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Not guilty? Agriculture in the 1920s and the Great Depression

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Not guilty? Agriculture in the 1920s and the Great Depression*

Abstract

Agricultural distress in the 1920s is routinely quoted among the causes of the Great Depression. This paper challenges the conventional wisdom. World agriculture was not plagued by overproduction and falling terms of trade. The indebtedness of American farmers, a legacy of the boom years 1919-1921, did jeopardize the rural banks, but the relation between their crises, the banking panic of 1930 and the Great Depression is tenuous at best.

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Introduction

The Great Depression of 1929 is arguably the major peace-time macroeconomic shock in world economy since the start of modern economic growth. From 1929 to 1933, the GDP per capita fell by a third in the United States and by about 9% in the whole Atlantic economy (Western Europe and its off-shoots) and the crisis had far-reaching political and social consequences¹. In spite of decades of research, its causes remain still controversial: not by chance, Bernanke has felicitously called the issue the “Holy Grail” of macroeconomics². Why did a recession start in 1929 and, above all, what did transform a mild downturn into the worst economic crisis since the Industrial Revolution, with far-reaching political consequences?

Most of the answers to these questions can be framed in two different interpretative traditions, the “real” or ET story (from the names of its main proponents, Eichengreen and Temin) and the “monetary” story³. Although disagreeing on most issues, they share a negative view of the conditions of agriculture during the “the roaring Twenties”. Temin states that, after the War, “agriculture had gone from prosperity to poverty”⁴. However, the two traditions single out different sources of weakness: the “real” story focuses on the disequilibrium between supply and demand in the world market, and the “monetary” one on the high level of debt of American farmers. These shortcomings allegedly made agriculture vulnerable to the initial price downturn and its crisis was a key component of the economy-wide depression. This stylized fact is routinely repeated in general books about the economy of the interwar years: for instance, according to P. Clavin, “the troubled health of agriculture, especially in eastern and southern Europe, was the most serious drag on European economic growth”⁵.

¹ Data from Maddison, *World economy*. See for the list of countries of the Atlantic economy Table 3.

² Bernanke *Essays* p.vii

³ Cf. for some additional references Balderston “Introduction” pp.1-6 for the “real” story and Calomiris “Financial factors” and Randall “An overview” pp.9-14 for the monetary one.

⁴ Temin *Lessons* p.11 and 55. Cf. also Temin *Did monetary forces* p.2 and pp.146-148

⁵ Clavin *The Great Depression* pp. 78. Cf. also Kindleberger *The world* pp.70-74 and 90-92, Romer “World War One” p.110, Pollard *Peaceful conquest* pp.500-01, Eichengreen *Golden fetters* p.227, Bairoch *Victoires* vol. III pp. 36-38; Koning *The failure* pp.163-184, Foreman-Peck *A history* pp.187-188, Feinstein, Temin and Toniolo *European economy* pp. 71-76, James *The end* pp. 63 and 105, Sheingate *The rise* pp. 76-77 and Findlay and O’Rourke “Commodity market” p. 44-45.

This article challenges this view. The conditions of agriculture on the eve of the Depression, although far from ideal, were not as bad as suggested by the received wisdom. Therefore, the collapse of agricultural prices in 1930-1933 and the ensuing devastating crisis were not a necessary consequence of the farmers' behaviour in the previous decade. Given the clear distinction among the two stories, they will be dealt with in two separate sections. The next one argues that evidence on prices, stocks and production before 1929 does not show any major disequilibrium. Section three deals with the "monetary" story: the indebtedness of American farmers did jeopardize the rural banks, but the causal relation between their crises, the nationwide panic of 1930 and the Great Depression is tenuous at best. Section four concludes, by discussing the possible causes of the collapse in relative agricultural prices during the Depression.

II) Agricultural "overproduction" and the Depression: the "real" story

II.1 The causes of the depression

According to the "real" story, agriculture contributed both to the outbreak of the Depression in 1929 and to its catastrophic worsening in the second half of 1930 because it was plagued by a structural disequilibrium between supply and demand. In the short-run, the downturn was accelerated by the parlous condition of the balance of payments of agricultural exporters such as Australia or Argentina in 1929. Timoshenko blamed mainly the poor 1929 crop, which reduced their exports, while Lewis and Eichengreen stress the effect of the American monetary squeeze of 1928 on these heavily indebted countries⁶. The drying-out of capital imports forced these countries first to liquidate their stocks of primary products, starting a downward fall in agricultural prices, and ultimately to abandon gold standard. On a different vein, Hamilton shows that future markets, usually quite efficient in predicting agricultural prices, spectacularly erred throughout the Great Depression, and Siklos speculates that the (unanticipated) price fall in 1929 might have triggered the Depression⁷.

The alleged disequilibrium was however a long-run problem, dating back to the war⁸. Since then, demand had been growing slowly, as the consumption of agricultural

⁶ Timoshenko, *World agriculture* pp. 66-76, Lewis *Economic survey* p. ?? and Eichengreen *Golden fetters* pp.227-228.

⁷ Hamilton "Was the deflation" pp. 158-162 and Siklos "Understanding" pp. 35-36. Hamilton shows how the (poor) predictions of future markets for agricultural commodities shaped also expectation about aggregate price level.

⁸ The gist of this interpretation was put forward in two major works by the League of Nations, *The agricultural crisis* (which voiced the opinions by agricultural experts from some thirty

products was price and income-inelastic, and the European population was increasing much less than before the war. In contrast, productive capacity had increased a lot, especially during World War One in overseas countries, for the combination of technical progress (mainly mechanization) and of the increase in inputs (land and capital). Different authors emphasize demand or supply-side factors in creating the disequilibrium, but they agree on the consequences. The additional production either ended up in stocks, financed with short-term loans, or, given the low elasticity of demand for food, caused prices of agricultural products to decline well before the outbreak of the Depression. A decade of “structural deflation”, to use Kindleberger’s words, had made farmers in the Atlantic economy highly vulnerable to any additional decrease in prices, even a relatively mild one⁹. In 1929-1930, farmers were forced to liquidate stocks, causing prices to spiral downwards. In a recent paper, Madsen sums up nicely this conventional wisdom: “the overproduction of agricultural products and the mounting stocks made agricultural prices vulnerable to shocks in demand, international lending and the international financial system”¹⁰.

How did the fall in agricultural prices cause the worsening of the Depression? Agrarian economists in the early 1930s used a proto-Keynesian argument: the fall in farmers’ income reduced economy-wide demand. Lewis pointed out that fall in prices benefited consumers – so that the net effect on domestic demand was likely to be small¹¹. He stressed that the decrease in prices created expectations of further decline, depressing investments, and reduced the purchasing power of exporters of primary products. As Eichengreen puts it, the ensuing contraction in exports was “another nail in the coffin of American prosperity”. These words seem to downplay the role of agriculture in the Depression. However, according to Madsen’s econometric estimates, it had a huge impact. The fall in absolute agricultural prices from 1929 to 1933 accounted for almost all the deflation and that the fall in relative agricultural

countries) and *The course and phases* (a report written by Bertil Ohlin, with the advice of other eminent economists such as Hayek or von Morgestern) and in the highly influential book by Timoshenko *World agriculture* pp. 8-32. Cf. also Genung *The agricultural depression* p.21, Arndt *The economic lessons* pp.10-12, Lewis, *Economic survey* pp.???. Cf. the more skeptical view Aldcroft *From Versailles* pp. 223-228 and Bernstein *Great Depression* pp. 9-12 and 103.

⁹ Kindleberger, *The world*, p.93.

¹⁰ Madsen *Agricultural crises* p.356

¹¹ Lewis, *Economic survey* pp. ?? Cf. in the same vein Fleising “The United States”, Aldcroft, *From Versailles* p.236 and also Kindleberger *The world* p.91. Temin (*Lessons* p.56) suggests that the net domestic effect might have even been positive. The quotation is from Eichengreen, *Golden fetters*, p.246

prices accounted directly for a sizeable share of the decrease in aggregate demand (about a half for consumption and between one fourth and one third for investment)¹².

This paper will not deal with the effects of the disequilibrium on the unfolding of the Depression, nor will it try to assess the relative importance of overproduction versus slow growth in demand. The paper will instead focus on the very existence of a disequilibrium, which is a necessary, though not sufficient, condition for the whole “real” story. To this aim, it will look at the evidence on prices, production and stock in the 1920s. Before discussing the available data, it is necessary to stress how narrowly focused the traditional narrative is. First, it deals almost exclusively with the countries of the Atlantic economy. African and Asian countries appear only as supplier of selected tropical imports, such as coffee and rubber. One can justify this focus to the extent that the Great Depression originated in those countries and affected only later, although very heavily, the rest of the world economy. Second, even the coverage of products of temperate agriculture is decidedly selective, in all likelihood according to the available data. Cereals and industrial crops have a paramount role while livestock products are given very little attention. Last but not least, the existence of the disequilibrium is mainly inferred from the decline in nominal prices and the increase in stocks for specific commodities. Production data are seldom quoted, and sometimes dismissed, as they do not show any spectacular increase in the 1920s, with the exception of rubber and perhaps silk.

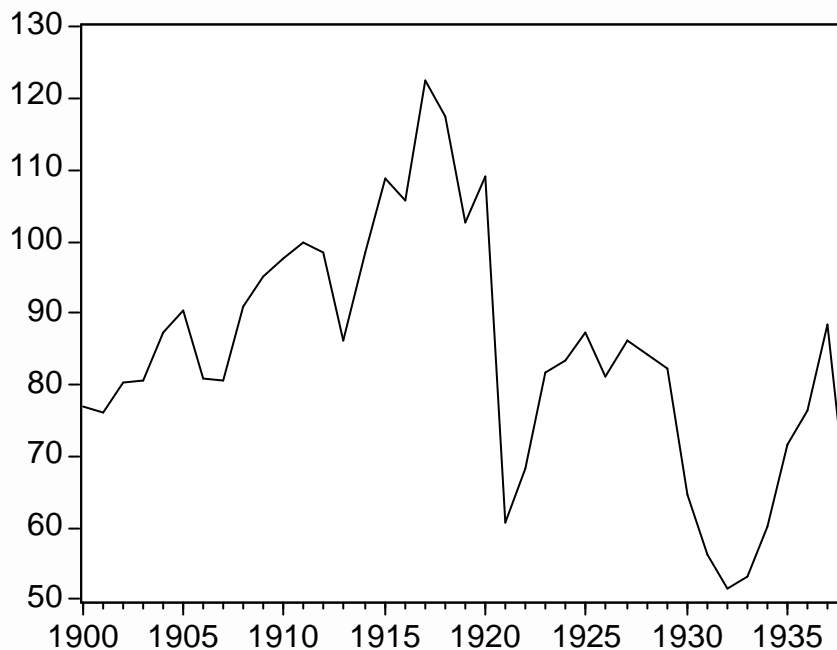
II.2 The evidence: prices

The data on relative prices do not confirm the conventional wisdom. Graph 1 reports the index of world agricultural terms of trade (ratio of prices of agricultural products to the unit values of manufactures) by Grilli and Yang since 1900, the starting point of the series¹³. Prices have been rising throughout the first decade of the 20th century, peaking in 1917, and then collapsed.

¹² Madsen *Agricultural crises*. The figures are obtained from the coefficients of a set of dynamic equations for fifteen countries in 1929-1936. They refer to the direct effect only, omitting the additional effects via the depression of land prices and the reduction in farmer's wealth.

¹³ The agricultural prices index is a weighted average of indices for food (0.85) and nonfood agricultural raw materials (0.15).

Graph 1
Terms of trade of world agriculture, 1900-1938
(1911=100)

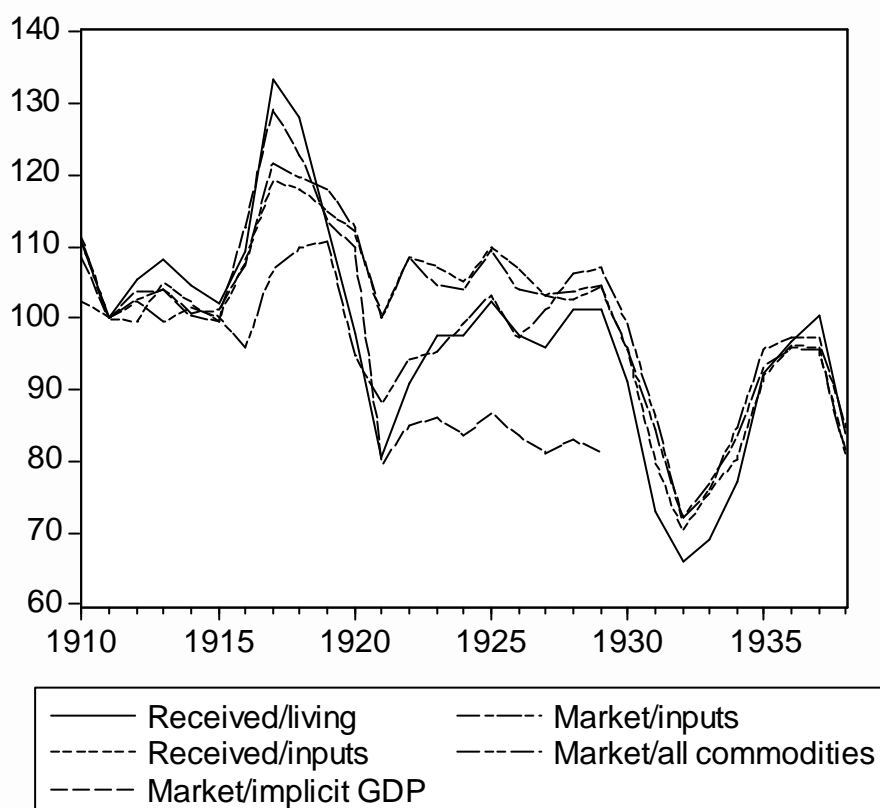


Source: Grilli and Yang “Primary commodity prices” Appendix one

The terms of trade fell by a half in four years, and then recovered, but only partially. On the eve of the Great Depression, the average was some 15% lower than in 1910-13. This comparison is somewhat unfair, as the pre-war prices were historically very high. Indeed, the 1910-14 price level (“parity”) was to assume a mythical status in the following years: achieving it became the goal of the Agricultural Adjustment Act, the cornerstone of the New Deal agricultural policy. In fact, the “terms of trade” in the late 1920s were still 10% higher than in the early 1900s.

Grilli and Yang are very economical with details of the computation of their indices. However, methods of computation can matter, as graph 2 shows. It reports five series of agricultural prices for the United States, which are computed as ratios of different basic series (farm-gate prices, wholesale price indices, implicit GDP deflators).

Graph 2
Real agricultural prices, USA 1910-1938



Sources: “Received” (prices received by farmers) *Historical statistics* series K344; “Living” (prices paid by farmers for living) *Historical statistics* series K347; “Inputs” (prices paid by farmers for production) *Historical statistics* series K348; “Market” (market prices of farm products from the Bureau of Labor Statistics) *Historical Statistics* series E42; “Implicit GDP” (implicit GDP deflator) Balke and Gordon “Estimation” tab. 10; “All commodities” (market prices for all commodities from the Bureau of Labor Statistics) *Historical Statistics* series E23.

These series, with one exception, show that agricultural prices on the eve of the Great Depression were back to their pre-war level. These data cast serious doubts about the conventional wisdom about price trends. The war-time cycle (peaking in 1919) was as wide as the Great Depression, but the long-term trends have been essentially flat ¹⁴.

What about other countries? Table 1 reports data on terms of trade (ratio of prices agricultural products/manufactures) and real prices (prices of agricultural

¹⁴ The rates of growth (computed with linear interpolation) for 1910-1929 are received/living – 0.67 (not significant), received/inputs 0.03 (not significant), market/implicit GDP –1.98 (significant 5%), market/inputs 0.05 (not significant) and market/all commodities 0.09 (not significant). The rate is –1.54 (significant at 15%) for the Grilli-Yang series.

products/overall price indexes) for as many countries of the Atlantic economy as possible. As expected, the terms of trade move more than real prices, which include the agricultural products also in the denominator. The table shows a wide variety of country trends, which reflect differences in coverage and methods of estimation. Yet, most series conform to the American pattern: prices declined or stagnated during the war-time cycle and grew in the 1920s. The prices in 1927-1929 were indeed lower than in 1910-1913 in a majority of countries, but in few cases only the difference exceeded 10%. As shown in the column e), in three countries only (all in Europe) there was a statistically significant downward trend. In all other cases, short-term fluctuations swamped long-term trends. Thus, in almost all the countries of the Atlantic economy, on the eve of the Great Depression, real prices of agricultural products were at their historical maximum or close to it. Price trends were even more favourable in the rest of the world ¹⁵. In short, there was no large-scale “structural deflation” in the 1920s. Nor there was a widespread worsening in 1929, which could account for the outbreak of the Depression à la Timoshenko/Eichengreen. From 1928 to 1929 the terms of trade did fall in Argentina (by 6%) and Uruguay (by 2%), and in the majority of European countries but they improved in Canada and Australia, as well as in the United States. These modest changes in prices contrast with the veritable collapse after the outbreak of the Great Depression (Graph 2 and col. f of Table 1): this fall is likely to have influenced the perception of pre-crisis experience.

II.3 Production and stocks

At a first glance, the available data on stocks seem to be a strong evidence for the conventional wisdom. Both the series by Timoshenko (from 1923 onwards) and the League of Nations (from 1925 onwards) show a fast increase in the late 1920s, at yearly growth rate of 7.5% and 11.3% respectively ¹⁶. However, these indices are seriously flawed. First, they cover a small set of products, such as cereals, textile fibres and tropical products, which happened to be the most subject to the (alleged) overproduction¹⁷. Second, the basic series may be not representative. Most of them

¹⁵ From 1911-13 to 1927-29 terms of trade improved in Punjab (+19%) Thailand (+11%) India (+4.5%) Korea (+4%) and Japan, while they decrease in Egypt (-1%), China (-1.2%) and above all Taiwan (-45%).

¹⁶ Timoshenko *World agriculture* tab.10 and League of Nations *Memorandum* 1938-39. Both sources reports estimate for different dates of the year. The growth rates in the text are computed with June 1 indexes for the period 1925-1929.

¹⁷ At least in the case of Timoshenko's index this effect is worsened by a bizarre weighting, which bears no relationship at all with the composition of agricultural production. Textile material (cotton and raw silk) account for 40.4% of total, tea, coffee and sugar for 36.8% and

refer to so called “visible supply”, the stocks in ports and public warehouses (sometimes only in some countries/markets). They omit stock held by farmers, by traders in their own warehouses and by processing industries. According to the League of Nations, the ratio of visible stocks to “world total stocks” increased for wheat and sugar (but not for cotton) – and therefore the latter overvalues the actual growth in inventories¹⁸. Last but not least, the late 1920s inventories were not exceptional if compared with production or consumption. Wheat stocks accounted on average for 14.7% of world output from 1922 to 1928, while from 1890 to 1913 they had amounted to 17.6% of production¹⁹. Inventories rose to 24.5% in 1929, after the 1928 bumper stock and remained around a quarter of output throughout the 1930s.

The information on productive capacity (Table 2) are scarce, but the 1910s and 1920s do not seem featured by a reckless expansion. The number of workers remained stable or even declined in most countries, capital increased by 5-10% and only the stock of land in few overseas countries was clearly on the rise. But this increase was at least partially compensated by the disappearance of Russian supply from the world market after the Revolution²⁰. Thus the posited growth in productive capacity had to be achieved with a substantial increase in total factor productivity and there is no evidence of an acceleration in the pace of technical progress after World War One²¹. From this point of view, the real watershed was to be World War Two.

This slow increase in productive capacity is consistent with the data on production. Table 3 reports the series computed by the League of Nations in the 1920s and 1930s and the results of a new research, which is based on yearly data for 25 countries at their 1913 borders. The data-base covers entirely the Atlantic economy, plus Eastern Europe (Russia and Austria-Hungary) and several South American and Asian

wheat for the remaining 22.2%. The League of Nations does not provide information on the weighting of its series.

¹⁸ From 1925 to 1929, the ratio for cotton remained stable, while those for wheat and sugar grew from 43% to 51% and from 34% to 48% respectively (League of Nations *Memorandum 1938-39*).

¹⁹ Output from Bennet “World wheat crops”, Davies “The world wheat situation” tab. I and Farnsworth “Wheat in the fourth year” tab. II (the series exclude Russia), stock of wheat at August 1 from Farnsworth “World wheat stocks” tab.1. The author points out (pp.57-58) that the increase of the share of output from the Southern hemisphere increased the equilibrium stock/output ratio. The stocks were not unusually large in proportion to output for coffee as well. The ratio was 50.5% in 1883-1913 (Ukers *All about coffee* p.274) and 37.6% on average in 1923-1929 (League of Nations *The agricultural crisis* tab.IX). It rose to 84.6% in 1928-29, which anyway was not the highest on record.

²⁰ Russia accounted for 12% of “world” gross output in 1913 (Federico “The growth” tab.5).

²¹ Federico, *Feeding*, chap.5. The sources of the 1930s often quote mechanization as a major change brought about by the war, but by 1930 there were only 130000 tractors in all Europe and about 300000 in the United States.

countries. All series refer to gross output (the total production available for human consumption or industrial processing after the deductions for seeds, cattle feeding and other farm uses) but the League of Nations omits dairy and meat, possibly biasing downward the outcome. As clear from Table 3, there were some substantial differences in performance among areas, but clearly production did not increase fast. On the eve of the Depression, gross output was about 15-20% higher than before the war. This increase is far from impressive. In the twenty years from the early 1890s to 1911-1913, a period which is widely regarded as a golden era for farmers, “world” production grew by a third, doubling in the countries of Western Settlement. If the 1870-1913 growth rate had been sustained in the 1910s and 1920s, by 1929 the output would have been about 10% higher than the actual one ²².

II.4 An estimate of the disequilibrium

The disequilibrium can be computed, for the year t , as

$$R_t = S_t / D_t \quad (1)$$

where S is an index of productive capacity and D is an index of potential demand – all expressed as a ratio to an equilibrium year. The data on productive capacity are too scarce to estimate S , which thus will be proxied with actual production. This is tantamount to assume that productive capacity was fully utilized and short-term fluctuations of output reflected only the vagaries of weather. The potential demand is computed as

$$D = P * C_p \quad (2)$$

where P is population and C_p is per capita consumption of agricultural products,

$$C_p = A * Y^a * P^b \quad (3)$$

where A is a survival bundle of consumption (constant over time), Y is GDP per capita, P an index of “world” real prices of agricultural products and a and b are the relevant elasticities.

The equilibrium year is assumed to be 1911. The baseline estimate of R (Tab.4 column b) is the ratio of aggregate production of the Atlantic economy (Table 3) to the baseline estimate of demand (Table 4 column a). This latter is computed by assuming a moderately inelastic demand, with $a = 0.6$ and $b = -0.3$ ²³. Clearly, there was

²² Cf. Federico “The growth” tab.4.

²³ The index of real prices is computed as a weighted average of country series of table 4, plus the ratio of food/consumer prices in the United States (*Historical statistics* series E 137/E135). These countries are fairly representative, as they accounted for about 85% of the population of the “Atlantic” economy. The national indices are weighted with population: using

no “overproduction”: if any, production was inferior to potential demand. The other columns of table 3 show that this result is quite robust to changes in assumptions. Column c) uses the index of production by the League of Nations, column d) assumes zero price elasticity and column e) assumes both income and price elasticity to have been zero –i.e. that aggregate demand changed only as much as population. Only in this last case, an extreme version of Lewis’s scenario, actual production did exceed potential demand all over the 1920s, with a widening gap. However, the assumption of zero income and price elasticities does not seem really plausible for the whole agricultural demand, which included “luxuries” such as sugar, coffee and livestock products.²⁴ Finally, column f) refers to wheat only – the product most affected by overproduction according to the conventional wisdom²⁵. Total production of the Atlantic economy did exceed demand only since 1926. On top of this, the estimate is biased upwards by the omission of imports from Russia, which in 1911 accounted for about 8-9% of supply of the Atlantic economy.²⁶ Adding imports from Russia to the equilibrium production level would reduce S and therefore R. This latter would exceed one only in 1927-1928.

II.4 The “real” story: an assessment.

The statistical evidence discussed so far refers to agriculture as a whole, and thus it does not rule out differences by crop. According to Grilli and Yang, in the late 1920s,

the country shares on gross output in 1913 (Federico “The growth” tab. 6) instead does not affect the results. These series are wholesale prices, and thus they might not be representative of retail ones, which consumers faced. It is for instance possible that falls in prices of raw products such as wheat did not pass through to consumers for the rise in processing costs (wages etc.) and/or for the market power of food companies. In the United States, the price of bread fluctuated much less than that of wheat (*Historical Statistics* series E 188 and K 508). The divergence between wholesale and retail prices was a major concern for agricultural experts (League of Nations *The agricultural crisis*). The GDP and population are from Maddison *The world economy*

²⁴ As an alternative, one could hypothesize that elasticity was positive, but consumers adjusted spending to their expected permanent income. Clearly, no one could have predicted the Great Depression – so permanent income in the 1920s could be computed as the average of the years 1921-1929 or as an interpolation of income growth in the same years. In both cases, the production/demand ratio is lower than in the baseline case.

²⁵ The wheat production is computed summing up gross output in Argentina, Australia, Canada, the United States, Belgium, Denmark, Finland France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom, plus imports from Russia (Stern, “). All the data are from Mitchell, *International historical statistics* tab. D2 – except Belgium (Blomme, *The economic development*), Italy (ISTAT *Sommario*) Portugal (Lains, personal communication). Prices are proxied by the ratio of price of wheat in the United States (*Historical Statistics* series K 508) to wholesale price index (series E 53). The elasticities are assumed 0.2 to income and –0.1 to prices. The “overproduction” disappears totally if the Atlantic demand is compared with the total world production, from Bennett “World wheat crops”.

²⁶ Stern “A series”.

the “terms of trade” for agricultural raw materials were 30% lower than before the war²⁷. In the United States, the real prices of cereals (and also of meat) never regained the pre-war level, while those of dairy products, fruits and even cotton in the late 1920s did exceed it²⁸. In most countries livestock products fared better than crops²⁹. The effect on farmers’ incomes depended on the scope for substitution among products. This substitution was limited in some cases by environmental constraints (climate, lack of irrigation water) or, for tree-crops such as rubber, by the lag between planting and the start of commercial production³⁰. However, in most cases, the elasticity of substitution was high enough: the share of livestock products on total gross output was rising in most countries and in the “world” total³¹. The same reasoning holds true for exporting countries: only few of them were inescapably trapped with the wrong specialization. On top of this, exporting countries were not yet seriously damaged by European protectionism. In fact, tariffs in the 1920s were lower than on the eve of World War One: according to Liepmann, the average duty on cereals was lower in 1913 than in 1927 in nine countries out of fifteen, including France and Italy³². On the other hand, disadvantaged farmers (and countries) complained loudly, and their plight loom large in the traditional account of the crisis.

Summing up, the evidence rules out a major disequilibrium. This result failure to find evidence of disequilibrium should not be really surprising, if one considers the behaviour of farmers in Western settlement countries implicit in the traditional story. They allegedly increased their productive capacity under the twin assumption that demand was to increase as fast as before the war and, crucially, that European

²⁷ Grilli and Yang “Primary commodity prices”

²⁸ Prices of corn, wheat and cotton from *Historical Statistics* series K504, K508 and K 555 other products Strauss-Bean “Gross farm income” series 85, 86 and 90; all prices deflated with the index of prices paid by farmers for living *Historical Statistics* K347

²⁹ Cf. Federico *Feeding the world* tab.3.7.

³⁰ The production of the trees planted in the boom years of the early 1920s glutted the market in the late 1920s (Aldcroft *From Versailles* pp.228-229). Even if the initial investment in plantation was totally amortized, plantations should not have continued to produce if prices did not cover variable costs.

³¹ The share of livestock products on total “world” output increased from 43.6% in 1911-1913 to 45.8% in 1928-1930. The sum of fruits, dairy/eggs and meat increased from 62.2% of US gross output in 1919-21 to 70.1% in 1928-30 (data from Strauss-Bean “Gross farm output” tab 10 and 27).

³² Liepmann *Tariff levels* tab AI (potential tariff levels). The duty was also lower in 1927 than in 1913 in the majority of countries for fruit and vegetables, while it was higher for the other categories such as livestock, animal foodstuff and other foodstuffs. The differences were anyway quite small. Furthermore, barriers to trade were even lower in the early 1920s (League of Nations, *Agricultural crisis* pp.17-21, Clavin *The Great Depression* pp.81-86, Federico, *Feeding the world*).

agriculture was to be unable to satisfy it. One can admit a collective error in prediction under the exceptional war-time circumstances, but the conventional wisdom implies that they went on erring throughout the 1920s, even after the great shock of 1920-1921 and the return to normalcy in international economic relations. They would have gone on increasing their productive capacity and output, betting on a price rebound, which did not materialize. Such a collective misjudgement is hardly credible, especially as farmers had the option to migrate to cities, where the economic growth offered plenty of job opportunities³³. The behaviour of farmers would be perfectly rational if prices had remained stable in the long run. This seems to have been the case: all the evidence suggests a slow but steady growth in production matching the slow but steady growth in demand.

III) Agriculture and the Depression: the “monetary” story

III.1 The “monetary” story

As is well-known, the modern “monetary” interpretation of the Great Depression was initiated by Milton Friedman and Anna Schwartz in their classic book *A monetary history of the United States*. They dismiss the effects of the events of 1929 and argue that the real turning point of the crisis was the banking panic of October 1930. It triggered the Great Depression by causing a substantial and unexpected reduction in the money stock which the Federal Reserve was unable or unwilling to contain³⁴. In a more recent version of this “monetary” story, Bernanke stresses the negative effects of the fall in supply of banking services and the more cautious lending policy of surviving institutions³⁵. They worsened the depression by forcing households to save more and consume less. In both versions, had not the banking panic not happened, the initial downturn would not have turned into a disastrous depression. Agriculture might have played a role in the panic via the effect of farmers’ indebtedness on the conditions of the banking system. Indebtedness could cause a nationwide banking panic if i) indebtedness caused a substantial number of farmers to fail, ii) these failures caused banks which had financed farmers to fail and

³³ In the United States, the market for labor was well integrated in the 1920s ((Alston and Hatton “The earnings gap”) and 0.63 millions farmers migrated to cities each year from 1921 to April 1930 (*Historical Statistics* series C 78).

³⁴ Friedman and Schwartz *A monetary history* pp. 299-311 and 338-341. Cf. the reappraisal by Hamilton “The causes” by Cole and Ohanian “The Great Depression” pp.16-19.

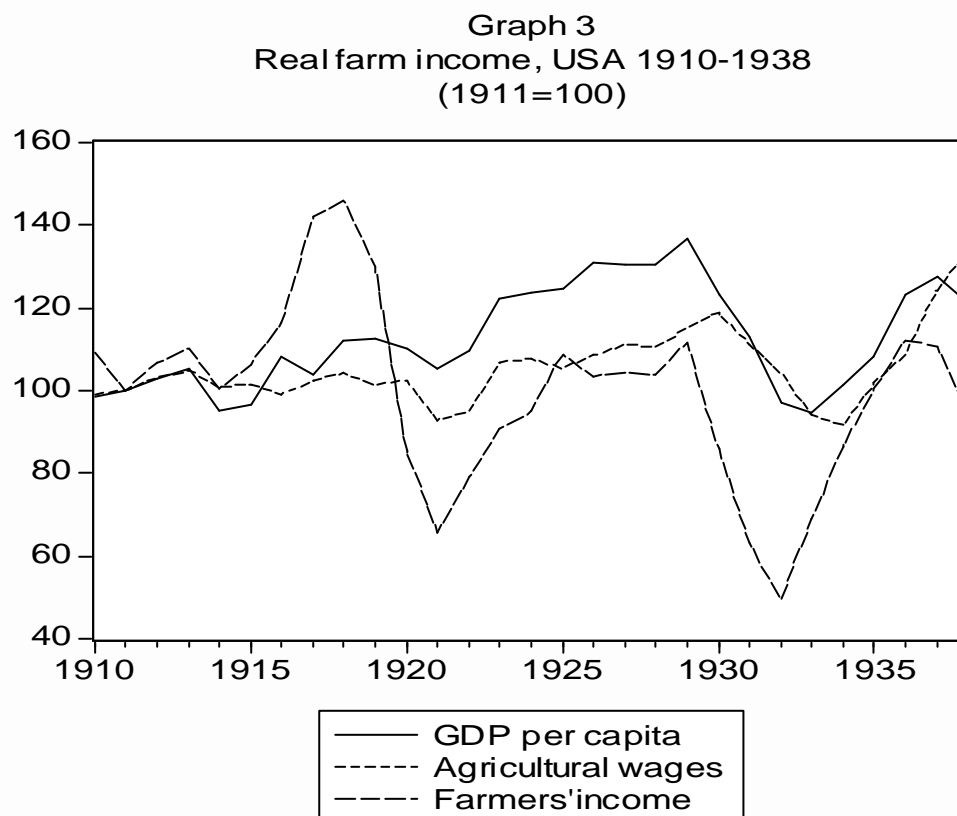
³⁵ Bernanke *Essays* pp.46-62

iii) the failure of rural banks either triggered the panic (a case of strong exogeneity) or helped to propagate it (weak exogeneity).

Before testing these three conditions, this section will illustrate briefly the situation of American farmers in the 1920s, in order to reconstruct the origins of their indebtedness. Consistently with the overall “monetary” story, it will focus uniquely on the USA, although the connection between indebtedness and banking panics elsewhere is worth of research. In fact, farmers were quite heavily indebted also in other countries – notably Germany- and the occurrence of a banking panic in a country worsened its performance during the Depression ³⁶.

III.2 The gathering of the storm: farmers’ income and indebtedness in the 1920s

As graph 3 shows, the income of American farmers fluctuated a lot in the 1920s.



Sources: GDP per capita Maddison, *World economy*; Agricultural wages: earnings for farm employees (HS D739) deflated with prices paid for living (HS K347); Farmers’ incomes: farmers’ income (HS K284) deflated with prices paid for living (HS K347) ³⁷.

³⁶ Cf. Bernanke *Essays* pp. 26-28 and on German indebtedness League of Nations *The agricultural crisis* pp.171-172

³⁷ The series (“realized net income of farm operators from farming”) omits income from non-farm work and capital gains and losses from the change in inventories. Cf. also the income

They had profited handsomely from war-time boom and were hit extremely hard by the fall in prices ³⁸. From 1917 to 1921, their real income fell by 55% -i.e. as much as from 1929 to 1932. In the 1920s, it crawled back, and at the end of the decade it was back to the pre-war level. However farmers had lost ground relative the rest of the economy and also relative to their own employees. The GDP per capita was 30% higher than before the war (series b) and the agricultural wages were some 10% higher than farmers' income. This difference with their own employees may have affected the farmers' status and self-perception more than the comparison with far-away city dwellers. But on the eve of the Depression, the farmers' conditions were not terrible, although surely not very good. The gap with agricultural workers and the rest of the economy was to widen during the Depression – just to ounce back with the New Deal and the Agricultural Adjustment Act.

The worst legacy of the early 1920s was however a massive worsening in the financial conditions of American farmers. From 1919 to 1921 their net wealth decreased by more than 9 billions (1911) dollars – i.e. by 1.3 times the initial output ³⁹. About one third of this sum reflects a decrease in net savings and the rest the increase in indebtedness. Actually, the available data underestimate the amount of debt, as they refer to all loans from institutions and to mortgage-backed loans from individuals. Therefore, the unsecured loans from individuals (“junior” mortgages), which accounted for a sizeable share of total ⁴⁰.

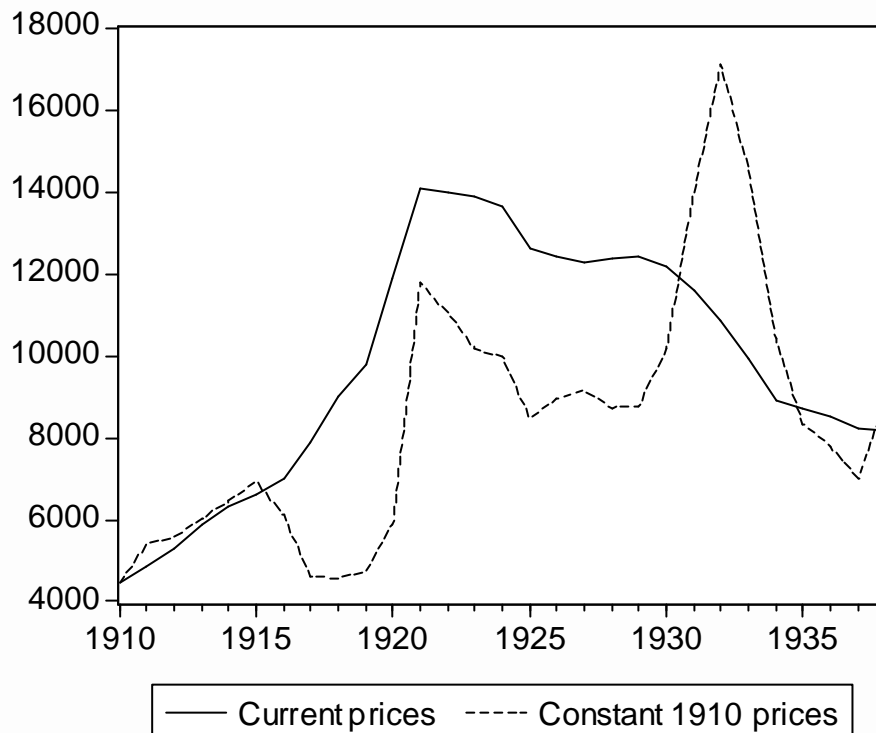
series by Holt “Who benefited” p.284 and Williamson and Lindert *American inequality* Tab. 5.13 and 5.14

³⁸ Shideler, *Farm crisis* pp.36-52, Johnson “Post-war optimism”

³⁹ Data on debt *Historical Statistics* series K361 and K376-K380, net personal savings *Historical Statistics* series F 547, both deflated with prices received by farmers (series K 344), gross output estimate by the author (Federico “The growth”).

⁴⁰ The main, official, mortgage usually amounted to about half the value of the farm, while these “junior” mortgages, backed with personal promissory short-term notes, could supply up to a further 40% in some cases (Johnson “Post-war optimism” pp.184-185).

Graph 4
Total debt of American farmers, 1910-1938
(millions dollars)



Source: see footnote ??

Yet, the increase in debt was really impressive: from 1919 to 1921 the total debt (graph 4) increased by 45% in nominal terms and by 156% in real terms. Farmers reduced their net wealth for a variety of purposes (including the speculation on pure-bred animals) but mainly for purchasing land. There are no data on transactions, but the boom is shown by the price increase. From 1918 to 1921, nominal prices of land increased by a third and real ones by 61.5%⁴¹. Clearly, the post-war boom deceived farmers, admittedly at a time when forming realistic expectations on future profits was exceedingly difficult. The 1921 crisis dramatically worsened their financial conditions. Real interest rates jumped to almost 50% and interest payments, on

⁴¹ Nominal value of land from Lindert "Long-run trends" tab.1 deflated with prices received by farmers (*Historical statistics* series K 344). These yearly figures are unadjusted for the quality change related to the westward expansion. Lindert does provide adjusted figures, but only at ten-year intervals, and therefore unsuitable for a short-term analysis. The bias from the use of yearly data is anyway very small: from 1915 to 1930 unadjusted real prices fell by 39.2% and adjusted ones by 36.9%.

mortgage-backed loans only, to 16.6% of farmers' income ⁴². Adding payments on other mortgages, the total burden might have exceeded a quarter of total income ⁴³. Last but not least, farmers incurred also huge capital losses: the nominal price of land fell by almost 30% from 1921 to 1922.

During the 1920s, the stock of nominal debt and the interest/income ratio decreased slowly but steadily: by 1929, the debt was 13% lower in nominal and 25% lower in real terms than eight years before. However, this reduction was brought about almost exclusively by foreclosures, which increased from 3.2‰ of farms in 1913-1920 to 10.7‰ in 1921-1925 and to 17.7‰ in 1926-1929 ⁴⁴. In fact the outstanding debt had fallen by a total of 2.4 billions current dollars, while according to Goldsmith, foreclosures had wiped out 2.8 billions of debt. ⁴⁵ Thus farmers still in business were heavily indebted: on the eve of the Great Depression the debt/output ratio, inclusive of the unsecured loans from individuals, might have been around 125% and the interest/income one around a sixth. These are nationwide averages, but the level of indebtedness varied a lot across the country – roughly increasing from East to West ⁴⁶. In other words, many American farmers were still haunted by the hang-over of the 1921 boom and bust and this may have been an important source of weakness once the storm broke.

III.3 Farmers' indebtedness and the Great Depression

The negative effect of indebtedness on the farmers' conditions during the Great Depression (the first of the three conditions) is hardly controversial. The nominal

⁴² Interest on mortgages *Historical Statistics* series K 372, income series K 284, plus interest payments. Cf. on the credit crunch Shideler *Farm crisis* pp.52-58 and for the policy of the Federal Reserve Metzler *A history* pp. 114-115

⁴³ This figure is estimated assuming that not-secured loans paid the same interest rate as mortgage-backed ones. This is a conservative estimate (Clarke *Regulation* tab.3.1). The total stock of debt is computed assuming that un-secured loans from individuals amounted to some 25% of the known total. This figure is hypothesized somewhat higher than the corresponding share in the 1970s (15% according to *Historical Statistics* p.478), taking into account the estate boom of the 1920s and the wide resort to promissory notes to finance it (cf. footnote ??).

⁴⁴ Alston "Farm foreclosures" tab.1 and Goldsmith *A study* tab. M 27. The data include also distress sale without formal procedure.

⁴⁵ From 1922 to 1929, the total financial assets remained constant (+ 9 millions only), tax arrears increased by 110 millions, while mortgage-backed debts fell by 1.1 billions and other debts fell by 1.3 billions (Goldsmith *A study* tabs M 28, A-53 and A-54 and A.65). The source reports figures at 1930 prices, which are converted in current prices with the index of prices received by farmers (*Historical Statistics* series K 344). The author estimates the total value of debt on foreclosed farm assuming that each mortgage amounted to three-quarters of the average one.

⁴⁶ Alston "Farm foreclosures", tab.2, Hamilton "The causes"

stock of debt did fall somewhat from the pre-crisis level, but much less than gross output – so that debt/output ratio doubled (Table 5). The financial conditions of farmers worsened dramatically: real interest rates soared, interests gobbled a growing share of income and foreclosures (with some lag) increased to unprecedented heights

⁴⁷ As column d.2) shows, farmers' real income would have fallen “only” by 18% instead of by almost 30% if they had not to pay any interest (column d.1). Alston shows that the percentage of foreclosures from 1926 to 1940 by state was positively related to the percentage of mortgaged farms: a 10% increase in this latter increased the average rate of foreclosure rate by 1.4‰, i.e. by a 7.5% at the average ⁴⁸.

The effect of the farmers' financial plight on the banking system depended, *ceteris paribus*, on the share of credit to agriculture on the banks' total assets. From this point of view, the situation of the banking system as a whole was not so troublesome. In fact most mortgages had been subscribed by individuals, insurance companies and other non-banking institutions, and, as said, a lot of capital had been supplied by individuals with “junior mortgages” ⁴⁹. By 1929 assets of “commercial” banks included 1 billion dollars for secured loans and 2.6 billions for unsecured loans to farmers – small sums if compared with the total assets of banking system (62 billion \$) and also with those of “state [chartered] commercial banks” (some 34 billion), which included rural banks. ⁵⁰ There are no data on assets by location of banks, but it is highly likely that credit to farmers was mainly held by rural banks and that it accounted for a sizable share of their assets. Rural banks were very vulnerable to agricultural crisis. Most states did not allow them to open branches, and thus to diversify their assets, and on top of this they had no right of support from the Federal Reserve ⁵¹. In case of foreclosure, the bank was bound to lose even if it could find a buyer for the farm. For instance, in 1933 the nominal price of land was about a third

⁴⁷ These figures are subject to a contrasting bias. They understate the burden of interests as they omit non mortgage-backed loans and they overstate the burden, as they neglect interest rate delinquency, which was on the contrary quite diffused.

⁴⁸ Alston “Farm foreclosures”. The rate of foreclosures was also positively related to the fall in income and to the extent of the previous land boom (measured with the increase in improved acreage from 1910 to 1925 and the increase in land prices from 1900 to 1912).

⁴⁹ By 1929, “individual and others” accounted for 47% of secured loans, insurance companies for 22%, Federal land banks, state credit agencies and joint-stock land banks (monitored and guaranteed by the state) for 20% and “commercial” banks for only 10% (including a tiny 1% for mutual saving banks) Goldsmith *A study* tab A-61 and A-62.

⁵⁰ *Historical Statistics* series X 684, less assets of private banks (series X 686). The total assets of “non-national banks”, which included also mutual savings, totalled 45 billion – 10.4 of which on (urban and rural) real estate (*Historical Statistics* series X 657 and 658).

⁵¹ Cf. Alston, “Why do banks”, *White Regulation* pp. 14-17 and 127-132.

of its 1920-1921 peak. In other words a bank which had lent a farmer half the value of its farm in 1920-1921 was bound to lose, on average, about 14% of its assets if it foreclosed in 1933. But rural banks were also subject to interest delinquency before seizure and fall in deposits. There are no data on the former, although likely to have been quite common, as many institutions resorted to foreclosure only as an extreme ratio⁵² The total deposits of farmers (surely most held in rural banks) fell from 2.9 billion \$ in 1929 to 1.6 in 1933⁵³. All these blows can account for the high mortality among “state [chartered] banks”: from 1930 to 1933 some 6865 of them, two out of five operating in 1929, failed. The rate of failure for the other categories of banks was “only” about 25%⁵⁴.

Thus, the two first conditions are established well enough: the crisis did jeopardize the financial situation of farmers and, as a consequence, of rural banks. The real question is to what extent the financial troubles of rural banks affected the rest of the banking system and the economy at large. Friedman and Schwartz, consistently with their overall interpretation, opt for a strong exogeneity: the 1930 panic was “neither foreseeable nor inevitable” and it was not a consequence of a worsening in the “quality of loans”. They state that “a contagion of fear spread among depositors, starting from the agricultural areas, which had experienced the heaviest impact of bank failures in the 1920s”⁵⁵. They do not pursue this hint, focusing instead on the case of the Bank of the United States, a New York bank with large loans in real estate. However, it is not difficult to hypothesize that an unanticipated fall in prices or perhaps a poor crop convinced depositors in some agricultural areas that the local bank could not sustain the farmers’ losses, starting the panic. How much plausible is this scenario? Elmus Wicker, in his book on The banking panics of the Great Depression strongly downplays the relevance of the 1930 panic for the Depression and above all barely quotes agriculture. He blames the failure of Caldwell and Co, a Tennessee bank, which had overextended itself in a purchasing spree, while the subsequent waves of panic in 1931 and 1933 originated in big cities (Chicago and

⁵² Alston, “Farm foreclosure moratorium”

⁵³ Goldsmith *A study* tab. A 53. These figures estimate and include the deposit to other institutions. In the 1920s a lot of discussion about competition by city banks, but unclear if so large..

⁵⁴ *Historical Statistics* series X 580, X 683 and X 685 for the number of banks in 1929 and X 741 and X 743 for the number of failed banks. Cf. Hamilton *From new day* pp. 148-165 for the hesitant and ultimately failed attempts to help to the distressed banks.

⁵⁵ Friedman and Schwartz *A monetary history* p.308.

Detroit), with the co-operation of the devaluation of sterling ⁵⁶. Wicker's account would thus relieve agriculture of any responsibility for the "origin" of banking panics. D. Hamilton disagrees, arguing that the failure of Caldwell and Co accounted for a small share of total bankruptcies. He stresses the general weakness of rural banks and role of falling prices and of the drought, which hit many Southern states in 1930⁵⁷. Such a conflicting assessment is not surprising: by definition, the hypothesis of strong exogeneity is difficult to prove, or disprove, conclusively.

On the other hand, some econometric papers suggest a weak exogeneity, by showing a positive relationship between the rate of bank failure and measures of agricultural distress and indebtedness. Alston et al show that in the 1920s agricultural distress, measured by the rate of foreclosures, had been the main determinant of differences among states in the rate of bank failures⁵⁸. Temin finds that the share of income from cotton and wheat on state GDP was positively related to the banking crisis in 1930 and 1931 – but not in 1929 ⁵⁹. In a short paper, Thies and Gerlowski show that the share of failed banks was positively related to the proportion of real estate loans on their assets in 1927-1929 and 1930-32, but not in earlier periods ⁶⁰. The effect is reinforced if the variable is interacted with indexes of the borrowers' distress such as the share of foreclosed farms or the change in land prices. Unfortunately, none of these results is really conclusive. Alston's work refers to the 1920s, Temin uses an indirect measure of distress, while Thies and Gerlowski do not discriminate between panic and not panic periods and consider all real estate loans, not just agricultural ones, in the denominator of their key explicative variable ⁶¹.

⁵⁶ Wicker "A reconsideration" and *Banking panics* pp.32-36 and pp.152-154. Cf. also Metzler *A history* pp.325-326

⁵⁷ Hamilton "The causes". His view is indirectly supported by Hamilton's results about price expectations (Hamilton "Was the deflation"). The less anticipated price falls were, the more likely that they triggered a panic.

⁵⁸ Alston et al "Why do banks" p. 421. Cf. also Wheelock "Regulation" on Kansas and Fisher *American* pp.199-210

⁵⁹ Temin *Did monetary forces* pp. 83-90. He uses several measures of crisis – number of failures, proportion of failed banks and so on. The concentration of failures in the South explains the strong effect of the variable share of cotton. The relationship is somewhat weaker for wheat, while, as said, wheat states had been the most hit by the wave of foreclosures of the 1920s. This geographical shift may have been a coincidence (or the consequence of the drought), but it might reflect also the effect of foreclosures, which had weeded out the weakest farmers in the wheat-growing states.

⁶⁰ Thies-Gerlowski "Bank capital". The rate of failure is negatively related to the size of the banks. The regression omits all real variables – including the state income. Cf. also the similar results by White ("A reinterpretation"), whose sample however includes only national banks.

⁶¹ Cf. on the role of loans to real estate in the Depression the very recent paper by Eichengreen and Mitchener "The Great Depression" pp.208-212.

Summing up, also the evidence for the “monetary” story seems insufficient. The euphoria of the 1920s had saddled farmers with a huge debt, which greatly reduced their strength to weather the fall in nominal prices ten years later. The agricultural crisis jeopardized the financial situation of the rural banks, and many of them failed. But it is quite difficult to prove the third condition – the existence of a causal link between the crisis of rural banks and the overall banking panic. The best guess rules out a strong relation between the crisis in the countryside and the outbreak of the 1930 panic. The poor conditions of rural banks are likely to have contributed to the overall financial crisis during the Depression, but their specific contribution is difficult to disentangle from the more general boom and bust in real estate.

IV) Conclusion: why did agricultural prices fall during the Depression?

Relative agricultural prices did fall dramatically in almost all countries during the Great Depression (Table 1), while world agricultural production remained roughly constant (Table 3). In the conventional wisdom, these trends would be quite easy to explain as a dramatic consequence of the long-term disequilibrium, but as Table 4 shows, there is even less evidence of overproduction after the outbreak of the crisis than before. How can the price fall be squared with the no-disequilibrium scenario? There are three possible answers to this question.

i) The Total Factor Productivity may have grown faster in agriculture than in the rest of the economy. This hypothesis seems highly unlikely, in spite of the acceleration of agricultural TFP growth after the war relative to pre-war years. The implicit gap in TFP growth rates among sector must have been implausibly large and anyway the available data suggest that from 1929 to 1937 TFP grew more slowly in agriculture than in the rest of the economy ⁶². Thus, if any, productivity trends caused relative prices of agricultural products to rise.

ii) The supply of banking services (à la Bernanke) might have fallen more in the rural areas than in the rest of the economy, as a consequence of the higher rate of failures. In this case, farmers had to resort to city banks, which, given informational asymmetries and the poor reputation of agriculture, rationed credit and/or charged

⁶² The TFP growth of farming from 1929 to 1937 (0.8%) was the lowest among the main sectors of the American economy according to Kendrick (*Productivity trends* tab.34). In a recent paper, Field (“The most technologically progressive”) argues that Kendrick’s figures underestimate non-farm productivity growth. Cf. for further data on productivity growth in agriculture Federico *Feeding the world* chap.5

high real interest rates⁶³. The increase in transaction costs would show up in a widening gap between prices received by farmers and (urban) wholesale prices of agricultural products. Indeed in the United States, the former did decline a little more than the latter, but the difference is too small to account for more than a minimal proportion of the fall in agricultural prices⁶⁴. It is a fortiori even less plausible that this effect extended to other countries, where agriculture was less dependent on credit.

iii) The third, and most plausible, hypothesis focuses on the asymmetry between agriculture and the rest of the economy. Agriculture was a competitive sector, and in the peculiar conditions of the Depression its elasticity of supply was bound to be low. In fact the opportunity cost of farmers' labor was extremely low, as it depended on the expected wages in other sectors. Real wages were rising, but the high rate of unemployment made the prospect of emigration to cities hardly attractive⁶⁵. Thus farmers were likely to go on producing as long as revenues covered their variable costs plus a minimum income for the purchases of indispensable consumer goods. In this situation, demand shocks caused prices to fall. In contrast, in the rest of the economy demand shocks caused a fall in output because prices were sticky. A long interpretative tradition, dating back to Keynes and revived by some recent works, attribute this feature to wage stickiness, determined by the power of trade unions, by the existence of welfare benefits or by the existence of long-term labor contracts⁶⁶. In contrast, Madsen, in two very recent contributions, argues that prices of industrial goods were sticky because competition in manufacturing was limited⁶⁷.

To sum up, this article largely exonerates agriculture from the allegation to have been responsible of the Depression. The acquittal is complete for the charge of "overproduction" in the "real" story, and likely for the "monetary" story. The message

⁶³ Cf. for some evidence of the insufficient supply of credit to agriculture and for the measures to increase it Hamilton, *From new day* pp.153-162. Bernanke (*Essays* pp. 55-56) downplays the possibility of a negative effect of the contraction in banking services on investments because big corporations could finance their investments with their funds. This argument, however, does not apply to cash-strapped farmers.

⁶⁴ From 1929 to 1932, prices received by farmers fell by 41.5%, while wholesale prices of farm products by 38.2% (*Historical Statistics* series K 344 and E42). The fall might reflect productivity improvements in transportation and marketing.

⁶⁵ The yearly net migration from countryside (*Historical Statistics* series C 78) to cities totaled 0.63 millions from 1921 to April 1930 and 0.64 from 1934 to 1939, while only 61000 in 1931. From April 1931 to April 1933, 3.0 million people left farms and 3.74 returned, with a net immigration of 763000 persons.

⁶⁶ Cf. e.g. among the many works Bernanke *Essays* Bordo-Erceg-Evans ("Money") and the discussion by Cole-Ohanian ("The Great Depression" pp. 19-21), Kehoe and Prescott ("Introduction") pp. 12-13 and Madsen ("The length") pp. 239-241

⁶⁷ Madsen "Prices and wages" and "The length"

of the paper is clear: in spite of their reckless borrowing spree during the 1919-1921 boom, farmers were more a victim of the Depression than a culprit for it.

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Tab . 1

Trends in relative prices, countries of the “Atlantic” economy

	a)	b)	c)	d)	e)
Terms of trade					
Argentina	-24.7	14	-14.2	-44.2	1.15 ns
Uruguay	25.8	-21.8	-1.5	-25.9	-3.00 ns
Australia	-7	-11.2	-17.4	-30.6	-1.17 ns
Canada	-10.2	13.6	2	-37.0	-0.03 ns
UK	-21.7	10.9	-13.2	-15.5	-0.91 ns
Denmark	-11.6	-10.1	-20.5	-40.7	-1.70 ns
Sweden	-4.6	9.5	4.5	-14.3	0.52 ns
Finland	14.2	9.8	25.4	-23.4	1.65 **
Ireland	-23.8	7.1	-18.3	-18.4	-1.16 *
France	-27.6	31.9	-4.6	Increase	-1.04 ns
Germany	-6.3	-2.9	-9.1	-20.8	-0.52 ***
Spain	-2.1	11.8	9.5	-11.2	0.38 ns
Italy	-11	-1	-11.9	-17.9	-1.20 ns
Real prices					
Denmark	-1.3	-16.6	-17.8	-37.4	-1.33 ns
France	-12.4	18.1	3.4	Increase	-0.36 ns
UK	5.8	-2.1	3.6	-5.4	0.07 ns
Italy	-0.3	-6.2	-6.5	-20.3	-1.02 ns
Uruguay	14.1	-11.5	1.0	-4.2	-1.50 ns
Canada	-14.7	13.1	-3.5	-32.2	-0.16 ns
Spain	-1.7	3.4	1.7	-13.3	0.15 ns
Germany			-13.3	-15.7	

a) 1911-13 to 1920-22; b) 1920-22 to 1927-29; c) 1911-13 to 1927-29; d) 1929 to Depression trough⁶⁸; e) growth rate, 1910 to 1929 (ns not significantly different from zero; * significant at 10%; ** significant at 5%; *** significant at 1%)

Source: Federico 2005 Statistical Appendix tab III

⁶⁸ The trough of the terms of trade was reached in 1931 in Australia, in 1932 in Argentina, Canada, Denmark, Germany and the United States, in 1933 in the United Kingdom, Sweden, Finland, Ireland, Spain and Italy and in 1934 in Uruguay; that of real prices in 1932 in Denmark, Germany and the United States, in 1933 in Italy and Spain, in 1935 in Uruguay and the United Kingdom.

Tab.2
Gross agricultural output, 1913=100

	World Total output	Crops	livestock	League Nations	Areas USA	Europe	North-Western Europe	Western Settlement	Atlantic economy
1911-13	103,4	102,5	102,5		100,6	105,6	102,6	101,2	102,4
1920	93,0	92,4	93,0	89,5	96,1	86,8	90,0	97,4	96,6
1921	97,6	96,9	99,0	89,5	107,7	87,8	93,7	106,1	101,4
1922	102,6	101,9	103,3	99,3	106,4	95,0	99,3	107,7	105,0
1923	104,3	102,8	105,9	103,0	108,4	98,5	98,9	110,6	107,3
1924	108,5	106,2	111,0	106,7	111,6	101,9	104,3	115,1	111,7
1925	112,7	110,8	114,0	115,3	111,9	110,9	107,4	115,8	113,9
1926	113,5	110,7	117,2	115,3	116,2	109,4	102,3	118,7	113,5
1927	117,3	114,1	119,8	118,9	120,0	114,7	109,2	122,1	118,4
1928	119,7	116,2	123,0	122,6	114,3	119,9	116,7	118,3	119,6
1929	123,8	120,6	127,0	122,6	119,2	126,0	120,9	120,4	123,8
1930	120,1	117,2	125,3	125,1	114,6	119,9	115,5	118,2	117,5
1931	121,7	118,0	125,9	123,8	120,9	121,0	120,4	123,2	123,4
1932	121,9	118,6	123,3	121,4	118,6	121,7	123,9	121,9	125,6
1933	123,8	120,5	123,8	126,3	122,0	124,3	128,2	123,3	126,1
1934	123,1	119,2	123,6	123,8	114,4	126,8	133,0	116,8	126,6
1935	121,8	117,9	122,9	126,3	104,9	127,5	128,9	108,7	122,7
1936	121,6	118,2	124,9	130,0	115,1	120,6	126,3	116,3	120,9
1937	128,1	123,8	127,5	142,2	112,5	133,3	128,6	114,9	124,4

World: Argentina, Australia, Austria-Hungary, Belgium, Canada, Chile, Denmark, France, Finland, Germany, Greece, India, Indonesia Italy, Japan, the Netherlands, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States, USSR and Uruguay; Europe Austria-Hungary, Belgium, Canada, Denmark, France, Finland, Germany, Greece, Italy, Netherlands, Portugal, USSR, Spain, Sweden, Switzerland, United Kingdom; North-Western Europe the United Kingdom, France, Sweden, Denmark, Belgium, the Netherlands, Germany, Finland, Switzerland; Asia Japan, India, Indonesia; Western Settlement Canada, Australia and the United States; Atlantic Economy: Argentina, Australia, Belgium, Canada, Denmark, France, Finland, Germany, Greece, Italy, Netherlands, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States and Uruguay

Source Federico 2004 and League of Nations 1938-1939

Tab.3
Growth in input, selected countries

	Ca 1910	Ca 1920	Ca 1930
a) Land			
Canada	15.6	25.1	30.5
USA	140.4	162.6	166.9
Australia	6.1	9.3 [°]	13.4*
b) Labor			
Argentina	1.05	1.35	1.54
Canada	0.96	1.04	1.13
USA	11.77	10.79	10.56
Australia	0.48	0.53	0.59
Argentina	1.05	1.35	1.54
France	8.73	7.21	6.39
Germany	10.7	9.8	9.3
Italy	10.7	11.2	10.5
UK	1.50	1.43	1.35
c) Capital			
Germany	100	99.1\$	106.8
Italy	100	106.5	119.6
UK	100	93.1	92.2
USA	100	116.4	105.9

Source: Federico (2005) tabs. 4.1, 4.3, 4.7 and 4.16

Land: millions ha arable and tree crops; labor: millions of workers (males and females); capital: index of stock (different definitions) at constant prices

[°]1925-26; *1938; \$ 1925

Tab. 4
Potential demand and overproduction in the “Atlantic” economy

	a)	b)	c)	d)	e)	f)
1911	1	1	1	1	1	1
1919	102.8					
1920	106.6	0.906	0.876	0.915	0.923	1.028
1921	106.3	0.954	0.878	0.968	0.968	0.989
1922	111.8	0.939	0.926	0.957	0.993	1.014
1923	115.9	0.925	0.926	0.943	1.002	0.960
1924	119.3	0.936	0.932	0.945	1.031	1.019
1925	122.8	0.928	0.979	0.936	1.041	1.015
1926	125.8	0.902	0.955	0.909	1.027	1.071
1927	129.0	0.917	0.961	0.924	1.060	1.068
1928	130.9	0.914	0.977	0.913	1.062	1.129
1929	135.3	0.915	0.945	0.918	1.090	1.204
1930	133.2	0.882	0.979	0.896	1.025	0.980
1931	131.4	0.939	0.983	0.979	1.068	1.022
1932	127.7	0.984	0.991	1.038	1.080	1.000
1933	129.4	0.975	1.018	1.031	1.078	1.083
1934	132.8	0.953	0.973	0.998	1.075	0.994
1935	136.2	0.901	0.967	0.933	1.035	0.930
1936	140.2	0.862	0.967	0.878	1.016	0.906
1937	144.9	0.858	1.024	0.874	1.036	0.816
1938	148.2	0.886	0.966	0.920	1.086	0.905

a) Atlantic demand, baseline estimate; b) ratio of Atlantic production (tab.2) to the baseline estimate; d) ratio of Atlantic production (tab.2) to lower bound estimate; e) ratio of world production according to the League of Nations (*Memorandum*) to Atlantic demand, baseline simulation; f) ratio of Atlantic wheat output to Atlantic demand

Sources: see text

Tab.5
Financial conditions of American farmers during the Great Depression

	a)	b)	c)	d.1)	d.2)	e)
1926-1928	7.7	112.4	10.1			16.8
1929	6.0	108.0	9.3	4.2	3.4	15.7
1930	21.5	130.5	12.6	-11.0	-9.0	18.7
1931	36.6	169.6	19.2	-18.3	-11.6	28.4
1932	29.5	212.1	27.3	-28.8	-17.7	38.8
1933	-1.7	175.0	17.2	-5.5	0.6	28
1934	-19.2	133.9	11.2	6.0	7.0	21

a) real interest rate (interest rates Historical Statistics 1975 series K371, price changes K 344); b) debt/gross output (debt Goldsmith 1955 tab. M-27, output Federico 2004); c) interests on loans/farm income (interests Historical Statistics 1975 K 372 and farm income Historical statistics 1975 K 284); d) change in real income since 1926-1928 at 1913 prices (deflated with K 344): d.1) actual data and d.2) counterfactual (no interest) series; e) foreclosure per one thousand farms (Goldsmith 1955 tab.M-28)