

AGRICLIOMETRICS AND AGRICULTURAL CHANGE IN THE
NINETEENTH AND TWENTIETH CENTURIES


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AGRICLIOMETRÍA Y CAMBIO AGRÍCOLA EN LOS SIGLOS XIX Y XX

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RESUMEN

Con anterioridad a la revolución industrial, la agricultura era la actividad económica más importante en las sociedades tradicionales. La difusión de los procesos de industrialización, primero a buena parte de los países occidentales, y más tarde a otros muchos, ha generado por ello una amplia literatura sobre el papel de la agricultura en dichos procesos. Las iniciales perspectivas que ofreció la historia económica, sobre todo sobre el caso inglés, y los planteamientos de los economistas del desarrollo, en buena medida basados en los trabajos previos de los historiadores económicos, experimentaron una profunda revisión cuando un amplio número de trabajos trataron de evaluar desde una perspectiva cliométrica los cambios experimentados por la agricultura y su contribución al crecimiento económico. En este contexto, el objetivo de este trabajo es utilizar estas aportaciones para analizar las profundas transformaciones que ha experimentado la agricultura en el mundo en los dos últimos siglos y su contribución a los procesos de desarrollo económico.

Palabras clave: Historia económica, Cliometría, Agricliometría, Producción agraria, Productividad agraria, Cambio tecnológico, Comercio agrario, Globalización, Políticas agrarias, Instituciones agrarias.

ABSTRACT

Before the industrial revolution, agriculture was the most important economic activity of traditional societies. The spread of industrialisation processes, first throughout a large part of the western world and later across many more countries, gave rise to an abundance of literature on the role of agriculture in these processes. The initial perspectives offered by economic history, particularly for the British case, and the approaches of development economics specialists, largely based on previous studies by economic historians, became subject to reconsideration when numerous studies emerged that, from a cliometric point of view, sought to evaluate the changes experienced by agriculture and their contribution to economic growth. In this context, the objective of this study is to use these contributions to analyse the profound transformations that have occurred in agriculture around the world over the last two centuries.

Keywords: Economic History, Cliometrics, Agricliometrics, Agricultural Production, Agricultural Productivity, Technological Change, Agricultural Trade, Globalisation, Agricultural Policies, Agrarian Institutions.

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AGRICLIOMETRICS AND AGRICULTURAL CHANGE IN THE NINETEENTH AND TWENTIETH CENTURIES

1.- Introduction¹

The agricultural sector has traditionally been a highly popular field of study among economic historians. Therefore, it is not surprising that, since the emergence of New Economic History in the 1950s, the cliometric approach has been frequently used in the analysis of the changes experienced by agriculture over the long term. Many researchers have used this methodology to explain the agricultural transformations and in recent years a specialised forum has been created (Agricliometrics Conferences) in which cliometric agricultural historians are able to discuss their work. Three of these events have been organised to date (Zaragoza 2011 and 2015, Cambridge 2017).

This methodological approach, which is predominant in the universities of many developed countries today, has made a significant contribution to an in-depth and renewed vision of the principal changes that have taken place in the agricultural sector and the forces that have driven them. The use of explicit theoretical approaches based on economic theory and the analysis of historical agricultural data with econometric techniques has enabled us to extend our knowledge substantially. For many regions, we have been able to establish not only by how much production has increased but we are also able to explain whether this growth is due to a better use of inputs or improvements in productivity. It has also been possible to gain a thorough knowledge of the changes occurring in agricultural trade during the two waves of globalisation and the forces that drove them. Finally, the agricultural policies, their effects and the institutional changes have been examined from a new perspective aimed, mainly, at understanding the political economy that explained them and the reasons that enable us to understand them.

Furthermore, in publications providing an overall perspective of the agricultural change in the modern world, cliometric agricultural historians have summarised their previous contributions and renewed our understanding of the long-term evolution of the agricultural sector. Without a doubt, the most important study is the general overview by Federico (2005, 2014 and 2017) of the economic history of global agriculture in the

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nineteenth and twentieth centuries. Also from this perspective, views about the agricultural change in Europe (Lains and Pinilla 2009a), the Global Periphery (Pinilla and Willebald 2018) or different regions of the world (Hillbom and Svensson 2013) have been published. Moreover, economic history publications on certain relevant countries in the global economy which incorporate a study of agriculture have largely been undertaken by cliometric historians, such as the case of the United States (Atack, Bateman and Parker 2000; Olmstead and Rhode 2000) or Great Britain (Allen 2004; Ó Gráda 1981; Turner 2004).

The interest of cliometric researchers in agriculture is not surprising. Until the beginning of the industrial revolution, agriculture was the principal economic activity of today's developed countries. There has been intense debate among economic historians about the role played by agriculture in the transformation of these countries from pre-industrial nations to advanced economies (Lains and Pinilla 2009b). Today, agriculture is still important in developing countries and, although in developed nations it has a very low weight in terms of production or the use of labour, it is still strategic as it produces the food essential for human beings. Furthermore, it is closely linked to the agri-food industry.

Within this context, the objective of this chapter is to offer a renewed vision of the changes that have taken place in global agriculture over the last two centuries in light of the research undertaken in recent decades by cliometric historians. Over the last twenty years, thanks to the surveys or joint volumes that have been published, this methodology has gone beyond the mere reporting of results in specialised academic journals. Nevertheless, it is still important to synthesise the principal results, as cliometric historians have tended to propose and verify new hypotheses while questioning some of the traditional ones.

The chapter is structured into five sections following this introduction. The first addresses the long-term evolution of agricultural production and productivity. An analysis of the technological change in agriculture is the subject of the second section. The third and fourth sections address the development of agricultural trade and the integration of agricultural product markets in the first and second globalisations respectively. The final section analyses some relevant aspects of the institutional change that has taken place in agriculture in the period studied in this chapter.

2.- Long run agricultural production and productivity

2.1.- Increase in production

The first difficulty faced by cliometric historians seeking to study the long-term changes in agricultural production and productivity was the absence of sufficiently consistent serial data for many countries. Therefore, the first task was usually to carry out a meticulous statistical reconstruction of annual agricultural production, particularly in

the period leading up to the Second World War (i.e., GEHR 1991; Toutain 1992; Federico 2003).

Table 1
Annual growth rates of gross agricultural output, 1870-2000 (%)

	1870/1913	1913/1938	1938/1948-52	1948-52/1958-60	1961/2000
Africa	n.a.	n.a.	1.72	3.10	2.25
Asia	1.11	0.58	0.31	3.64	3.54
Europe	1.34	0.76	n.a.	n.a.	0.00
Western Europe	n.a.	n.a.	0.56	2.55	0.91
North and Central America	n.a.	n.a.	2.63	1.40	1.77
South America	4.43	3.05	1.68	3.13	2.92
Oceania	n.a.	n.a.	0.81	2.85	1.68
Western Settlement	2.20	0.74	n.a.	n.a.	n.a.
World	1.06	0.72	1.34	2.69	2.27

Source: Federico (2004) and (2005). Between 1870 and 1938 Asia includes only Japan, Indian and Indonesia; Western Settlement includes Canada, Australia and New Zealand; South America includes Argentina, Chile and Uruguay. Asia between 1936-38 and 1958-60 does not include China. The World between 1936-38 and 1958-60 excludes the Socialist countries.

The availability of broad statistical series subsequently enabled the analysis of changes in production. From a global perspective, agricultural production has increased in the world as a whole over the last two centuries at a much faster pace than population growth. If we take into account that, due to the demographic transition, population has increased at a very fast rate during this period, the capacity of agriculture to feed humankind should be recognised as an important achievement (Federico 2005).

It is obvious that the most complex estimates of agricultural production growth are those referring to the nineteenth century, given the lack of quality data or the difficulty in finding them. For example, in England there is considerable controversy surrounding the estimates carried out and there is a lack of consensus (Allen 2005; Broadberry *et al.* 2015; Clark 2010; Floud *et al.* 2011; Muldrew 2011; Clark 2018). Kelly and Ó Gráda (2013) have examined the causes of these differences, proposing compromise estimates of agricultural output for the period of the industrial revolution, which show that the British population had broken the Malthusian ceiling as its agricultural production grew at a faster rate than population. Therefore, the food resources were clearly greater than those necessary for subsistence. Also, in Portugal and Sweden agricultural production outperformed population growth substantially. In Scania, the granary of Sweden, agricultural production increased faster than in England between 1800 and 1850, with an annual growth rate of 1.77% (Olsson and Svensson 2010). Agricultural production also grew in Portugal in the first half of the nineteenth century at an appreciable annual rate of 0.7% (Reis 2016).

The only estimate carried out regarding the growth in agricultural production on a global scale highlights that, between 1870 and 1938 increased at an average annual rate

of 1.3%. This growth was much greater until 1913 than during the inter-war period when it slowed down considerably (Federico 2004) (Table 1). The increase in production during this period varied greatly between the different regions, with faster rates in South America, the Settler Countries and Europe. As production grew at a faster pace than the population, during this period agriculture contributed to improving nutritional levels, at least in those regions of the world where there was higher growth. However, this growth seems modest if we compare it with what came later. Between 1938 and 2000, world agricultural production grew at a higher rate, but particularly after 1950 when it grew by more than 2% annually. Again, there was considerable regional dispersion as developing countries had growth rates of over 3% per annum after 1950, while developed countries grew more slowly, particularly during the final decades of the twentieth century (Federico 2005: 20).

The greater availability of data for developed countries enables us to analyse the growth rate of their production in more detail. The agricultural production of European countries grew throughout the nineteenth century until the First World War at an annual rate of between 0.5% and 1.5% with notable differences between countries. These rates remained at similar levels in the interwar period, although the dispersion across countries increased and some had rates higher or lower than the aforementioned range. The annual growth rates of settler countries were very high (usually above 6%) during the conquest of new territories and the displacement of the frontier westward. Once this process was completed, in the interwar period, the growth rate fell significantly (Federico 2004). After the war the growth rates accelerated considerably between 1950 and 1990 when they grew at an annual rate of over 2%. Since 1990, these rates have fallen considerably to an annual level of less than 1% or have stagnated.

For the second half of the twentieth century it is possible to determine the growth rates of production and their regional differences with greater precision. In terms of the growth rates of production, a clear gap can be observed between developing countries and developed countries as the former had higher rates while the latter had steadier rates in the expansion of their production (Alston and Pardey 2014; Pinilla and Willebald 2018b). Europe is an example of the developed countries. Its production grew very fast until the end of the 1980s, with annual rates of over 2%, but then it stagnated with minimum growth in the majority of the countries and negative growth in the old centrally-planned economies (Martín-Retortillo and Pinilla 2015a). In developing countries, the pattern is very different. If we take the case of Latin America, the figures show that the growth rates of agriculture remained relatively stable during the whole period (somewhat lower during the crisis years of the 1970s and 1980s), with very high levels at around 3% per year (Martín-Retortillo *et al.* forthcoming).

2.2.- Growth in productivity

Once the growth rates of production had been established, the most important contributions began to focus on analysing the changes occurring in agricultural productivity and its determining factors. Two main strategies have been followed to

approach this issue: calculating the Total Factor Productivity (TFP); and partial productivities and principally labour productivity.

The emphasis on the study of TFP is largely due to the growing role that its improvement has had in the increase of production. According to Federico (2005), we can talk about a predominantly extensive model of agricultural growth until WWII, based on the use of a greater amount of inputs and a small contribution of an increased TFP, and an intensive growth model after the Second World War in which a more relevant role is attributed to the improvement in TFP. Many studies have been carried out estimating the historical growth of TFP, the majority of them for countries with currently high incomes. Although there is a clear spatial variability in the results obtained, some general trends can be drawn from them. First, the studies for Great Britain (i.e. Clark 2002; Allen 1994) or the United States (Craig and Weiss 1991) show that at the beginning of the industrialisation processes, the TFP grew at an annual rate of around 0.5%. The most advanced European countries followed this trend in the second half of the nineteenth century, with higher annual rates, which in some countries exceeded 1% (Van Zanden 1991). Other European countries, such as France, Italy, Portugal or Spain had similar rates at around 0.7% (Grantham 1993; Federico 2003; Lains 2003; Bringas 2000). In these countries, the TFP grew even faster during the inter-war period, as the industrialisation processes intensified. But, without a doubt, the greatest growth acceleration of the TFP occurred during the decades following the Second World War. Agricultural economists have carried out the majority of studies for the second half of the twentieth century for short periods of time, which makes the comparison of their results difficult (Federico 2014).

Table 2
Annual growth rates of outputs, inputs and TFP between 1950 and 2005/8: The big European and Latin American countries

	Output	Labour	Land	Capital	TFP
Argentina	1.68	-0.23	1.13	3.66	-0.04
Brazil	3.97	0.28	2.23	4.57	1.90
Colombia	2.55	1.01	0.98	1.99	1.18
Mexico	3.67	0.89	0.77	3.22	1.99
France	1.48	-3.87	-0.14	2.43	2.31
Germany	1.24	-3.88	-0.22	1.00	2.48
Italy	0.89	-3.78	-0.87	3.08	1.78
Poland	0.63	-1.35	-0.44	3.01	0.49
Spain	2.34	-2.52	-0.20	3.64	2.37
United Kingdom	1.06	-1.64	-0.41	1.04	1.54

Source: Martín-Retortillo and Pinilla (2015 a) and Martín-Retortillo *et al.* (forthcoming). European countries between 1950 and 2005; Latin American countries between 1950 and 2008.

Two recent cliometric studies for Europe and Latin America for the whole of the period 1950-2005 enable more robust conclusions to be drawn (Table 2). Therefore, the European case shows that the growth of agricultural production in European countries followed different paths but tended to converge. A model strongly based on increased efficiency was categorically followed by the more advanced countries from the early 1960s and by the more backward countries of the southern periphery from the early 1980s. The countries of Central and Eastern Europe had to wait for their transition to market economies in the mid-1990s before they could adopt a similar model. Latin America constitutes an interesting contrast as the countries in this continent had medium and low incomes in around 1950. In this case, efficiency gains made a rather modest contribution to the considerable increase in production, although this contribution became increasingly larger over time and was highly significant between 1994 and 2008 (Martín-Retortillo and Pinilla 2015a; Martín-Retortillo *et al.* forthcoming).

The historical studies conducted on partial productivities highlight the wide variety of agricultural systems which have existed and their evolution. The studies conducted by O'Brien and Prados de la Escosura (1992) and Van Zanden (1991) for Europe from the end of the nineteenth century to the end of the twentieth century and the study undertaken by Hayami and Ruttan (1985) for six developed countries over a long time period from the end of the nineteenth century to the end of the twentieth century enable us to appreciate a wide variety of models. In all of them, over these one hundred years, the increases in productivity of the land and of labour have been spectacular. In some countries, usually those with lower levels of land productivity, the improvements in labour productivity were achieved mainly by increasing the number of hectares farmed per worker, with the United States being the most notable case. In other countries, such as Japan, it was largely the improvement in land productivity that contributed to the increase in labour productivity.

This variety in the agricultural development models can be generalised to the whole of the world, which also shows the existence of different trends in the second half of the twentieth century, particularly based on the improvement of land productivity in Asian countries or labour productivity in developed countries (Alston and Pardey 2014 Federico 2005: 74).

2.3.- Technological change

A key study in the analysis of technological change in agriculture is, undoubtedly, the one conducted by Hayami and Ruttan (1985). It combines a theoretical proposal for its understanding, an international comparison between developed and developing countries and an historical-econometric analysis contrasting the cases of the United States and Japan. Based on Hicks' analysis of technical change, these authors proposed the theory of induced innovation to explain the technological change in agriculture, whereby the direction of this change depends on the relative prices of the factors. In the United States, as labour was a relatively scarce and expensive factor, the mechanisation of

agriculture was predominant in order to make savings in labour, while in Japan, where land was the scarce factor, biological innovations predominated. This is what Olmstead and Rhode (1993: 102) call the 'level approach' to technical change, meaning that even at constant relative factor prices innovations try to save relative scarce factors.

Some studies seek to verify the key factors that determined the adoption of the new agricultural machinery. For the case of the United States, David (1966) concluded that the adoption of the harvester in the Mid-West depended on whether certain economies of scale were obtained, which, in turn, critically depended on the variation of the relative prices of the factors. However, Olmstead (1975) highlighted that small variations in the values of the variables that intervened in the model had significant repercussions on the profitability threshold farm size for adopting machinery and that the hire or joint purchase of machinery enabled this size to be reduced. Also for the European continent, Reis (1982) concluded that in order to adopt the steam thresher in Portugal, the variation in the price of labour, the cereal yields and the hiring or joint purchase of these machines were key factors. For Italy, the diffusion of the steam thresher from the 1870s was determined by the cost of the capital and was facilitated because these machines were purchased by specialised entrepreneurs who rented them to farmers and landowners (Federico 2003).

An additional problem in the analysis of technological change in agriculture is the classification of the innovations as land or labour saving. Some of them can produce effects simultaneously in both directions (Federico 2005; Olmstead and Rhode 1995). For example, in the case of the United States, tractorisation substantially reduced the land required to feed draught animals (Olmstead and Rhode 2001).

However, the analysis of technological change in agriculture must be more complex than studying the mechanical application of the theory of induced innovation, as shown in the in-depth review of the North American case carried out by Olmstead and Rhode (2008 and 2015). These authors have highlighted the importance that the biological innovations (not mechanical) had throughout the nineteenth century and the first third of the twentieth century, as they were decisive for the country's important crops, particularly through the import of genetic material from other places or the growing capacity to combat plagues and insects that threatened the harvests. Furthermore, one of the most important consequences was the increasing capacity to control and eradicate epidemics suffered by animals for human consumption, which is not usually taken into account when the impact of these innovations on the improvement of land productivity is estimated. Finally, they showed that the evolution of the relative prices of land and labour in the United States moved in the opposite direction to that forecast by Hayami and Ruttan. Throughout the nineteenth century and until 1910, the ratio between the value of land and agricultural wages increased progressively, or, in other words, there was higher growth in land prices than in labour prices (Olmstead and Rhode 1993: 105).

The innovations designed to increase the productivity of the land have also been important in European agriculture. Until the Second World War, the use of chemical fertilizers or pesticides substantially contributed to increasing the productivity of the land

(Van Zanden 1991). During the first decades after the war, European agriculture intensified its yields. In the case of arid or semi-arid areas (not only in Europe), the extension and intensification of irrigation has also been fundamental. In Europe, the irrigated area increased from 8.7 million hectares to 19.1 million hectares, 10 million of which are located in Mediterranean Europe (Martín-Retortillo and Pinilla 2015a). The contribution of irrigation to the increase in agricultural production is remarkable. For example, it is estimated that in Spain between 1935 and 2006, the contribution of the increase in the area irrigated to the rise in vegetable production was 45% and that of the productivity of irrigated land was 41% (Cazcarro *et al.* 2015).

In general, an important area of study regarding the technological change and improvement in efficiency in agriculture is related to the driving forces. Several studies have sought to demonstrate the importance of both foreign and domestic demand in encouraging the adoption of technological innovations which could increase supply without increasing prices. This is an important argument to explain the virtuous cycle that triggered the English industrial revolution, as the demand for food from the cities played a fundamental role in the growth of agricultural productivity (Allen 2003). In the case of European countries, Van Zanden (1991) highlights the importance of domestic demand and overall economic growth to explain the improvement in agricultural productivity. Also, in the case of Germany, agriculture reacted to urban and industrial development rather than shaping it (Kopsidis and Hockmann 2010; Kopsidis and Wolf 2012; Pfister and Kopsidis 2015). In the case of France in the first half of the nineteenth century, demand was the main driver of the improvement in productivity (Grantham 1989). In Sweden, institutional change and growing markets for agricultural products boosted agricultural production and productivity between 1700 and 1860 (Olsson and Svensson 2010). The same argument has been used to explain the growth in North American agriculture throughout the twentieth century, emphasising the importance of labour market adjustments and the relocation of the agricultural labour force in the non-agricultural sector as the principal cause of increased productivity in agriculture (Gardner 2002). In general, both internal and external demand have been identified as being important factors for the development of European agriculture (Lains and Pinilla 2009a).

Supply factors also played an important role in the technological change and the improvement in productivity. Returning to Hayami and Ruttan (1985), it seems obvious that, with all the precautions that we have already indicated, relative prices were important for understanding the direction in which innovation was moving. Here we can add some other key factors. First, public action, that is the role of the public research centres, has undoubtedly been important, more than in other sectors, for explaining innovation (Ruttan 2002). Due to the difficulties in ensuring the appropriability of the innovations, the public sector organised an agricultural research system that has produced remarkable results which are clearly reflected in the case of the green revolution. Therefore, organised public (and also private) investment in agricultural R&D was a primary driver of rapid growth in productivity in the second half of the twentieth century (Alston *et al.* 2013; Federico 2014). Furthermore, as we shall see later, agricultural

cooperativism facilitated the diffusion of innovations. Finally, access to credit was a determining factor for adopting innovations as it required large capital investments.

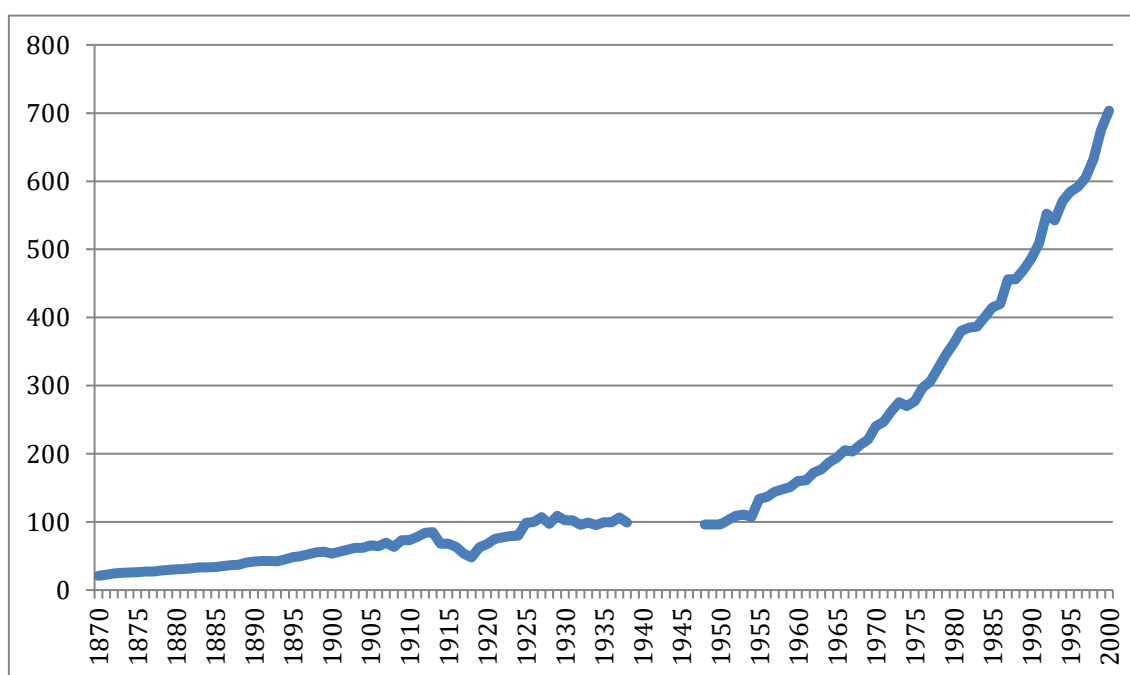
3.- The first wave of globalisation and the growth of agricultural and food trade

3.1.- Market integration and agricultural trade

The upsurge in trade, together with mass transoceanic migrations of workers and capital movements were the essential components of the first wave of globalisation from the early decades of the nineteenth century (O'Rourke and Williamson 1999). A strict definition of globalisation such as that commonly used by economic historians requires an increasing integration of factor and product markets (O'Rourke and Williamson 2002). In the case of goods markets, those with a greater weight in economic activity, such as textiles or grain, played a decisive role.

In the first wave of globalisation, agricultural international trade expanded rapidly (Figure 1). The estimations performed by Lewis (1952 and 1981) for primary products as a whole indicate an annual growth rate of 3.7% between 1850 and 1900. In the first third of the twentieth century, agricultural trade grew at an annual rate of 1.4%. However, this period was characterised by enormous contrasts. Until 1914, the growth rate of agricultural trade was similar to that of the nineteenth century. It subsequently fell during the First World War, recovered in the 1920s and suffered a considerable decrease in the 1930s due to the Great Depression (Aparicio *et al.* 2009).

Figure 1
International trade in agricultural and food products, 1870-2000
Constant prices, index numbers, 1934=100



Source: Own elaboration based on Aparicio *et al.* (2009) and González *et al.* (2016)

During the first wave of globalisation, agricultural products were a key component of international trade, representing approximately half of the total. During this period, trade was essentially inter-industrial, that is, the predominant tendency was the exchange of raw materials and food products for manufactured goods. Therefore, the Heckscher-Ohlin models based on comparative advantage usually provide a convincing explanation of the specialisation trends and trade patterns.

During this first wave of globalisation, the integration and formation of the agricultural product markets was essential. The wheat market was fundamental as wheat was a staple product and its trade accounted for a high volume of total agricultural trade.

There is an abundance of evidence that reveals that, between the end of the Napoleonic wars and approximately 1870, a massive international integration process of the wheat market took place, measured through the convergence of its prices and the reduction of its dispersion (Jacks 2006). The north-Western European countries led this process of market integration, reaching high levels of integration before any other region (Chilosi *et al.* 2013). The protectionist measures implemented after the “grain invasion” in the final decades of the nineteenth century partially reversed this integration process which resumed at the beginning of the twentieth century. The domestic markets also partially experienced this integration process (Federico 2012a; Uebele 2011). In the case of integration between Asia and the international market, the process was more continuous until the First World War with no regression at the end of the nineteenth century (Chilosi and Federico 2015). After WWI and during the 1920s, the dispersion in prices was once again very low, but the 1930s depression disintegrated the wheat market once more (Federico and Pearsson 2007; Hynes *et al.* 2012). In this process, at least in the European market, the contribution of the domestic and international markets to the long-run process of integration was similar. Its main drivers were political events, trade liberalisation and the fall in transportation costs (Federico 2011).

The European demand for wheat, mostly from Britain, was the key factor in the growth of its trade in the nineteenth century. The abolition of the Corn Laws in Britain in 1846 was one decisive factor in the liberalisation process which took place (Sharp and Weisdorf 2013). However, at the end of the century the situation for the European producers became very complicated with the increasing imports of wheat from the East (the Russian Empire) and from the West (the United States), at prices which were lower than those usually seen in Europe. The largest countries, such as Germany, France, Italy or Spain reacted by imposing protectionist barriers which gave a certain margin to their farmers to compete with foreign production, with the condition that they modernised their farms by introducing innovations such as chemical fertilizers or machinery. Less common was the practice implemented by countries such as the United Kingdom, the Netherlands and Denmark which decided to maintain their free trade policies. These different responses have been explained by the fact that the grain invasion implied different shocks in different European countries and also had different effects on income distribution depending on the importance of grain production and agriculture (O’Rourke 1997). The capacity of influence of the different sectors affected by the crisis in each country was,

therefore, decisive in explaining the type of trade policy adopted (Lehmann S, Volckart O 2011).

Until the First World War, trade in wheat was characterised by the stability of demand from the European free trade countries, while that proceeding from the protectionist countries was highly irregular. The war and the decline of European production, together with the end of Russian exports, led to a growth in production in overseas countries, while in the rest of the world production decreased. Exports from those countries also increased significantly. In the 1920s, the market began to display unequivocal signs of saturation. During the 1930s worldwide exports of wheat decreased. This fall was approximately 65 million quintals between 1928-32 and 1934-38 (Aparicio and Pinilla 2018). The principal explanation is to be found in the increasing self-sufficiency of the principal wheat consumers due to the increase in protectionist measures. From 1929 onwards, the traditionally protectionist countries increased their tariffs on wheat imports, and in 1932, adopted additional measures to reinforce their protectionist policies. In this latter year, even the United Kingdom abandoned its free trade policy and adopted some type of protective measures.

Market integration processes also took place in other agricultural products or processed agricultural products. In the case of Mediterranean fruit and vegetables, which were hardly consumed outside of their area of production before the first wave of globalisation, there was a strong increase in trade and intense international competition. As exports from southern Europe increased, new producers entered the market, with California being the most noteworthy, seeking to win market share from the traditional producers (Morilla *et al.* 1999). Spain obtained a prominent leadership position when, over the first third of the twentieth century, it became the world's number one exporter, with its sales increasing more quickly from the end of the nineteenth century. Rising incomes in the more developed countries and technological change in agriculture specialising in these products were key to the growth of this trade. Spanish exporters also benefited from the increasing integration of international markets, especially through declining transport costs and, to a lesser extent, trade liberalisation (Pinilla and Ayuda 2010). The results of the transatlantic competition between the Mediterranean countries and the new producers were varied. Thanks to its technological leadership, efficient marketing and protectionist policies, California was able to seize the North American market from the Mediterranean producers. However, the latter retained the European markets, mainly thanks to maintaining highly competitive prices despite a certain technological delay. Even so, the cost of losing the North American market, which had the highest growth rate in the world, was high. For Spain, which was the leader in the trade of these products, the cost was considerable. Only for the orange market, in the counterfactual case of the non-existence of Californian product, Spain's GDP in 1910 would have been 0.8% higher thanks to the higher sales which it would have had in the United States (Pinilla and Ayuda 2009:194-195). In the case of raisins, the only example where the Californians eliminated the Mediterranean competitors, the cost was extremely high and their production in the old continent stagnated or decreased substantially (Morilla *et al.* 1999).

In other cases, the competition was mainly intra-European, such as the case of olive oil, where Italy became specialised in the highest quality and value segment, while Spain dominated the lower quality segment (Ramon 2000).

The trade of wine increased from the mid-nineteenth century (Anderson and Pinilla 2018). It grew strongly during the second half of the nineteenth century due both to the increase in demand in countries which traditionally did not consume wine in the north of Europe and in the destination countries of European Mediterranean emigrants, and to the arrival of the phylloxera plague in France and the need of this country to import wine from Spain and other countries in order to supply its domestic market and maintain its exports. Soon France took a leadership position as an exporter and later as an importer due to the phylloxera plague (Ayuda *et al.* 2018). This plague implied a progressive orientation of this country towards the high-quality segment and of other Mediterranean countries towards the low-quality segment. In this case, however, the French trade policy, which opened its duty-free doors to wine from its Algerian colony, from the 1890s penalised the rest of the producers who were subject to high tariffs once the Algerian production was able to replace their exports. The wines that entered France, the leading importing market, were highly sensitive to tariff policy. Each one per cent increase in the tariff reduced the market share of imports by 1.8% in the long term (Pinilla and Ayuda 2002: 73-74). From the end of the nineteenth century, new competitors entered the wine market from the new world, namely Argentina, Chile, the United States, Australia, and South Africa. Before the last quarter of the twentieth century, the new competing countries did not threaten the European markets, but helped by their fierce protectionist policies they were able to reduce the imports of European wines slightly. The use of gravity models to explain the determinants of wine exports has revealed their sensitivity to tariff increases (Pinilla and Serrano 2008). The wine market also shows how the end of the first wave of globalisation was the result of deliberate measures taken by different countries to enormously limit trade flows. So, French wine exports, despite being specialised in high quality wines, suffered enormously from the tariff increases caused by the new Soviet State, the 1930s Depression or Prohibition in North America (Ayuda *et al.* 2018).

The textile fibre markets also operated on an international scale. In the case of silk there were three main competing countries: Japan, China and Italy. International demand grew and the producers responded by expanding their supply, with Japan gaining the greatest market share and China with the worst results due to its technological delay and poor competitiveness. The silk market illustrates how two of the three principal producers (Japan and Italy) took advantage of the opportunities of an expanding demand to improve their productivity and expand their exports (Federico 1997).

In other cases, such as the Anglo-Danish trade of butter, the integration between these markets took place extremely early (Lampe and Sharp 2015a).

3.2.- Export-led growth

One of the most relevant consequences of the advance in globalisation was a new division of labour on an international scale. In this respect, those countries of the world with a clear technological and industrial leadership position, such as Britain and other Western European nations specialised in the production and export of manufactured goods. On the contrary, other regions of the world, such as the Settler countries, Africa and Asia, took advantage of the strong demand for agricultural raw materials and food to specialise their production and supply these goods to countries with higher levels of industrialisation.

In the Settler countries, in order to be able to produce the products demanded by the industrialised world, the development of this specialisation implied the displacement of the native people of these territories and, in general their confinement to reserves or their extermination, the colonisation of the territory and its exploitation. In these countries, the agri-export sector acted as a driver of their economic development and throughout the first wave of globalisation not only did they expand their frontiers and increase the size of their economies spectacularly, but they also reached high levels of income per inhabitant. Before WWI, Australia, Argentina, Canada or New Zealand were among those countries with the highest per capita income. However, the jump from this agri-export specialisation to industrialisation was not always straightforward and the results were varied. The progress of Australia, Canada and New Zealand after WWI was clearly superior to that of Argentina and Uruguay. According to Willebald (2007), there was a positive relationship between higher degrees of inequality and production-trade specialisation in goods of a low aggregate value and a lower capacity to absorb more advanced technology, which was a problem when industry became the leading sector. Therefore, in the second half of the twentieth century, while the production structures which had been generated and had produced an undeniable success in the exporting era in some of these countries, those of South America limited the structural change and the technological processes which were essential for the culmination of the industrialisation and diversification process of exports due to the low levels of physical and human capital (Willebald and Bértola 2013).

Not all of the countries seeking to base their economic development on agricultural exports had the same success. Even expanding their exports, the countries located in tropical areas of America, Africa and Asia were not able to develop their economies sufficiently so as to close the gap with the industrial centre of the world. The growth of exports was much slower and the linkages with the rest of the economy were very weak. As a consequence, income levels remained low and these economies did not experience far-reaching transformations (Aparicio *et al.* 2018).

Other countries combined the development of an export sector of agricultural raw materials and food with the beginning of their industrialisation process. Therefore, some peripheral countries of Europe, such as Italy or Spain, combined an early specialisation in the export of agricultural products to their neighbours in northern Europe with the

development of a slow industrialisation process. Their position in the international markets of agricultural products was strong and this sector made an appreciable contribution to their development (Federico 1994; Clar and Pinilla 2009)

Finally, the case of the United States is noteworthy. This country experienced a rapid and far-reaching industrialisation while simultaneously pushing its frontier ever westward to colonise an immense territory (Attack *et al.* 2000). This resulted in large increases in both grain and cotton production. The exports of only two products, cotton and wheat, constituted a substantial part of the total exported goods by this country until well into the nineteenth century (North 1966). This concentration of exports in only one or two products was also common in the settler countries (Anderson 2018).

3.3- Agricultural trade in the second wave of globalisation

The Second World War dealt a harsh blow to trade which had already been significantly affected by the depression and the policies implemented during it (Hynes *et al.* 2012). South American agricultural exports contracted by about 40% during the war (Pinilla and Aparicio 2015: 241). For the world as a whole, in 1948-50, agricultural trade was still 4% lower than that of 1934-38. At the beginning of the 1950s, trade once again exceeded the pre-war level, although in 1952-54 it had only grown by 9% with respect to the pre-war level (González *et al.* 2015: 65). More important than the fall in the level of trade was that of the terms of trade which experienced a considerable deterioration in the inter-war period during which there was a structural rupture in the series and the improvement during the Second World War did not compensate this decline (Ocampo and Parra-Lancourt 2010).

After the post-war recovery period, world agricultural trade displayed remarkable contrasts during the second globalisation that started around 1950. On the one hand, it grew at an even faster rate than during the first wave of globalisation, but on the other hand it suffered a spectacular drop in its relative share of total international trade.

Agricultural trade grew faster in this period than during the first third of the twentieth century (Figure 1). This growth was also higher than in the expansion phase during the second half of the nineteenth century, when it grew at an average annual rate of 3.7% whereas in the second half of the twentieth century it grew at a rate of 4.0% (Aparicio *et al.* 2009). A series of econometric studies have sought to explain the causes of this rapid growth with two different methodologies: the use of time series and gravity models (Santos Silva and Teneyro 2006, Shepherd 2016).

In the first case, the rapid growth of agricultural trade is explained mostly by the increase in income and also, although to a lesser degree, by the fall in real agricultural prices and exchange rate stability. Transport costs and tariff protection, measured through the nominal protection coefficient, remained stable in the long term without fostering agricultural trade (Serrano and Pinilla 2010).

The cliometric research based on gravity models provides us with richer information about this evolution. First, it offers a powerful explanation for the change in the composition of agricultural trade. The trend in trade shows a substantial loss in the relative importance of commodities while processed and high value products gained considerable weight. This explains why in the processed and high value products we can observe the home market effect (not in commodities), which was closely related to the progressive concentration of the agri-food industry in the developed world. Therefore, the gravity equation has enabled us to verify that the increasing returns/product differentiation theory appropriately explains the growth in trade in high value and processed products and that the homogeneous goods/relative factor abundance theory can explain trade growth in agricultural commodities. Finally, the group of high value-added products and processed foods benefited from greater trade liberalisation, as we have seen. Thus, trade flows between high-income nations, where differentiated and reference priced products were concentrated, benefited earlier from a progressive liberalisation of regional markets. Later on, from the 1990s, these products enjoyed a more liberalised trade, with a new boost from Regional Trade Agreements (RTAs) among economies of the South and the liberalisation which the Uruguay Round produced for the food and drink industry. In contrast, the markets for traditional export groups, homogeneous goods, which characterise South–North trade flows, remained tightly controlled, and the GATT had no effect on the liberalisation of their trade. This suggests that closed markets were a key factor in the decline in homogeneous goods trade flows, compared to the rise in the trade in differentiated products and reference price goods (Serrano and Pinilla 2014).

Also, the gravity model can be used to explain the important changes that have taken place in the shares that the different regions have of the trade of agricultural and food products. A highly interesting contrast can be observed between Europe, particularly after the Treaty of Rome, and Latin America.

The European case is surprising from the outset. In the first wave of globalisation, this continent, particularly the most industrialised countries with England leading the way, was the world's principal importer of agricultural products and food, representing around 60% of world imports before the Second World War. However, this percentage progressively decreased throughout the second half of the twentieth century, falling to less than 50%. Notwithstanding, if we divide these imports into inter-European and intra-European exports we can observe two contrary trends. Trade between the member countries of the European Union (EU) began to grow quickly after the customs union was formed at the beginning of the 1960s while, on the contrary, agricultural imports from third countries lost importance very quickly in relative terms and at the end of the twentieth century their percentage share of world imports was just half of what they represented in the 1950s. In absolute terms, these imports were much lower than those from the EU member countries. Before WWII, Europe represented only 17% of world exports of agricultural and food products, but by the end of the century it had a share of almost 50%. Again, the explanation resides in the strong increase in trade between EU member countries (Pinilla and Serrano 2009). The econometric studies which have used gravity models once again help us to understand the causes of these trajectories. First,

exports from EU countries in the period 1963-2000 were stimulated by their high concentration in products that had a home market effect, characteristic of a pattern of intra-industrial trade associated with the growing concentration of the international agri-food industry within the EU. The expansion of these countries' markets had a major impact. This proved to be even more important as a driver of exports than growth in their export markets as intense trade specialisation in industrially processed agricultural and food products created economies of scale and generated a home market effect that increased export levels. Moreover, the development of the EU enormously affected the growth of imports from the countries joining it and the slow growth of imports from third countries was affected by the growing agricultural self-sufficiency of the EU. Models for intra-EU trade show that membership created trade between the partners (Serrano and Pinilla 2011a).

The evolution of the agricultural trade of Latin America constitutes a striking contrast. In the second half of the twentieth century, Latin American countries lost a substantial part of their weight of worldwide exports of agricultural and food products. These countries specialised intensively in the export of commodities during the 'first globalisation', to the point where the excellent economic results achieved by some republics can be attributed entirely to export-led growth models (Martín-Retortillo *et al.* 2018). Disincentives for farm exports produced by Import Substitution Industrialisation (ISI) strategies followed by these countries partly explain the decline in Latin America's relevance as a partner in world trade. Furthermore, other factors are important in helping us to understand what happened. Some econometric studies using gravity models highlight the importance of the profound regionalisation of farm trade in this period, which occurred in an international context of acute multilateral protectionism, and the relative failure of Latin American attempts to liberalise trade in the region delayed the creation of trade until much later. Latin American countries failed to make any major changes in the composition of their farm and food exports until very late in the day, and as a result they remained anchored to low-demand products. Moreover, the region's agro-export specialisation fundamentally consisted of basic goods and did not benefit from any home market effect in the long run. The high levels of protection facing Latin American exporters throughout practically the whole of the period, made it difficult for them to perform better in their target markets. The exclusion of agricultural products from the GATT agreements almost until the end of the century had a high cost for countries specialising in farm exports and the European customs union produced a trade distortion effect which affected Latin American exports. This illustrates just how important it was for third parties, because the process not only removed trade barriers between the EU partners, allowing an expansion of trade, but it also raised the tariff wall against outside imports (Serrano and Pinilla 2016).

Another important characteristic of the evolution of agricultural trade in the second wave of globalisation is its loss of relative importance with respect to total world trade. While agricultural and food products accounted for 43.0 per cent of total world trade in 1951, this share had shrunk to just 6.7 per cent at current values by 2000. Among the reasons for this significant loss of importance, and doubtless one of the most important,

is the relative fall in prices. This is evident when we consider the difference between the drastic loss of share of agricultural trade of total trade in terms of value, compared to the more moderate (albeit important) decline in terms of volume, which demonstrates an extremely serious fall in relative prices. The aggregate index of the real prices of agricultural and food products presents a structural break in the level (AO2) in 1976 and in the trend (IO2) in 1977, which suggests that they suffered, with a lagged effect, the impact of the first oil crisis on the world economy in the 1970s. Thus, the deterioration in terms of the trade of agricultural and food products was strong and clear in the second half of the last century and especially conditioned the incomes of countries specialised in the export of the most basic products (Serrano and Pinilla 2011b).

With regard to the causes of the loss of share in terms of volume, one reason was the generalised protectionism in the international markets for agricultural products (Anderson, 2009 and 2016). While other types of trade, such as manufacturing, enjoyed a greater multilateral liberalisation of their markets, strong market intervention caused agricultural trade growth to be based on the proliferation and success of regional trade agreements, in addition to important changes in consumption patterns related to rising income levels. Therefore, the slower growth in farm trade had a lot to do with the significant fall in agriculture's share of world GDP. The smaller share of intra-industrial trade for the majority of agricultural products was also crucial. The home market effect for agricultural exchanges had very little importance, which explains why these markets grew less dynamically than those of manufactured goods and total trade (Serrano and Pinilla 2012).

3.4.- Public intervention in the agricultural sector

In the *laissez-faire* period, public intervention in the agricultural sector was scarce and highly focused on trade policy. Throughout the nineteenth century, the states adopted a fairly passive role not only with respect to agriculture but also in terms of economic activities as a whole. In the case of agriculture, maybe the main exception was the creation of agricultural experiment stations in different countries. The objective was for these centres to collaborate with agricultural producers, facilitating the adoption of innovations. In some cases, their role was highly relevant.

In contrast, in trade policy, despite the liberal paradigm advocating free trade, in many countries there were varying degrees of tariff protection, particularly in the case of wheat. In Europe, the first half of the nineteenth century was predominated by highly protectionist policies to safeguard the national wheat production. The abolition of the Corn Laws and its effects on British agriculture was an issue that aroused the interest of the cliometric researchers. Some studies indicated that, until the 1840s, the impact of these protectionist measures on British agriculture was only moderate, as in the counterfactual case of the existence of a free market the production of grain in Great Britain would have decreased only moderately (Williamson 1990). The liberalisation arising from the abolition of these laws, within a context of robust demand, implied the

rapid increase of exports to Great Britain from different countries. However, during the first post-abolition decades, prices remained more or less stable in the British market, although they tended to increase in the markets of the exporting countries (Gallego 2004). This demand was also favoured by the fall in transport prices and trade liberalisation (O'Rourke and Williamson 1997). However, some studies have given more importance to the trade liberalisation processes or the reduction in other trade costs than the reduction in transport costs, at least until the last quarter of the nineteenth century (Jacks, 2006). The trade liberalisation processes, brought about through the signing of many trade agreements, had particular importance during that period (Lampe and Sharp 2015b). The technological innovations also contributed to a decrease in the production costs of the exporting countries and, from the end of the 1870s, grain from the Russian Empire or the American continent began to arrive to Europe at prices that were lower than the production costs of the European farmers. The so-called European grain invasion generated numerous responses in the continent, although the large countries, such as Germany, France, Italy or Spain reacted by substantially increasing their tariffs on grain. However, other countries, such as The United Kingdom or Denmark, kept their markets open. The wide variety of responses has been explained, at least partially, by the fact that the shocks suffered due to the invasion were also very diverse, both from a price perspective and also due to their different effects on income distribution (O'Rourke 1997). However, we should note that this protectionist reaction did not imply a general increase of tariffs on other agricultural products, nor was it essential for the survival of European agriculture (Federico 2005: 189-190). The estimates of the nominal rate of assistance for several western European countries show that the support received by the farmers was very low until the First World War and only grew substantially in the 1930s (Swineen 2002).

Until the 1930s, direct public intervention in agriculture was very low, although at the end of the nineteenth century there were some cases that went against the *laissez-faire* policy, such as the federal intervention in the United States to control animal health, mainly through the creation of the Bureau of Animal Industry in 1884. This organisation exerted substantial influence and its actions to eradicate the principal diseases which decimated the livestock population of this country had considerable success (Olmstead and Rhode 2015). Other interventions were also carried out in the 1930s that sought to prevent price reductions. The interventionist policies became enormously far-reaching in the 1930s as a consequence of the Depression. The most paradigmatic case is that of the United States and the passing of the Agricultural Adjustment Act of 1933 which, undoubtedly, marked a divide in the scale of public intervention in agriculture and had an enormous influence in future policies both in the United States and in other developed countries (Libecap 1998). On the other hand, the fixing of minimum prices for the purchase of produce from farmers required the restriction of this production and, therefore, implied a profound intervention which completely distorted the functioning of the agricultural product market in the United States. We cannot find policies in any other countries with such a high capacity to limit the role of the market in agriculture. However,

regulatory policies also began to be extended, normally on a sectoral basis, as in the case of the regulation of wine production in France (Chevet *et al.* 2018).

The Second World War and the needs that it created for the warring parties increased government intervention in agriculture and in many countries the regulatory measures of production, consumption or prices were extended. These precedents are fundamental for understanding the policies that were designed after 1945, as the tendency to intervene persisted (Federico, 2012b and 2017).

The North American policy implemented in 1933 was to have profound consequences for the functioning of the international market of agricultural products. Its objective in 1933 was to raise the purchasing power of most agricultural products to their 1909-1914 parity ratios (Olmstead and Rhode 2000). The farm income problem, that is to say that gains in agricultural efficiency and output were not matched by a comparable advance in farm incomes, was soon perceived as structural rather than temporary and intervention measures were implemented in order to raise and stabilise agricultural income (González *et al.* 2016). Policy developments in the rich countries over the period following World War II tended to ignore the supply side and were mainly focused on raising farm returns through price support. One paradoxical outcome of those policies was the stimulation of production, thus aggravating the problem of surpluses (Johnson 1987). The farm problem and the notion of an equitable income for those engaged in agriculture were at the heart of most policy statements in post-war industrialised countries. However, agricultural policy was also driven by other considerations. As Johnson has pointed out, these included national self-sufficiency or autarky for food, reducing balance of payment difficulties, and benefits to consumers in the form of an assured source of supply and stable prices. However, as food shortages disappeared, price support was maintained and even reinforced, thus revealing that the objective of sustaining higher incomes in agriculture was the major driving force behind policymaking. Of course, national farm policies strongly reflected the private and public interests underlying their national political economy systems. In the case of the U.S., there is no doubt that post-war agricultural policy was deeply influenced by the farm lobby. These policies which were traditionally justified as welfare policies for farm households have been questioned in some cliometric studies. Spoerer (2015) has calculated that their combined benefits gave much more benefits to European agriculture than any welfare policy could have achieved. Rent-seeking behaviour by agricultural lobbies emerged as a fundamental determinant of these policies.

This orientation of agricultural policy had significant consequences for trade. International agricultural trade after WWII was, therefore, greatly distorted by trade policies that were an adjunct of domestic farm policies. Intervention was widespread among industrialised countries and was actually permitted by the set of international rules regulating trade. On the one hand, agricultural trade was severely restricted by import control measures, but on the other hand it was actually expanded by the use of export subsidies and restitutions. The disarray in world agriculture was visibly significant because of the distortions in prices and trade, the large cost imposed upon taxpayers and

consumers, the uneconomic expansion of farm output in the industrial countries and the associated effects upon the developing countries (Tyres and Anderson 1992). In the GATT, which was the principal mechanism for reducing tariffs in the second half of the twentieth century, special rules were applied to agricultural trade and agricultural protectionism was largely untouched. The GATT rules were adapted to the agricultural policies of the developed countries, particularly the United States. This meant that, in the European integration process, it was not necessary to adapt agricultural policy to the international trade rules.

Therefore, we can say that countries tended to go from taxing to subsidising agriculture depending on other sectors and the course of their economic development. Lindert (1991) identified the existence of two clear patterns. While developed countries tended to protect their agricultural sector with protectionist policies and direct intervention in the markets, regulating prices or establishing transfers to farmers (development pattern), developing countries did just the opposite, taxing exportable-good agriculture and protecting import-competing agriculture (anti-trade pattern). This pattern established by Lindert has been confirmed quantitatively with the estimates of the Nominal Rate of Assistance (NRA) (defined as ‘the percentage by which government policies have raised gross returns to producers above what they would be without government intervention, or lowered them, if the NRA is below zero’) conducted by Anderson (2009). The figures are telling: the NRA was positive in weighted average terms in the developed world at least after 1955, the first year for which data are available. Thus, developed countries’ public policies increased farm incomes by 44% in Western Europe, 39% in Japan and 13% in the US in the years 1955-59. In later years, support to farmers grew considerably, especially in Western Europe and Japan. The NRA estimates for European countries show a continuous growth from the beginning of the 1950s until they reached very high values after the implementation of the Common Agricultural Policy (Swineen 2002). Furthermore, the pattern identified by Lindert has been verified econometrically as there is a quadratic relationship between the NRA and per capita GDP, whereby for low levels of income the increase in them reduces the NRA (developing countries) while for higher levels the NRA increases (Anderson *et al.* 2010: 65-67). During these years in developed countries, electoral regimes and coalition governments also influenced agricultural policies. The adoption of proportional representation in Europe is related to heavier support for farmers (Fernández 2016: 117). In developing countries, however, the pattern after WWII was the direct or indirect taxation of farmers due to the implementation of import-substituting industrialisation strategies which led to the over-valuation of their currencies. The consequence was the depression of price incentives so that their farmers turned towards export markets (Anderson 2009).

3.5.- Agrarian institutional change

The analysis of institutional change has been at the heart of the research of economic historians in recent decades, undoubtedly driven by the theoretical and

empirical development proposed by Douglas North (1991 and 1999). The agricultural institutions have experienced extensive transformations over the last two centuries. Even when the discussion addresses how much the institutional change has contributed to the increase in production, there is broad consensus regarding the significance of this. The configuration of a market economy in which the economic agents respond to the price signals is decisive in explaining not only the growth in agricultural output in Europe and other countries colonised by the Europeans since the beginning of the nineteenth century, but also for understanding the processes of technological change which enabled a substantial increase in productivity.

3.6.- Property rights, agrarian contracts and labour

In the case of agriculture, the redefinition of property rights over the land and the transformations in the agricultural contracts was highly important (Federico, 2014). From the eighteenth century and throughout the nineteenth century, the majority of European societies considerably modified an institutional framework in which the property rights over land were not clearly defined or were shared and frequently limited the capacity of landowners to act. The long shadow cast by the seigniorial rights still extended across many European countries. Therefore, one of the primary objectives of the liberal revolutions, beginning with France, was the establishment of an institutional framework characteristic of a market economy. In the case of land, this implied ending the partitioning of rights where this system still existed and ensuring the capacity of owners to freely dispose of their land and act according to their interests, with clarity regarding their ownership rights. In the catholic European countries, disentailment processes were carried out which undermined the rights of the Church over the land. This meant that large areas of land were placed on the market.

The agricultural contracts have also changed over the last two centuries, displaying an enormous spatial variability. Without a doubt, the types of contract that exist are endogenous to each society and the cliometric researchers have sought to explain them accordingly. It is well known that the establishment of market-economy style institutions did not imply that agriculture would thereafter be organised principally through large companies using salaried workers. On the contrary, the family farms not only survived but they became the dominant form of organising agricultural production. Even so, the organisational forms were varied and coexisted alongside one another, frequently benefiting from coexistence advantages. Large farms that used salaried work coexisted with family-run farms where the land was either owned or leased. In other continents, particularly in Africa and Asia, the plantations, usually owned by European colonists who employed local labour, gained considerable weight. However, after decolonisation they began to lose significance, being replaced with mainly small family farms due to the combination of their inherent efficiency, a more level playing field in terms of policy support and institutional innovations to coordinate their production (Byerlee and Viswanathan 2018: 111).

The study of lease contracts has attracted much attention, particularly sharecropping. Decades ago this was seen as feudal survival and a type of inefficient contract. However, the cliometric researchers understand them as a perfectly rational concept adapting to the circumstances and characteristics of the countries where they prevailed, such as the crop mix, the social environment or the characteristics of the agents involved (Carmona and Simpson 2012; Garrido 2017). In short, agriculture has special characteristics derived from the difficulties of obtaining perfect information, the risks assumed, the supervision costs and, in general, the transaction costs (Federico 2006). In this way, the choice of contract and their various types have been explored in different cliometric studies. In their study on the variety of contracts—wage payment, crop sharing, and land rental—, in the south of the United States, Alston and Higgs (1982) concluded that their variations over time and space, depended on the relative resource endowments of the contracting parties, the prevailing risk conditions and the transactions costs of alternative contractual arrangements. Federico (2006) highlights that the total share of tenanted land, under both sharecropping and fixed-rent contracts, followed a significantly declining trend, due to the combined outcome of economic motivations, institutional changes and specific policies, such as the agricultural reforms implemented in the twentieth century. In Western Europe, this fall was particularly important, most of all during the second half of the twentieth century (Swineen 2002).

The case of Spain also shows how the number of landless workers decreased as a result of the falling ratio between land prices and rural wages, which made plots of land cheaper for landless workers to rent and buy; and structural change that drained the rural population from the countryside (Carmona and Rosés 2012; Carmona, Rosés and Simpson 2018). This process did not work that well in Southern Spain where landless labourers continued to constitute a significant part of the agricultural population (Robledo and González Esteban 2017).

In short, the modernisation of agriculture, with changes in technology, the prices of factors of production or the products themselves could have also contributed to the disappearance of sharecropping contracts which had prevailed for a long time.

Considerable social conflict surrounded the agricultural contracts and the existing pattern of landownership. In some countries, criticism of the existence of large properties or the tenants asserting their rights to be owners generated serious social conflicts. During the inter-war period and after WWII, agricultural reforms were implemented in different continents, which transferred the ownership of the land from large landowners to small farmers, landless workers or tenants (Federico 2005: 149-151). Some had a significant impact due to the volume of land transferred such as in Mexico during the 1930s or in Japan between 1947 and 1950, when almost 40% of the land changed hands (Hayami and Yamada 1991). However, the most important land ownership transfer processes were the collectivisations which took place in the Soviet Union, the Eastern European countries after 1945 and China after the communist party came to power. The collectivisation of Soviet agriculture was the first that was carried out and served as a model for the other cases to follow. Justified by the Soviet leaders as inevitable due to the recurring

procurement crises during the years of the New Economic Policy (NEP), Gregory and Mokhtari (1993) reveal that they were really caused by state pricing policy. The accelerated industrialisation as a major economic objective was another justification of this collectivisation process, although in reality its contribution to economic growth was very small and could have been achieved under the NEP framework (Allen 2003 a).

Another fundamental aspect in the institutional change in agriculture was the elimination of coercive ways of providing work. In Eastern Europe, serfdom still existed in the nineteenth century and was eliminated over the course of that century (Federico 2014). In Imperial Russia this abolition produced substantial increases in agricultural productivity, industrial growth and peasant's living standards (Markevich and Zhuravskaya 2018). Outside of Europe, slavery was commonplace in many regions where it was also eliminated throughout the nineteenth century. The United States is not only the best case study but was one of the favourite subjects for the early cliometric researchers, as indicated in the recent study of Olmstead and Rhode (2018). One of the foundation studies of cliometrics, that of Conrad and Meyer (1958), breaking with paradigms which were, until then, firmly established, highlighted that the economy of the plantations in southern USA based on slave labour was a profitable activity. The investment in slaves provided returns that were comparable or higher than the alternative investments (Fogel and Engerman 1974; Yasuba 1961). Other studies reveal that there was no economic reason that could have led to the disappearance of slavery in the south (Sutch 1965), although the growth perspectives of the economy of this region based on this system were not promising due to their incapacity to foster innovation and economic diversification (Wright 2006).

3.7.- Agricultural cooperatives

The emergence and development of the agricultural cooperatives from the end of the nineteenth century was a relevant phenomenon in the agricultural sectors of western countries. It involved the practice of different activities collectively, such as the purchase of agricultural inputs when certain innovations were launched on the market, such as fertilizers or machinery, the financing of farmers, providing them with credit, the processing of some products or their marketing and distribution. These new forms of cooperation sought to improve the competitive possibilities of the farmers in response to the technological change or the problems derived from the agricultural depression at the turn of the century. In this way, family-run farms sought to better adapt to the new economic conditions arising at the end of the nineteenth century.

The reasons for the highly unequal degree of success enjoyed by the cooperation in these diverse tasks or in different products have aroused much attention from the cliometric researchers who have attempted to propose econometric models that can explain the wide variety of results in the expansion of cooperativism. Some studies have identified the pre-existing social capital as the key to explaining this unequal diffusion of the agricultural cooperatives (Fernández 2014; Guinnane 2001; Henriksen 1999).

Therefore, the trust between farmers emerged as a decisive factor for understanding these differences, with a whole variety of factors that could determine it. The existence of networks that allow for social interaction may also have been favoured by the existing common lands and irrigation communities, such as in Spain, providing the social networks that facilitated the building of mutual trust (Beltrán Tapia 2012). The existence of this previous social capital is not a guarantee, however, that cooperatives necessarily emerged, as other factors could prevent this (Garrido 2014; Henriksen *et al.* 2015). Furthermore, other factors were also essential for the diffusion of the cooperatives such as the existing institutional framework, the predominance of small and medium-sized family farms, the existence of well-trained human capital, the density of production or the specialisation in products which could be sold in the national or international markets (Henriksen *et al.* 2012).

The characteristics of the products were also important for the spread of cooperatives. They were much more important in the production and marketing of butter in the north of Europe than in that of wine in the south. Fernández and Simpson (2017) explain this contrast by pointing out that while in some products cooperative production could improve product quality and competitiveness in high-value markets, wine cooperatives produced mostly low-quality wine due to environmental conditions and measurement problems. However, specialising in a certain type of production did not guarantee the success of cooperativism. The successful Danish case in butter production contrasts with the poor results in Ireland (Ó Gráda 1977), due to the existence of a serious social and political conflict on the island which generated distrust between the potential partners of the cooperatives in contrast with the religious and cultural homogeneity of Denmark (O'Rourke 2007).

3.8.- The privatisation of the common lands

Finally, to conclude this section, we will analyse the advances made in the understanding of the role played by the common lands in economic development. In the early cliometric studies, the privatisation of the communal regime was a precondition to foster economic growth (McCloskey 1975; North and Thomas 1978). It was considered that private property rights were essential for stimulating innovation and investment, and therefore generating growth. They also indicate that an inevitable consequence of the existence of common property regimes was resource overexploitation. However, since the 1980s, the essential points of these arguments have been thoroughly revised. First, it has been indicated that common property regimes can be efficient and sustainable, which, in turn, has led to the reassessment of the possible role that they have played in economic development (Allen 1982 and 1992; Clark 1998; Van Zanden 1999; De Moor *et al.* 2002 and 2009; Ostrom 1990 and 2005).

As a result, the link established between the enclosures and the British agricultural revolution has also been questioned. Allen (1992, 1999, 2003b) reveals that before the Parliamentary enclosures began, the agricultural revolution was already underway and

agricultural productivity growth had also taken place on open fields. Allen also notes that the privatisation of the common lands also deprived the lower rural classes of their rights of access, which, in many cases, gave rise to the worsening of the standards of living, forcing them to migrate to the towns (Humphries 1990). It is also important to highlight how this series of more recent studies has emphasised the fact that the commons were not open-access resources. They were regulated by local communities by way of a series of formal and informal rules that guaranteed their sustainability (Allen 2001: 4; De Moor 2009: 4–10; Beltrán Tapia 2016).

The case of the privatisation of the common lands in Spain has been used to highlight that this process did not promote the growth of agricultural productivity. In contrast, it is associated with deteriorated living standards of the poorest segment of the rural population, such as the case of Great Britain, lower educational attainments due to the limited capacity of town councils to finance primary education and deteriorated social capital (Beltrán Tapia 2016).

4.- Conclusion

The emergence of cliometrics in economic history revolutionised this discipline (Hauptert 2015). From the beginning of the new economic history, research in agriculture was not alien to this new methodological perspective which provides many possibilities for analysing the agricultural sector of the past. Although this rupture with the traditional methods used by agricultural history emerged in the United States, its spread to other continents, particularly Europe, has been enormously important, most of all from the 1990s. Today a large number of economic historians base their research on economic theoretical foundations and use econometric methodology. The organisation of three international conferences over the last decade to discuss the progress made in this field could have helped to consolidate it. Agricliometrics is, therefore, a growing field of study.

Cliometric economic historians have addressed an enormous variety of topics in the study of agricultural history, but they have concentrated a good part of their efforts on the main subjects. The study of the evolution of agricultural production and the role played by the increased productivity in its growth constitute one of the priorities which also implies the analysis of the technological change and its drivers. The studies carried out highlight the different speeds in the growth rates of production over the last two centuries and their regional differences. Furthermore, the increasing role, particularly after the Second World War, of the gains in productivity in the increase in production is evident. With respect to the technological change, the complexity of its analysis has revealed the difficulty in explaining it in the case of agriculture due to its specific characteristics.

The relevance of the two waves of globalisation and their effects on the economies of the different countries enables us to understand the interest generated by the analysis of agricultural trade and the articulation and development processes of the agricultural product and food markets. Agricultural products played a key role in the first wave of

globalisation, and the analysis focuses on the integration processes of the different product markets and the drivers of these processes. In the second globalisation, although agricultural trade grew even more quickly, its relative weight with respect to total trade fell sharply due to the low elasticity of demand for agricultural products, the diminished importance of its intra-industrial trade, the lower degree of differentiation of its products and the high level of protectionism, which contrasts with the strong liberalisation experienced by manufactured products.

The growing role of public intervention from the 1930s had oriented many studies towards the study of the government both in relation to the trade policies adopted and the agricultural policies followed. The trade policies were relaxed until the end of the nineteenth century and the grain invasion experienced by Europe and consequently protectionism was increased. However, it was the 1930s depression which caused the first globalisation to collapse and had a profound effect on international agricultural trade. The high levels of protectionism were maintained during the decades following the Second World War and only at the end of the twentieth century were tentative attempts made to liberalise it.

Finally, the analysis of the different agricultural institutions, such as ownership, the agricultural contracts, the privatisation of the common lands or the cooperatives has also constituted a fertile field for cliometric research, showing the importance of institutional change and the reasons explaining the continuity or modification of certain agricultural contracts, and the unequal growth of agricultural cooperatives.

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