Protectionism, agricultural prices and relative factor incomes: Sweden's wage-rental ratio, 1877-1926

Jan Bohlin and Svante Larsson

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jan.bohlin@econhist.gu.se; svante.larsson@econhist.gu.se

Abstract: Trends in wage-rental ratios have figured prominently in the recent literature on factor price convergence and globalisation in the late nineteenth century. In that literature Sweden has been described as a free trade country whose wage-rental ratio exhibited a distinguished upward trend before World War I. This article presents a new series of land prices which indicates an increase in land rentals and an evolution of the wage-rental ratio more in line with other European protectionist countries. We explore the determinants of the Swedish wage-rental ratio and assess the relative importance of protectionism and the change in the product mix from arable to animal products in Swedish agriculture.

Göteborg University
School of Economics and Commercial Law
Department of Economic History
P.O. Box 720
SE-405 30 GÖTEBORG
www.econhist.gu.se

Jan Bohlin and Svante Larsson: Protectionism, agricultural prices and relative factor incomes

1. Introduction

Trends in factor prices have recently figured prominently in the literature on globalisation in the late nineteenth century Atlantic economy. An important observation in this literature is the narrowing income gap between the Old and the New World in the latter half of the nineteenth century. The guiding principle behind the division into the Old and New World was relative factor endowments. The New World had plenty of land but scarcity of labour, while the Old World had plenty of labour but scarcity of land.[1] The well known globalisation story tells us that declining transport costs in the latter half of the nineteenth century made possible massive exports of agricultural products from the New to the Old World, which led to changed relative factor returns on land and labour. For land owners in the Old World, the inflow of cheap grains put downward pressures on their incomes, while exports of grain on a massive scale favoured the income growth for land owners in the New World. In a seminal article by O'Rourke, Taylor and Williamson empirical trends in relative factor prices were represented by trends in wage-rental ratios for a number of countries.[2] Their evidence showed that wage-rental ratios fell abruptly in the New World prior to World War I. The opposite happened in the Old World, where wage-rental ratios rose. The Old World sample was further divided so that countries entered into either a protectionist or a free trade group, the idea being that some Old World countries muted the forces of Globalisation by erecting tariffs on imports of grain. In protectionist countries wage-rental ratios should therefore have displayed a slower increase than in free trade countries. Sweden was classified as an Old World free trade country, whose wage-rental ratio exhibited a markedly upward trend, as did wage-rental ratios in the other Old World free trade countries.

The classification of Sweden as a free trade country defies what we know about Swedish trade policy.[3] For example, from 1888 onwards Swedish grain tariffs were similar to those in Germany and France, both of which were classified as protectionist countries by O'Rourke, Taylor and Williamson.[4] So why did evidence show that the Swedish wage-rental ratio behaved in a way more similar to free trade countries than protectionist ones?

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[1]   O'Rourke and Williamson, *Globalization and History*.
[2]   O'Rourke, Taylor and Williamson, Factor price convergence.
[3]   Bohlin, Tariff protection in Sweden.
[4]   O'Rourke, Taylor and Williamson, Factor price convergence, p. 54.

This article intends to resolve this seeming contradiction by documenting new evidence of Swedish land prices, indicating land rentals. The new series of land prices covers the years from 1877 to 1926, which means it captures the impact of late nineteenth century Globalisation, the advent of Swedish industrialisation and rapid economic growth, and the dramatic distributional changes associated with World War I. It omits though the impact of the new era in Swedish agricultural policy, involving trade regulations and subsidisation, which commenced in 1933.

We begin the article by discussing the new series of land prices and offer our criticism of the series used by O'Rourke, Taylor and Williamson. To build up a new picture of the Swedish wage-rental ratio requires also representative series of wages for either agricultural or industrial workers. We document the wage series at hand and discuss if the application of an agricultural or industrial wage series as a numerator in the wage-rental ratio makes a difference. Until World War I agricultural and industrial wages increased at about the same rate. However, in the aftermath of the war agricultural and industrial wages set out on different courses in the 1920s; for this period, the wage rental ratio increases more if we use industrial wages in the numerator. When we use our new series of land prices, the new Swedish wage-rental ratio displays a slower increase than the wage-rental ratio documented by O'Rourke, Taylor and Williamson, whether computed by an agricultural or industrial wage series in the numerator. The Swedish wage-rental ratio evolves similarly to that of other Old World protectionist countries', which is more in harmony with the Swedish protectionist turn in 1888.

Using economic theory and stylised facts about long-term economic development we argue that the wage-rental ratio tend to increase in developing economies such as Sweden at the end of the nineteenth and the entire twentieth century. The key to understand short-term fluctuations in the wage-rental ratio lies in the movements of land prices. We therefore turn to a discussion about the determinants of land prices. More specifically, we explore the effects of agricultural productivity increase and commodity prices on the evolution of land prices. The terms of trade developed favourably for the agricultural sector in the decades preceding the First World War, and we ask to what extent the price increase for agricultural products were caused by tariffs and a change of the product mix from grain to animal products in the agricultural sector.

2. Documentation of new land prices

There are two sources for documenting the evolution of Swedish land prices. Both were presented by Åmark in a monograph commissioned by the public investigation committee devoted to exploring the effects of late nineteenth and early twentieth century protectionism.[5] The first source is a series of Crown land leases per hectare in 1861–1913.[6] The authors of *National Income of Sweden 1861–1930* extended the series to 1930 and capitalised it to land prices by applying an interest rate of five percent.[7] O'Rourke, Taylor and Williamson used that series to compute the Swedish wage-rental ratio.[8] The other source is a series of sales values of private land between 1876/78–1918/20. As far as we know this series has neither been used nor commented upon in any scholarly work since it saw the light of day. Complementing sales values of private land appeared in yet another public investigation in 1930, extending the series of private farm sales values to 1926.[9] Accordingly, we have information on both measures of land prices only from 1877 to 1926. The series of private land prices and Crown land leases are displayed in figure 1. There are two differences that warrant our attention: firstly, Crown land leases fell more abruptly during the agrarian crises in the 1880s; and secondly, private land prices grew more briskly during World War I. As the two series display markedly different behaviour, it is necessary to determine which one of them should be used in computing the Swedish wage-rental ratio. This requires a minor digression on the judicial status of land.

(GRAPH 1 ABOUT HERE)

Three types of landownership existed in Sweden at the end of the nineteenth century, three juridical categories rooted in the Middle Ages. Private land was owned by freeholders who paid taxes to the Crown (*skattejord*). Crown land was leased by tenants who paid land dues to the Crown as rent (*kronojord*). Tax exempted land was owned by rich peasants and noblemen and was cultivated by tenants who paid rents to the owner (*frälsejord*). Around 1700, these categories of land made up more or less equal shares of the total arable area.

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[5]   Åmark, *Undersökning angående jordegendomsvärdena.*

[6]   Åmark, *Undersökning angående jordegendomsvärdena*, p. 27, table 8.

[7]   Lindahl, Dahlgren and Kock, *National Income, II*, p. 393, table 126.

[8]   O'Rourke, Taylor and Williamson, Factor price convergence.

[9]   Höijer, *P.M. angående jordegendomsvärdenas förändringar fram till år 1928*, p. 121.

However, at the end of the nineteenth century, the proportions of each category of land had changed considerably. In 1878, 60 percent of the land was owned by freeholders, while the share of Crown land was merely eight percent.[10] Here is the first clue as to why the series representing the leases of Crown land in this period is unrepresentative for the evolution of land prices in Sweden.

There are at least two more arguments against using the series of Crown land leases as indicative of the evolution of sales values in the private land market. First, the farms leased on Crown land were in general exceptionally large. While the most common size class for private farms was 5–10 hectares in Åmark's sample, the average Crown land unit was larger than 50 hectares, and if we include forest land, they were larger than 90 hectares. Second, as the terms of the leases were long (20 years) any potential user of land had to take into careful consideration any anticipated change in legislation regarding their disposal rights over the land they leased. The most important change in legislation that affected the value of the leases came in 1882, severely curtailing the Crown land tenants' right to exploit forest land. Essentially, tenants were only allowed to exploit forest land to collect firewood for household requirements after 1882. That permission was besides gradually restricted in the 1890s.[11] Åmark tried to remove the influence of the changed legislation by only using arable land and meadows reduced to arable when calculating Crown land leases per hectare. He nevertheless acknowledged that the much more precipitous decline of Crown land leases in the 1880s, compared to sales values of private land, reflected the changed forest legislation.

Since Crown land leases give arguably a distorted picture of the evolution of sales values in the overall land market, we turn now to Åmark's investigation of private sales values. Åmark's series of private sales values was constructed from a sample of 4,854 sales transactions. He presented the series in three-year averages stretching from 1876/78 to 1918/20. The geographical area covered by the investigation was confined to counties in central and southern Sweden.[12] The investigation further excluded farmlands smaller than 5 hectares, and farms with forestland and pasture that were more than three times the size of the arable. The number of purchases varied a lot by the size of the arable. Purchases of farmlands with more than 100 hectares of arable do not figure

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[10]   Gadd, The agricultural revolution in Sweden.
[11]   Åmark, *Undersökning angående jordegendomsvärdena*, pp. 24–6.
[12]   The investigation included the counties of *Östergötland*, *Halland* and *Skaraborg*.

prominently in the sample; in some locations and years, there were only a few purchases of properties of that size.

(GRAPH 2 ABOUT HERE)

In figure 2 we present four separate series of farm prices by size class. The small and medium-sized farmlands had a more favourable development of sales values than the large and very large farmlands. Small farms relied heavily on family labour. The evolution of sales values on farms above 50 hectares that relied on hired labour should be more indicative of the evolution of land rentals. If we disregard the series of farms above 100 hectares, all series of land prices show nevertheless the same general contour of development.

We have scanty information about the way land prices have been collected for the years after 1919. All we are told by Höijer is that the sales values were collected in a way that would make them comparable to Åmark's investigation.[13]

3. Documentation of wages

3.1 Agricultural workers

Agricultural wage earners did not represent a homogenous group of rural workers. At least three broad categories of workers can be distinguished, the largest of which consisting of day-workers. They were people who were either landless or owners of a parcel of land insufficient to provide them with incomes above subsistence. They worked for peasants or nobles. Those workers made up a growing relative number of the rural working class, amounting to 46 percent in 1870/80 and 50 percent in 1920/30. As day-workers were largely paid in cash, assessments of wage increases for agricultural workers often refer to this specific category of workers. Day-workers had the freedom to work wherever they found appropriate, in contrast to farm servants, whose efforts were guided by the Domestic Servants Act, constraining their freedom of movement. Domestic farm servants were paid an annual or monthly cash wage with free board and lodging. Lack of freedom also concerned another class of workers, namely the so-called *statare*, who worked for nobles on large estates. They were paid a fixed annual cash wage with free housing and benefits in kind (*stat*).

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[13] Höijer, *P.M. angående jordegendomsvärdenas förändringar fram till år 1928*, p. 121.

(TABLE 1 ABOUT HERE)

Our knowledge of wages for agricultural workers stems from compilations made by the authors of the voluminous *Wages in Sweden*, based on market price scales (*markegångstaxa*) for pre-1913 years and wage material by the Social Board thereafter. [14] The most homogenous wage series represents day-rates for day-workers, a series that was used by O'Rourke, Taylor and Williamson to compute the Swedish wage-rental ratio.[15] However, reductions in working hours make it problematic to take that series to represent the growth of wages in agriculture for an unaltered unit of labour input. It is well known that although the time at which reductions occurred varied by geographical area, there was a gradual shortening of the working day. Reductions concerned only working hours during the summer, while working days during winter remained quite stable before the 1930s, since daylight acted as a check on the elasticity of working hours. In all likelihood no substantial reductions in working hours took place before the 1870s, implying that people spent on average 14 hours a day at work, including breaks. As the 1920s drew to a close, the norm was approaching ten hours a day during summer time. If we take further account of unaltered working hours during winter, roughly half of the year, the reduction amounts to two hours in sixty years. After adjusting the growth of daily wages to reductions in working hours we are left with a wage series of agricultural workers that increases somewhat faster than the series used by O'Rourke, Taylor and Williamson. Later in this article we will use our modified series of daily wages as a numerator when computing the new Swedish wage-rental ratio.

These adjusted day-rates cannot simply be grossed up to annual incomes as many day-workers had at their disposal a small piece of land for horticulture and small scale farming. Furthermore, in off-seasons many of them were employed in above all lumbering. That makes it difficult to compare day-workers day-rates to annual wages for farm-servants and *statare*. Jungenfelt, in his pioneering study of the share of wages in national income[16], tried nevertheless to construct a general series of annual wages for agriculture. We will counterpoint below his annual series with the annual wage series for manufacturing workers when computing the ratio of agricultural to manufacturing wages.

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[14] Bagge, Lundberg and Svennilson, *Wages in Sweden, II*, p. 113, table 169, p. 152, table 180. An identical series of wages for day workers also appears in Jörberg, *A history of prices in Sweden I*, pp. 710–14.

[15] O'Rourke, Taylor and Williamson, Factor price convergence.

[16] Jungenfelt, *Lönernas andel av nationalinkomsten*, p. 104.

3.2 Manufacturing workers

Information on wages of manufacturing workers did not find its way into official statistics until 1913, when the Social Board began its annual report, implying that assessments of wage behaviour rest on quite scanty grounds pre-1913. Before further efforts have been made to dig into archives for more information, we have once again to resort to the wage series that appeared in *Wages in Sweden*.[17] The wage material there was mainly collected from firms whose wage records had been kept and preserved for a period long enough to make them worth extracting. From each firm's wage record, wage series of a small number of workers from representative occupations were collected and combined into occupational averages. That method probably tracked changes of wages from one year to another better than it pinned down actual levels. Many of the wage series in *Wages in Sweden*, both the aggregate, the regional and the occupational ones, have of course been subjected to scrutiny by Swedish economic historians.[18] It has for instance been objected that the omission of temporary workers renders the wage series in *Wages in Sweden* questionable, but no attempts have so far been made to construct a new national series of wages pre-1913.[19] For industrial workers two series are presented in *Wages in Sweden*, the first of which represents hourly wages, the preferred measure when studying the rate of change for an unaltered unit of labour input. The other series represents annual wages. After 1913, the Social Board collected wage data, and the authors of *Wages in Sweden* used this source to construct a wage series that could be linked to their pre-1913 series.[20]

International wage comparisons rely in many instances on samples of so called urban unskilled wages, and most commonly on wages for construction workers, because of data abundance and a fairly homogenous wage structure. For Sweden, though, wage data for unskilled construction workers are comparatively scarce pre-1913.[21] Furthermore, few wage series of unskilled workers in manufacturing exist for the latter part of the nineteenth century, which means that it is difficult to tell with certainty whether the skilled-unskilled

[17] Bagge, Lundberg and Svennilson, *Wages in Sweden, I*.
[18] Gustafsson, *Den norrländska sågverksindustrins arbetare*; Berglund, *Industriarbetarklassens formering*; Cornell, *Sundsvallsdistriktets sågverksarbetare*; Johansson, *Glasarbetarna*.
[19] Gustafsson, The industrial revolution in Sweden.
[20] Bagge, Lundberg and Svennilson, *Wages in Sweden, I*, pp. 260–1, table 26.
[21] As construction workers were largely paid by piece rates, preserved records of hourly wages were more difficult to come by and thereby excluded from the investigation by Bagge, Lundberg and Svennilson, *Wages in Sweden, I*, p. 8.

pay ratio exhibited any upward or downward trend.[22] The Swedish wage series presented by Williamson in his widely cited article from 1995 probably overestimated the growth of real wages by being based, pre-1888, on merely four series of unskilled occupations whose wages grew faster than those for manufacturing workers in general.[23] We do not know whether a series of urban unskilled workers would deviate from our series of wages in manufacturing. To stand on safe ground, we stick to the series from *Wages in Sweden* representing wages of manufacturing workers as a whole, a series that captures our present state of knowledge of wage behaviour in manufacturing. We seek a representative measure of the development of wages in sectors other than agriculture, and the series of manufacturing wages serves this purpose.

3.3 Ratio of agricultural to manufacturing wages

The wage-rental ratio can be computed by using either agricultural or manufacturing wages as a numerator. Thus, the relative movement of wages in the two sectors matters for our interpretation of the wage-rental ratio. Furthermore, the movement and magnitude of the ratio of wages for agricultural to industrial workers is an important component in the transition from agriculture to industry. For rural workers it represents the opportunity cost of staying in agriculture. As agricultural workers were above all attracted to unskilled jobs in manufacturing, their wage levels should preferably be compared to wage levels of unskilled manufacturing workers. The ratio of unskilled manufacturing to agricultural hourly wages fluctuated between 2 and 2.5 until the 1890s. It then started to contract slowly until shortly after World War I, when the ratio was substantially enlarged.[24] After being quite tightly coupled together, hourly wages in industry and agriculture set out on different pathways in the aftermath of World War I. The nominal income gap between agricultural and urban workers does not translate to a commensurate real income gap, however, since it is likely that rural dwellers had access to cheaper food and housing. As time went by industrialisation and urbanisation drove a wedge between farm gate and retail prices as processing and marketing made food in urban areas more expensive than agricultural products in rural areas. That promoted a

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[22] Larsson (Globalisation, inequality and Swedish catch up) shows that the few existing wage series of skilled and unskilled workers indicate a stable skilled-unskilled pay ratio.

[23] Williamson, Evolution of global labor markets.

[24] Larsson (Globalisation, inequality and Swedish catch up) has on the basis of the few skilled and unskilled wages series in Bagge, Lundberg and Svennilson, *Wages in Sweden, I–II*, estimated that the unskilled-skilled pay ratio in industry was on average around 84 between 1860–1912.

contraction of the real wage gap. Besides, the annual wage gap was smaller because of longer working days in agriculture, and it did not swell after the war because of heavy reductions in working hours in industry.[25]

(GRAPH 3 ABOUT HERE)

4. Theory: what determines the wage-rental ratio?

The wage-rental ratio is a quotient that shows the evolution of the relative reward per unit of input accruing to labour and landownership. In an economy without technical progress an increase of labour per unit of land leads to diminishing returns, increasing the relative reward to landownership. The classical economist Ricardo was more concerned with extensive diminishing return that would occur when, because of increasing population pressure, land of lower fertility was brought into cultivation. The world of the classical economists was inhabited by three classes: landowners, capitalists and workers. Land was leased by capitalist tenants who employed workers to cultivate it. In competitive equilibrium the capitalist tenant on marginal land expected to earn the same rate of return on his investment as in every other sector of the economy. When less fertile land was brought into use competition between capitalist tenants would therefore lead them to bid up land rents for owners of infra-marginal land. Otherwise expressed, a more fertile piece of land could fetch a higher sales price than a less fertile land of the same size. The classical theory of rent was at heart a theory of differential rent; there was no rent on marginal land. Ricardo's pessimistic conclusion was that land rents would swallow an ever increasing share of national income, while workers' wages would in the long term stagnate at subsistence levels because of Malthusian population pressures. The classical prognosis was that the wage-rental ratio would fall.

The dismal vision of the classical economists turned out to be false. Importation of cheaper food and above all technical progress neutralised the forces of diminishing returns. Industrialisation and concomitant productivity increase have also led to increasing real wages. In the long run, real wages have increased more or less at the same rate as labour productivity; the deviation around the long-term trend is explained by intermittent changes in the income distribution between wages and profits. Since the income elasticity of food is

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[25] Bagge, Lundberg and Svennilson (*Wages in Sweden, I*, p. 253) report that marked reductions in working hours occurred in 1918–20. In 1920, hours of work were restricted to 48 hours per week in the manufacturing, commerce and transport sector.

less than unity, the share of agriculture in the economy decreases with economic progress unless neutralised by increased net exports. Moreover, available data from developed countries show that over a long period of time, at least in the twentieth century, the growth of wages has by far outstripped the growth of land rentals.[26] This is also what we would predict from theoretical reasoning.

A capitalist tenant expects the same rate of return on his investment as in any other sector. The rental that a tenant would be prepared to pay to a landowner is therefore obviously dependent on the yield of the rented land. The larger the difference between the yield per land unit and the required rate of return, the more he is willing to pay in rent. It is a stylised fact of economic growth that the rate of return shows no long-run trend.[27] Therefore, the rate of growth of real rentals is dependent on the rate of growth of yield per land unit. The latter in its turn is dependent on the rate of growth of sales revenues minus the rate of growth of costs. The growth of sales revenues per land unit is the sum of growth in prices and volume. To better explore the role of productivity change for the evolution of land rents we assume in the following discussion that prices of agricultural products stay constant.

The most important cost item for agriculture is wages. It seems reasonable to assume, and it accords well with facts, that agricultural wages grow at about the same rate as in other sectors of the economy. Another stylised factor of economic growth is that the income distribution between wages and profits has stayed constant in the long run, which means that wages tend to grow at the same rate as average labour productivity in the economy. Economic growth is the sum of the growth in labour inputs and the growth in labour productivity. Since the late nineteenth century the growth in labour productivity has been much larger than the growth in labour inputs. Accordingly, in developed economies the growth in the wage rate, being approximately equal to the growth in labour productivity, will not fall much short of the growth in GDP. It certainly grows faster than the growth in agricultural output. What does that mean for land rents? Since agricultural output grows considerably slower than GDP, labour productivity in agriculture must grow

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[26] See for example Lindert, Land scarcity, p. 860. From 1900 to 1970 real farmland value per acre in the USA grew by 1.1 percent per annum (Lindert, Long-run trends, pp. 50–1, table 1), while real wages of unskilled workers grew by 2.1 per cent per annum over the same period (Williamson, Evolution of global labor markets). Federico also documents substantial increases in the wage-rental ratio for various Western European countries in the period 1870–1938, see Federico, *Feeding the World*, p. 239, table III.

[27] Kaldor, Capital accumulation and economic growth.

much faster than productivity in the overall economy for land rentals to grow at the same rate as wages.

To better understand the argument it is useful to give a numerical example. We take our departure from the following equation:

(1) $p_y Y = wL + rK$

where p_y=price index of value added, Y=volume of value added, w=wage rate, L=number of labour units, r=rate of return on capital invested in farms, K=volume index of farm capital (land, buildings, equipment etc.).

Equation (1) is an accounting identity which says that the value of output can be dissolved into payment for the various inputs: wages for employed workers and rentals per hectare for owners of farmlands.

Logarithmic differentiation of (1) gives:

(2) $\dfrac{\dot{p_y}}{p_y} + \dfrac{\dot{Y}}{Y} = a\left(\dfrac{\dot{w}}{w} + \dfrac{\dot{L}}{L}\right) + b\left(\dfrac{\dot{r}}{r} + \dfrac{\dot{K}}{K}\right)$

where *a* and *b* are cost shares and the dots stand for time derivatives.

Equation (2) tells us that if prices stay constant, the rate of growth of output is a weighted average of the rate of growth of factor inputs and factor payments.

Let us imagine that GDP grows at three percent per year and that two-third of this growth is due to labour productivity. Accordingly, wages will grow by two percent per year. If we for example assume an income elasticity of demand for food of 0.5, agricultural output will grow by 1.5 percent per year. In this example we furthermore assume that the share of wages is 0.5. If land rent on a given piece of land is to increase at the same rate as the wage rate, the labour force must decline by one percent, or otherwise expressed, labour productivity must rise by 2.5 percent. In that case the share of land rentals in agricultural value added would rise, since labour input diminishes while the input of land stays intact. If labour productivity growth is the same as the growth in wages, rentals would grow at the same rate as output, by 1.5 percent, keeping constant the income distribution between wages and rents. If labour productivity growth is lower than the growth of wages, rentals must grow slower than output and the income distribution would be tilted in favour of wages. The historical record shows that labour productivity in agriculture has not grown

faster than labour productivity in the overall economy.[28] Hence, if the agricultural terms of trade do not continuously increase to compensate for lower output growth, we would expect the growth of rentals to lag behind wage growth.

Even though we would expect the wage-rental ratio to increase with economic development, its short term variations, or rather the variations in its denominator, land rents, were of great concern to contemporaries in a society where agriculture still contributed 25 percent of national income and where 40 percent of the labour force was employed in the agricultural sector. We now continue our discussion of what determines land rents and land prices.

Theoretically, as for any asset, the price of a piece of land is nothing but the future stream of income from owning it discounted to present value by applying a suitable rate of interest. Accordingly, land prices serve well as an indicator of land rentals. Experience from asset markets shows that expectations of future incomes tend to be heavily influenced by recent experiences. Therefore, if income from owning land is on the rise, land prices will rise too. If buyers of land expect that land prices will continue to increase in the future, land prices may run ahead of rents for speculative reasons, but in the long run they would on average follow each other closely. To understand the evolution of land prices we therefore have to understand the variables that determine the income of land owners. An important determinant of farmer's revenues is obviously the prices of agricultural goods. The revenue of the farmer though is not only determined by what prices he gets but also by how much he sells. In other words, if he can raise the monetary value of his output by reallocating his product mix in the direction of more income elastic goods, and if he can raise productivity by means of technical progress, his revenues will rise.

Landowners' income is determined both by revenues and costs. The most important costs to consider are wages for agricultural workers and purchased inputs. However, the effect of agricultural wages on land prices is not so clear-cut. On the one hand, a rise in agricultural wages would increase the cost of hiring labourers. This would affect the income of large landowners negatively, relying heavily on hired labour. On the other hand, as a majority of farms were small family farms, who only sparingly relied on hired labour, it might be argued that for owners of family farms it did not matter whether incomes derived

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[28] To give an example: between 1890 and 1970 agricultural labour productivity in Sweden increased by 2.3 percent per year, while it grew by 2.9 percent per year in manufacturing and 2.3 per year in the overall economy. Calculated from data presented by Edvinsson, *Growth, Accumulation, Crisis*. See www.historia.se.

from imputed payments to their own labour or from rewards to their landownership. What was important for family farms was their total income. Therefore, if agricultural wages increased they might have been inclined to accept a lower rate of return on their farm capital than large landowners and be willing to bid up land prices.

Purchased inputs were another cost item for farms, although they were less important than wages since they only constituted 15 percent of final sales value. Most of the inputs emanated from the industrial sector, so an increase in industrial prices should lead to increased costs per unit of output for the farmers.

From the above deliberations we may conclude that in order to explore the evolution of farm prices we should look at the evolution of agricultural and industrial prices, agricultural wages and agricultural productivity. We have already dealt with wages. In the following two sections we take a closer look at commodity prices and agrarian productivity.

5 Commodity prices

5.1 Agricultural prices

The invasion of imported grain into Western Europe following the US civil war put downward pressure on agrarian commodity prices. In Sweden, as in many countries on the European continent, landowners succeeded in their campaign for grain tariffs. Therefore, from 1888 onwards the prices of arable products developed more favourably for Swedish farmers than world market prices for grain. In addition, the index of agrarian prices includes animal products whose prices developed more favourably than grain prices from the mid-1880s, as figure 4 shows.[29] In this period Swedish farmers expanded production of animal products while the output of arable products stagnated; between 1870 and 1913 the volume of animal produce grew by 2.3 percent per year, while arable produce declined by 0.2 percent per year.[30] The overall index of agrarian prices thus captures the effects of the transition from arable to animal products. As we argue below, the change in the output mix of the agricultural sector from arable to animal produce was more important for the favourable price trend than grain tariffs. The

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[29] The separate series of animal and arable products do not appear in Schön, *Historiska nationalräkenskaper för Sverige: Jordbruk*. Instead the separate series were provided by the author on request.

[30] Schön, *Historiska nationalräkenskaper för Sverige: Jordbruk*.

more favourable price trend for animal products was intensified during the First World War when agrarian prices soared.

(GRAPH 4 ABOUT HERE)

5.2 Industrial prices

The weighing of all manufactured goods into an aggregate measure to represent the overall movement of prices for manufactured goods poses a great challenge; the index number problem is present all the way. Works within the field of *Swedish Historical National Accounts* (SHNA) provide plenty of price series for manufactured goods, especially after 1885.[31] Edvinsson, in his contribution to SHNA, argues persuasively that when possible we should use chained Paasche and Laspeyres indices combined into an ideal Fisher index.[32] That requires annual current values of production for each item. Thanks to the Swedish Census of Manufactures, these are readily available for most goods, so there is no reason why some kind of ideal solution to the index-number problem should not be applied.[33] One of the present authors has carried this approach still further for manufactured goods by including more price series, but only in a series that stretches up until 1912.[34] The rest of the period is covered by Edvinsson's series.[35] Prices fell from a peak in 1874 to a trough in 1887, and recovered slowly until 1915. The impression one gets of these pre-war decades is nevertheless one of price stability as regards industrial goods. The high rate of inflation during World War I brought a dramatic increase in prices of manufactured goods; the index rose from 100 in 1915 to 334 in 1920. Prices then dropped to more moderate levels.

5.3 Agricultural terms of trade

In Sweden, as in most other countries, the two decades preceding World War I were in Federico's words a 'veritable golden age' for farmers. [36] The terms of trade for Swedish

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[31] Ljungberg, *Priser och marknadskrafter*; Schön, *Historiska nationalräkenskaper för Sverige: Industri.*

[32] Edvinsson, *Growth, Accumulation, Crisis.* Previous authors contributing to SHNA have used so-called deflation periods, i.e. fixed weights for periods of 20–25 years. The present authors side with Edvinsson that as long as there are annual current production values at hand chained Laspeyres and Paasche indices combined into a Fisher index provide the ideal solution to the index number problem.

[33] *Bidrag till Sveriges officiella statistik, D. Fabriker och manufakturer.*

[34] Larsson, Estimates of employment.

[35] www.historia.se.

[36] Federico, *Feeding the World* p. 23.

farmers (agricultural prices/industrial prices) improved by 75 percent between 1897 and 1915. This improvement of the terms of trade was fundamentally driven by price increases for agricultural goods, especially animal products, while manufactured goods prices remained fairly stable. If we look only at animal products, the terms of trade improved by 85 percent, while for arable products the terms of trade improvement were 48 percent. World War I and its aftermath brought extreme conditions in commodity markets. At the initial stages of high inflation agricultural prices increased faster than industrial prices, but they also fell deeper in the deflation that set in once the war had ended, which adjusted the terms of trade downwards to its pre-war levels.

Figure 6 demonstrates that land prices followed agricultural prices closely. However, the swings in land prices were not as pronounced as those in agricultural prices. When agricultural prices declined precipitously in the 1880s and in the deflation after World War I, land prices did not follow suit, and when agricultural prices rose during the war land prices did not rise to the same extent.

(GRAPH 5 ABOUT HERE)

(GRAPH 6 ABOUT HERE])

6. Productivity in agriculture

It would be possible to obtain estimates on the evolution of labour productivity in agriculture since we have time series data on value added[37] and employment[38]. However, the employment figures which derives from the population censuses held every tenth year are of dubious quality. Population census registered people by occupation, but it is well known that many of those classified as employed in agriculture performed other tasks such as rural handicrafts at least part of the year. Employment varied seasonally in agriculture. It is fair to say that we simply do not know the accurate number of full time employed agricultural labourers. Underemployment in the countryside is likely to have been prevalent, even though it declined as industrialisation and urbanisation proceeded. The accuracy of official employment statistics improves gradually, implying that we would overstate the growth of labour productivity in agriculture when using employment data derived from the population censuses.

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[37]   Schön, *Historiska nationalräkenskaper för Sverige: Jordbruk.*
[38]   Jungenfelt, *Löneandelen*. See also Edvinsson, *Growth, Accumulation, Crisis*.

Therefore, to obtain an estimate on the growth of productivity in the agricultural sector we try another method based on price data. The method has been used for studying the evolution of labour productivity in agriculture by several authors.[39] An estimate of total factor productivity can be derived be rearranging equation (2) above:

$$(3) \quad \frac{\dot{Y}}{Y} - a\frac{\dot{L}}{L} - b\frac{\dot{K}}{K} = a\frac{\dot{w}}{w} + b\frac{\dot{r}}{r} - \frac{\dot{p}y}{py}$$

The left-hand side of (3) is nothing but the growth in total factor productivity (TFP) as it is defined in the literature. Accordingly, TFP can also be measured by means of price data. Viewed from the side of prices, TFP is the difference between the weighted growth of input prices and the growth of the output price. Essentially, productivity growth manifests itself in increased buying power of factor incomes over final goods. As several authors have pointed out this is of considerable interest for economic historians, since we often have much better price data than data on physical volumes of inputs and outputs.

To estimate the expression on the right-hand side of (3) we need data on factor shares. One of the authors of this article has estimated the wage share in agriculture to 60 percent in 1913.[40] According to Jungenfelt, the wage share in the agricultural sector (including forestries and fisheries) was 49 percent in 1913 and 70 percent in 1876–1877.[41] According to Åmark, the share of wage costs of total costs in agriculture was 'at least 52 percent'.[42] We conclude that it seems reasonable to assume a wage share of 60 percent for the period 1877–1913. We also need a series of prices for agricultural goods, agricultural wages and land rentals. The first two are readily available. We use our new series of sales values for private land as an indicator of land rentals. As the discussion in a previous section of this article has revealed, the evolution of land prices varied depending on the size class of farms. A calculation of TFP according to (3) should be most appropriate for large farms that relied on hired labour. In table 2 we present our estimates of TFP growth in Swedish agriculture (column 5 from the left in table 2) and we also present separate calculations for four different size classes.

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[39] See for example, Hoffman, Land rents and agricultural productivity.
[40] Bohlin, The income distributional consequences of agrarian tariffs.
[41] Jungenfelt, *Löneandelen*, pp. 248–9, table 9.
[42] Åmark, *Undersökning angående jordegendomsvärdena*, p. 21.

(TABLE 2 ABOUT HERE)

The productivity data presented in table 2 indicate that TFP grew by approximately one percent per year between the late 1870s and World War I. The growth figures for TFP on small farms seem suspiciously high. The average size of farms in the size class 5–10 hectares was 7 hectares, while it was 20 hectares in the size class 10–50 hectares. Farms of these sizes were heavily reliant on family labour, especially in the smallest size class. The calculation of TFP from price data presupposes that all labour units are paid at the going market rate. It may have been the case that wages for family members at family farms did not increase at the same rate as those for hired labourers. Owners of family farms were concerned about their total income and did not bother about the extent to which it derived from imputed wages or land rents. In that respect productivity growth might be overestimated for small farms by the right-hand side of eq. (3). We also have little confidence in the productivity figures for farms in the size class >100 hectares, since the land price data for this category of farms are based on a very small sample of sales. The TFP figures for farms in the size class 50–100 hectares seem more reasonable. It is interesting to compare our calculated TFP growth rate with growth in labour productivity. The latter grew by 1.4 percent between 1876/78–1912/14, indicating that our TFP measure is not unreasonable. As we have already noted, land rentals may be overstated by land prices if buyers speculated in further land price increases. It is therefore of some comfort that our calculated TFP growth rate does not differ too much from other estimates based on alternative methods. For example, van Zanden gauges that the yearly increase in 'total productivity' in Swedish agriculture in 1870–1910 was 1.03 percent.[43]

6.1 Commodity prices, wage costs, productivity and land rentals

We have assembled evidence on the evolution of commodity prices, wage costs and agricultural productivity. Together they determined farmers' income. To the extent that prices in the land market reflected income growth, they also determined land prices. An example may illustrate the mechanisms at work. Let us assume a farm whose sales value in 1876/78 amounted to 100, 60 of which went to wages of agricultural labourers. Between 1876/78 and 1912/14 agricultural commodity prices increased by 0.4 percent per year while agricultural productivity increased by 1.3 percent. With given factor inputs the farm's

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[43]   van Zanden, The first green revolution, p. 229, table 4.

revenue would have increased to 183.8 in 1912/14. At the same time wages increased by 2 percent per year. In our farm they would have increased to 122.4 in 1912/14, leaving 61.4 to the owner of the farm. Thus his income would have grown from 40 to 61.4 or by 1.2 per year between 1876/78 and 1912/14, which is also approximately the rate at which land prices grew in the period. Our example is of course only another way to illustrate that a productivity increase slightly over one percent per year was required to motivate the increased land prices in this period.

7. Evidence and interpretation of the wage-rental ratio

Our new series of land prices, showing a more rapid increase than previous series, flattens out the steep upturns in the Swedish wage-rental ratio that was documented by O'Rourke, Taylor and Williamson.[44] In figure 7 we display their Swedish series along with our two new wage-rental series, one with manufacturing and the other with agricultural wages in the numerator.[45] All series show that wages increased faster than land prices, but there are some notable differences. Our series of wage-rental ratios did not increase nearly as much between 1877 and 1900 and during World War I as O'Rourke, Taylor and Williamson's series. The previous section on land prices clarified that they underrated the growth of land prices by using the series of Crown land leases, thereby overrating the increase in the wage-rental ratio. That accounts for most of the difference.[46]

(GRAPH 7 ABOUT HERE)

Much of the explanation of the wage-rental ratio turns on the rate at which commodity and factor prices rise and fall. The new series unfold that wages grew somewhat faster than land prices until around 1900. Then the ratio levelled off, and wages and land prices grew in tandem until World War I. In the inflationary conditions during the war, wages increased more than land prices. The interpretation of the wage-rental ratio as a measure of income

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[44] O'Rourke, Taylor and Williamson, Factor price convergence.

[45] O'Rourke, Taylor and Williamson (Factor price convergence) showed the evolution of the Swedish wage-rental ratio in 1870–1914. We have extended to 1926 their series of the Swedish wage-rental ratio which was based on Crown land leases and agricultural wages unadjusted for working hours. A similar extended Swedish series appeared in Williamson, Land, labor, and globalization, p. 54, table 4.

[46] A minor part of that difference is offset by our use of a series of wages for agricultural workers that grows somewhat faster, because it has been adjusted to take account for reductions in working hours.

distribution requires caution. During inflationary conditions land prices may not be a representative indicator of the income of farmers and landowners. If market participants do not expect the surge in commodity prices to last, land prices will not increase at the same pace as farmers' income, implying that the wage-rental ratio fails to represent accurately distributive shares. That was the case during World War I; according to the wage-rental ratio the lot of workers improved compared to landowners when in fact the opposite happened, as real wages declined because of rapid price increases of agricultural products. Land prices did not increase nearly as much as agricultural commodity prices apparently because buyers of land did not expect the inflationary conditions to last.

Furthermore, our judgement of the wage-rental ratio depends on the wage series in use. Before World War I, agricultural and industrial wages tended to grow in parallel, but after World War I industrial wages surged ahead. Between 1877 and 1926 the wage-rental ratio increases by 175 percent if we use the series of industrial wages and by 55 percent if we use the agricultural wage series. The bifurcation of the path of hourly wages in agriculture and manufacturing after World War I marks a striking redistribution of power between labour and capital in manufacturing. In 1918–20 hourly wages rose quickly in the manufacturing industry along with heavy reductions in working hours. In the ensuing deflation in the 1920s industrial wages did not fall nearly as much as industrial commodity prices. Figure 8 shows that the increase in labour productivity was not high enough to compensate the owners of industrial firms for the reduction in working hours and the increase in product wages. The share of wages in value added expanded, which mirrors a shift in the distribution of power between social classes in favour of workers. It is no coincidence that workers managed to encroach on capital's share of value added after the end of World War I, as it coincided with the introduction of universal suffrage in Sweden and revolutionary tendencies looming in many other European countries.[47]

No similar distributional shift in favour of labour took place in agriculture. The terms of trade turned against agriculture in the 1920s, which made it difficult or impossible for landowners to grant agricultural workers wages large enough to maintain the relative wage gap to manufacturing. Mass unemployment and complete absence of unionisation weakened the bargaining powers of agricultural workers vis-à-vis landowners. Even though

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[47] Greasley and Madsen (A tale of two peripheries) found a similar dislocation of incomes in favour of labour in Denmark in the aftermath of World War I. They attributed most of that shift to a rise in labour's bargaining power associated with trade union militancy.

wages sank more in absolute terms in the manufacturing sector during the deflation of 1920s, the percentage rate of decline in wages was larger for agricultural workers. It was almost as large as that for agricultural products. Hence, product wages increased only slightly in agriculture.

(GRAPH 8 ABOUT HERE)

8. The Swedish wage-rental ratio in international comparison

In the latter half of the nineteenth century mass migration, trade, and capital flows – all of which deserve the label Global – brought forth a factor price equalisation between the labour scarce but land abundant New World, and the labour abundant but land scarce Old World. Despite our revision of the Swedish wage-rental ratio, it still displays the main characteristics of an Old World country. Between 1875/79 and 1910/14 wage-rental ratios increased in the Old World and decreased in the New World, as figure 9 reveals. These historical trends should come as no surprise, as the historical context presents us with a unique case: In newly settled areas, like the US and Australia, 'virgin land' conquered from the indigenous population was transformed into private holdings by a soaring number of immigrants, and thereby assigned a price. Before the middle of the nineteenth century, land was practically free or could be purchased at very low prices. Eventually the frontier was closed and the land to labour ratio decreased. At the same time the transport revolution opened up the world to exports of agrarian products from the newly settled territories. Hence the price of land rose rapidly from very low levels.[48]

(GRAPH 9 ABOUT HERE)

In the Old World the invasion of cheap grain brought about a fall in income for land owners, which provoked political reactions. Land owners rallied for protectionist interventions in order to stem the flow of cheap grain from the New World. Tariffs were raised in a number of countries, notably France and Germany while others, like Britain, Ireland and Denmark, adhered to free trade. O'Rourke, Taylor and Williamson, in their

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[48] It may be of some interest to compare farmland prices in the USA and Sweden. Using official exchange rates, in 1870 farmland prices on plain-lands in Southern and Central Sweden (in the counties of *Östergötland* and *Skaraborg*) were more than five times higher than in the US. Still in 1910, they were more than two times higher. See Åmark, *Undersökning angående jordegendomsvärdena*, pp. 789, table A; Lindert, Long-run trends, pp. 49–51, table 1.

article on factor price convergence, put either a free trade or a protectionist label on the countries in the Old World sample and found that free trade countries' wage-rental ratios increased faster than protectionist countries', thus indicating that tariffs mitigated the negative influences of cheap grain on land prices. Sweden was given a free trade label despite evidence presented showing that it had a high rate of protection.[49] The argument for putting a free trade label on Sweden anyway was that the country went protectionist relatively late. We cannot approve of that argumentation: the free-trade era in Sweden ended in 1888, only three years after most of the other Old World countries erected their tariffs.[50] If protectionism mattered in these countries, it mattered in Sweden too.

The first steps towards a protectionist trade regime in Sweden were taken in 1888 when custom duties were reinstalled on agrarian and food products, above all on bread-grain and flour. Tariffs came to range over a wide array of agricultural, food and industrial products, while raw materials were generally free from protection. For most of the years after 1888, the rate of nominal protection for bread-grain varied between 20 and 40 percent.[51] It granted Swedish farmers higher incomes than what would have prevailed in a free trade world. Animal products received some protection as well, but it was of little consequence since the most important animal product, milk, was unprotected.[52] The turnaround in trade policy probably slowed down the transition from arable to animal production in Swedish agriculture, but it did not change its general line of direction.

(GRAPH 10 ABOUT HERE)

If Sweden should be classified as a protectionist country, why did its wage-rental ratio behave similarly to the free world countries, as O'Rourke, Taylor and Williamson showed? The answer is that it did not, if we use our new series of land prices in the denominator of the wage-rental ratio. Figure 10 unveils that instead it moves more in a fashion resembling France, Germany and Spain. However, the link between the evolution of the wage-rental

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[49] O'Rourke, Taylor and Williamson, Factor price convergence, p. 504.
[50] O'Rourke and Williamson, *Globalization and History*, ch. 6.
[51] Bohlin, Tariff protection in Sweden.
[52] Fresh milk enjoyed a high natural protection anyway since it was not transportable over long distances, but milk was primarily used for making butter. Therefore, since butter enjoyed tariff protection, it may be argued that milk was indirectly protected. However, butter was an important export product at the time and Swedish butter prices followed closely the world market price for butter as argued by Jörberg (*History of Prices in Sweden, II*, p. 211), so the butter tariff was largely inconsequential.

ratio and protectionism is questionable in the case of Sweden. Tariffs on bread-grain raised domestic prices of bread-grain above the world market level but they did not affect prices of the most important animal products significantly, most of which were non-tradable. Prices of animal products developed more favourably, and demand for them was more income elastic. A transition towards more animal products would have boosted land prices in a free trade world too.

Some simple calculations may illustrate the relative importance of price movements and volume changes for the growth of nominal income in agriculture. The rate of growth of output in current prices is the sum of the growth rates of volumes and prices. Table 3 shows that total agricultural output grew by two percent per annum in current values between1876/78 and 1912/14, 30 percent of which was accounted for by price increases and 70 percent by volume growth. At the same time, farmers changed their product mix in the direction of more animal produce. In 1876/78 about 50 percent of the output consisted of arable products, in 1912/14 it had contracted to 25 percent. For animal products, the proportion of current value growth accounted for by volume changes was 72 percent, while it was slightly less for arable products. A coarse calculation may shed some light on the importance of grain tariffs for nominal income growth in arable products. If we assume that prices of arable products had been 25 percent lower in 1912/14 without tariff protection than they actually were, nominal output growth in agriculture would have been reduced by roughly 0.25 percent per annum, assuming unchanged product mix. In other words, the agricultural growth rate would have been reduced by one-eighth. We conclude that the most important factor behind nominal income growth in agriculture after the protectionist turn in trade policy in 1888 was volume increases and, to a minor extent, price increases in animal products.

(TABLE 3 ABOUT HERE)

To sum up, industrialisation, especially from the 1890s onwards, set Sweden on a rapid and sustainable growth track, which spurred demand for more income elastic products. Wages for industrial workers accompanied productivity advances in industry, and wages for agricultural workers followed suit. Owners of large farm lands could bear the burden of rapid wages by increasing productivity and switching to animal products. For smaller farmers, commonly more committed to animal production, rapid wage increases did not affect their profitability much as they did not rely to any great extent on hired labour.

9. Conclusions

This article joins the stream of recent attempts to increase our knowledge of movements in relative factor prices, with its focus set upon the Swedish wage-rental ratio between 1876 and 1926, in light of the wider historiography of Globalisation and factor price convergence. We set out initially to document a new series of private land prices in 1877–1926. The new series, in contrast to a series based on Crown land leases used by other authors, fell by a smaller magnitude during the agrarian crises in the 1880s and increased faster after the turn of the century. A corollary of the new series of land prices is a new picture of the wage-rental ratio, a measure supposedly indicating trends in income distribution. In contrast to earlier evidence, showing that the Swedish wage-rental ratio increased rapidly in 1870–1914, our new wage-rental ratio exhibits a much slower increase. This is interesting as industrialisation which sets in motion powerful forces of accumulation tend to put the wage-rental ratio on an upward track. Sweden enjoyed rapid and sustainable economic growth from the 1870s onwards, which means that a priori we should expect the wage-rental ratio to increase. Our documentation of a more reluctant increase of the new wage-rental ratio than previous thought highlights the very good conditions for agriculture. Rapid productivity advances in agriculture and favourable prices, especially for animal products, boosted land prices.

Historical trends in wage-rental ratios have figured massively in discussions of Globalisation and its impact on relative factor price movements in the land scarce but labour abundant Old World, and the land abundant but labour scarce New World in the latter half of the nineteenth century. Notwithstanding our revision of the wage-rental ratio, the Old World label still fits Sweden comfortably well: the wage-rental ratio increased in Sweden and other Old World countries and decreased in the New World. The revised Swedish wage-rental ratio, in contrast to the previous one, behaves more like wage-rental ratios in the protectionist countries than in the free trade countries in the Old World. That view is consistent with the Swedish protectionist turn in 1888. However, while farmers gained from grain tariffs, their income growth had more to do with a change in their product mix from arable to animal products. Real output increases and favourable nominal price movements of animal products served to raise land prices a lot more than tariffs on bread grain did.

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Tables and graphs

TABLE 1. *Distribution of agricultural workers in Sweden, 1870/80 and 1920/30 (%)*

	Farm servants	Day workers	Statare
1870/80	49	46	5
1920/30	39	50	11

Source: Jungenfelt, Löneandelen, pp. 106–8.

TABLE 2. *Growth in total factor productivity and labour productivity in Swedish agriculture, 1876/78–1912/14 (% p.a.)*

| Hectare size of farm unit					
5–10	10–50	50–100	>100	Weigthed average	Labour productivity
1.4	1.4	1.3	1.2	1.3	1.4

Sources: Schön, Historiska nationalräkenskaper för Sverige: Jordbruk, table J19; Åmark, Undersökning angående jordegendomsvärdena; www.historia.se.

TABLE 3. *Growth in current values of output in agriculture (% p.a.), decomposed into volume changes and price changes, 1876/78–1912/14*

		Precentage share accounted for by:	
	Growth	Price changes	Volume changes
Agriculture	2.1	30	70
Animal products	3.2	28	72
Arable products	0.1	34	66

Source: Unpublished data of arable and animal output in fixed and current prices, provided by Lennart Schön.

GRAHP 1. *Crown land leases and private land prices per hectare, 1877–1926 (1913=100)*
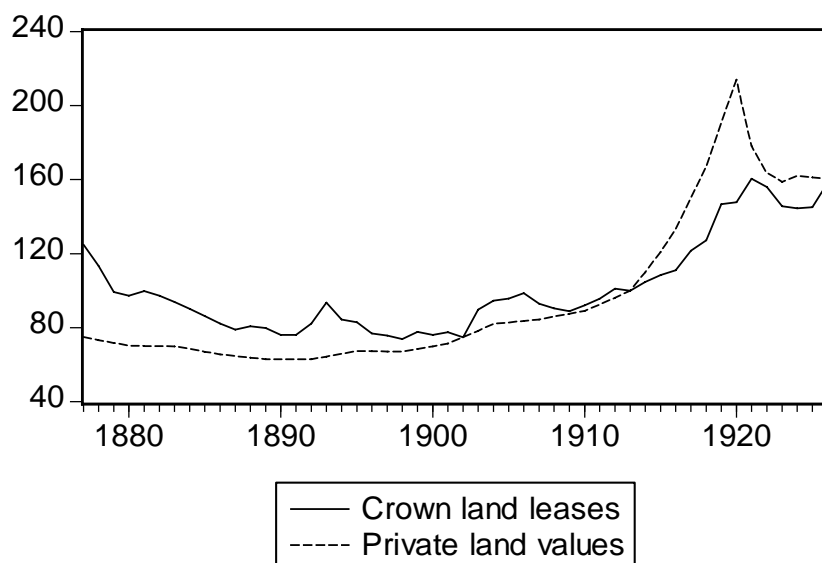
Note: In 1877–1919, the series of private land prices are based on averages for three years. Linear interpolations fill the remaining gaps. Thus the first year is actually the average of 1876–78.

Sources: Crown land leases: Lindahl et al., National Income, II, p. 393, table 126. Private land prices: In 1877–1919, a weighted measure based on series from Åmark, Undersökning angående jordegendomsvärdena, pp. 78–89. In 1919–1926, Höijer, P.M. angående jordegendomsvärdenas förändringar fram till år 1928, p. 121.
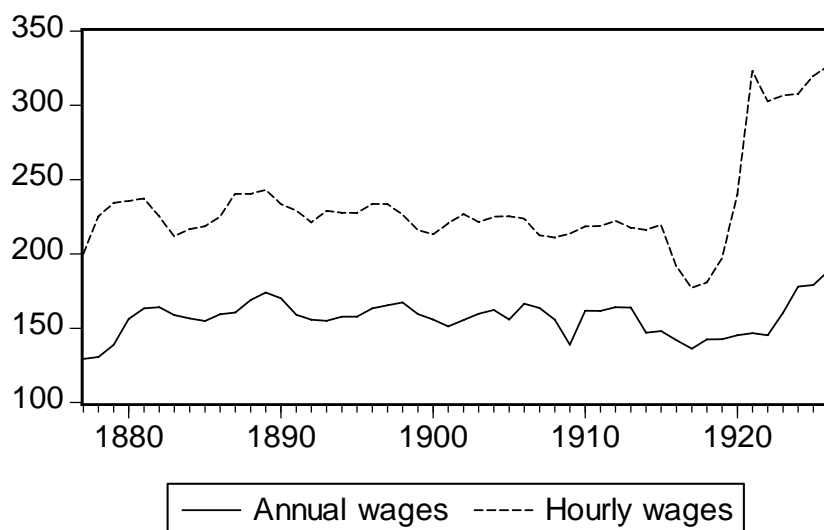
GRAPH 2. *Private land prices by size classes, 1877–1919 (1913=100)*
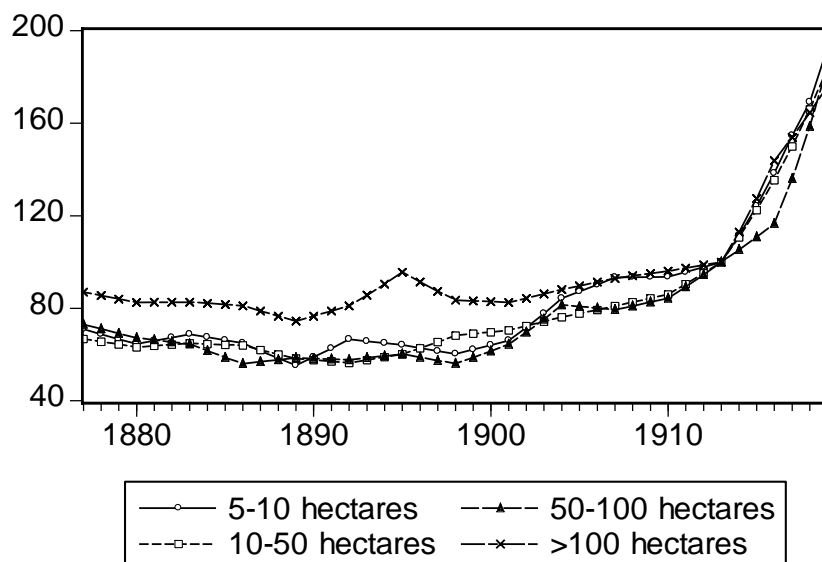
Note: Based on averages for three years. Linear interpolations fill the remaining gaps. Thus the first year is actually the average of 1876–8.

Sources: Åmark, Undersökning angående jordegendomsvärdena, pp. 80–9.

GRAPH 3. *Ratio of manufacturing to agricultural wages, 1877–1926*



Note: The wage gap was estimated for a benchmark in 1877.

Sources: Manufacturing: hourly and annual wages, Bagge, Lundberg and Svennilson, Wages in Sweden, I, pp. 260–1, table 26. Agriculture: hourly wages, Bagge, Lundberg and Svennilson, Wages in Sweden, II, p. 113, table 169, and p. 152, table 180; annual wages, Jungenfelt, Lönernas andel av nationalinkomsten, pp. 106-7

GRAPH 4. *Ratio of animal to arable prices, 1877–1926 (1913=100)*
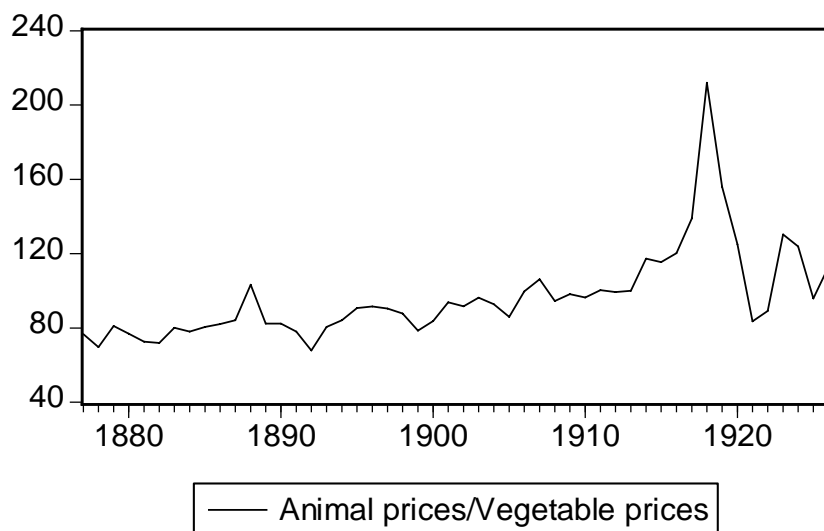
Source: Unpublished series by Lennart Schön, provided by the author on request.

FIGURE 5 *Ratio of agricultural to industrial prices, 1877–1926 (1913=100)*
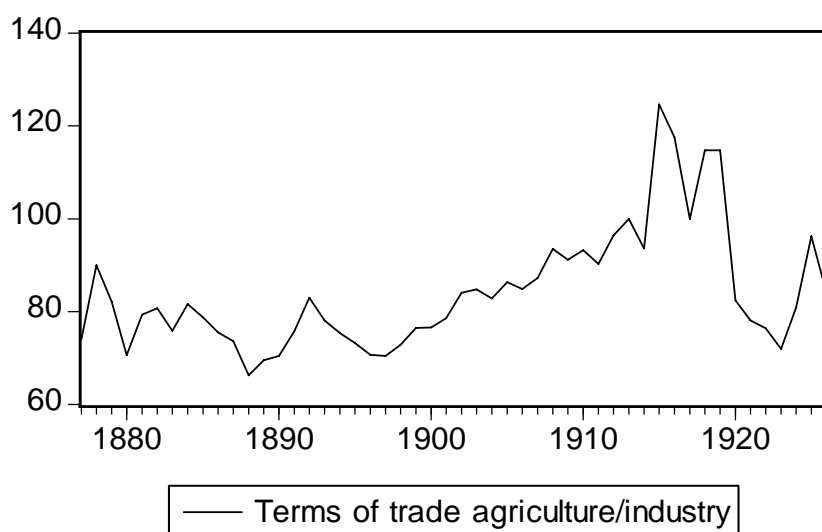

Sources: Agricultural prices: Schön, Historiska nationalräkenskaper för Sverige: Jordbruk (table J1 and table J6). Industrial prices: in 1877–1912 Larsson, Estimates of employment; in 1912–26, Edvinsson, Growth, Accumulation, Crisis, www.historia.se.

GRAPH 6. *Prices of agrarian products and land prices, 1877–1926 (1913=100)*
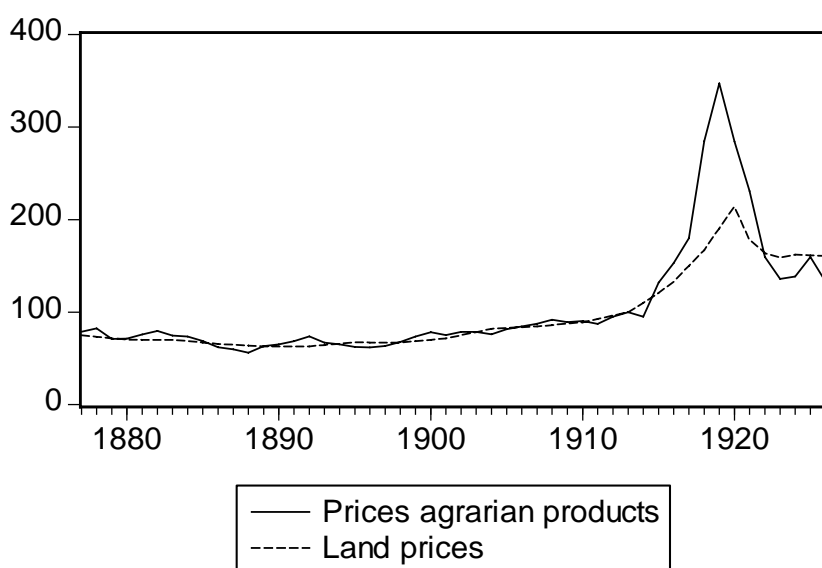
Source: See figure 1 and figure 5.

FIGURE 7. *Different measures of Swedish wage-rental ratios, 1877–1926 (1913=100)*
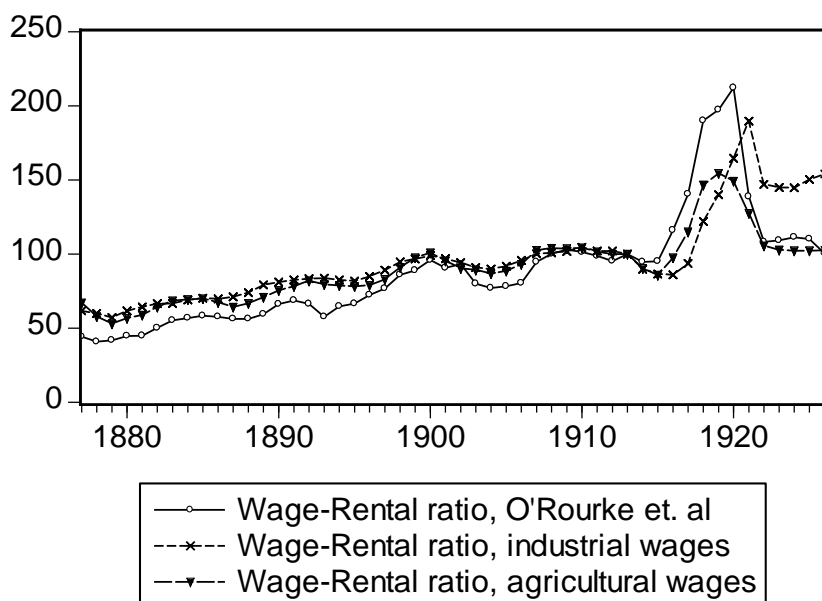
Note: O'Rourke, Taylor and Williamson's ratio is computed by dividing agricultural wages by Crown land leases. Our new wage-rental ratios are computed by dividing either agricultural wages, adjusted for working hours, or manufacturing wages, by private land prices.

Sources: See figure 1 and figure 3.

GRAPH 8. *Ratio of industrial product wages to labour productivity in Swedish manufacturing, 1877–1926 (1913=100)*

Sources: Value added from Schön, Historiska nationalräkenskaper för Sverige: Industri, pp. 308–9, table I14. Employment: Larsson, Estimates of employment; Edvinsson, Growth, Accumulation, Crisis, www.historia.se. Wages: Bagge, Lundberg and Svennilson, Wages in Sweden, I, pp. 260–1, table 26. Deflator: see Figure 5.

GRAPH 9. *Wage-rental ratios in the Old and the New World, 1875/79–1925/29 (1911=100)*
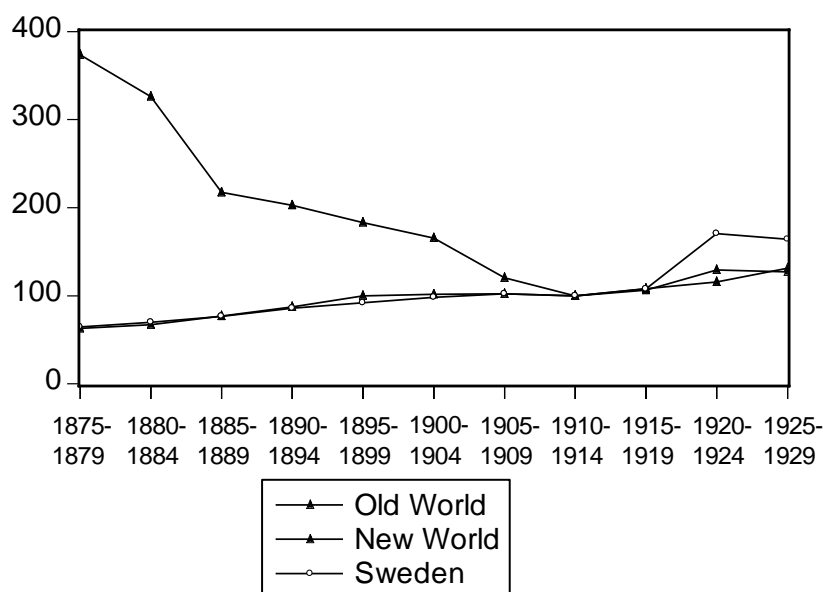
Note: Old World countries: Britain, Denmark, France, Germany, Ireland and Spain. New World countries: Argentina, Uruguay, Australia, Canada, New Zealand and the USA.

Sources: New and Old World countries: Williamson, Land, labor, and globalization, pp. 73–4. table 2 and 3. We have included in the New World sample data for New Zealand from Greasley and Oxley, Refrigeration and distribution, data appendix. Sweden: our new wage-rental ratio with industrial wages in the numerator.

GRAPH 10. *Wage-rental ratios in protectionist and free trade countries in the Old World, 1875/79–1910/14 (1875/79=100)*
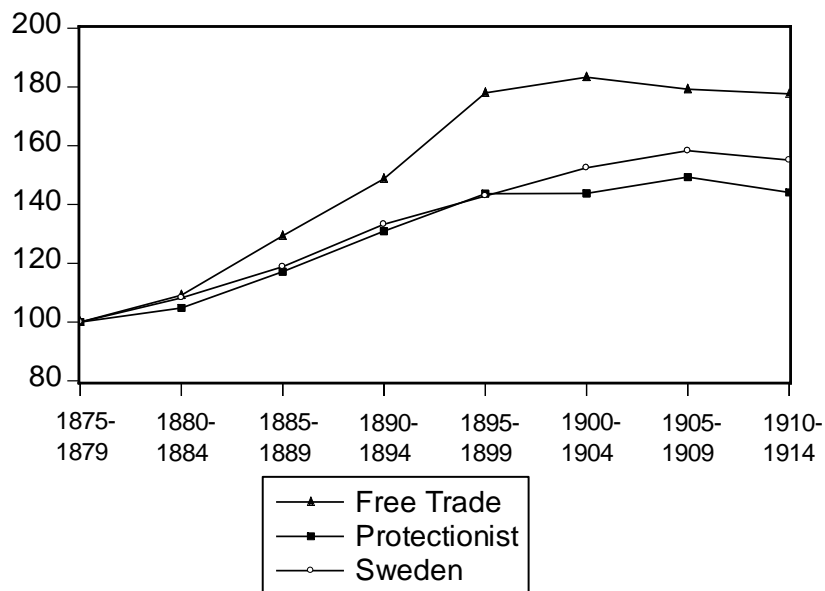
Note: Protectionist countries: France, Germany and Spain. Free trade countries: Britain, Ireland and Denmark.

Sources: Protectionist and free trade countries: Williamson, Land, labor, and globalization, pp. 73–4, table 2 and 3. Sweden: our new wage-rental ratio with industrial wages in the numerator.

Appendix

Land values for private land and Crown land, 1877–1926 (1913=100)

	Private land Size class, hectares					
	5-10	**10-50**	**50-100**	**100-**	**Average**	**Crown land**
1877	71	67	73	87	75	125
1878	69	66	71	86	73	113
1879	67	64	69	84	72	99
1880	65	63	67	83	70	97
1881	66	64	66	83	70	100
1882	67	64	65	83	70	97
1883	69	65	65	83	70	94
1884	67	65	62	82	69	90
1885	66	64	59	82	67	86
1886	65	64	56	81	66	82
1887	62	62	57	79	65	79
1888	58	60	58	77	64	81
1889	55	58	59	74	63	80
1890	59	58	58	77	63	76
1891	63	57	58	79	63	76
1892	67	56	58	81	63	82
1893	66	58	59	86	64	94
1894	65	59	59	90	66	84
1895	64	60	60	96	67	83
1896	63	63	59	91	67	77
1897	62	65	57	87	67	76
1898	60	68	56	84	67	74
1899	62	69	59	83	68	78
1900	64	70	62	83	70	76
1901	66	70	64	82	72	78
1902	72	72	70	84	75	75
1903	78	74	75	86	78	90
1904	84	76	81	88	82	95
1905	87	78	81	90	83	96
1906	90	79	80	91	84	99
1907	93	81	79	93	85	93
1908	93	83	81	94	86	91
1909	94	84	83	95	88	89
1910	94	86	84	96	89	92
1911	96	90	89	97	93	96
1912	98	95	94	99	96	101
1913	100	100	100	100	100	100
1914	111	111	105	113	110	105
1915	124	122	111	127	121	109
1916	138	135	117	144	133	111
1917	155	150	136	154	150	122
1918	169	166	158	165	167	127
1919	193	184	185	176	190	147
1920					214	148
1921					178	160
1922					164	156
1923					159	146
1924					162	145
1925					161	145
1926					160	158

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