

Agriculture and the Market in Northern Italy (XVIII century): the Papal States and the Republic of Venice

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Introduction and state of the art

The paper aims at analysing the interaction between market dynamics and agriculture in Eighteenth century Northern Italy, with a particular focus on the area of Bologna (Papal States) and Padua (Republic of Venice). Using a micro-economic historical approach, it will show how productive choices, products destination, investments in agriculture, in various ecological, economic, social, and institutional contexts, were affected by market characteristics – such as demand trends, labour supply, market integration, agricultural prices. After a short state of the art and an introduction describing the characteristics of the case studies and their comparative potential, a statistical analysis using the data collected in the archives of landowners will show which variables related to the characterization of the market are correlated with the productive and distributive choices of the most important families of landowners of the period in the two provinces. This kind of analysis allows at evaluating the responsiveness of the agricultural sector (or, at least, of a part of it) to the changes in market variables. The correlations underlined by the statistical regressions will be interpreted, according to the contexts in which the case studies are located. It is important to underline that the data collected in the archives of landowners will not allow the creation of macro-economic models, in terms of relationship between specific agricultural structures and market ones:ⁱ however, they are very useful in order to observe the «microeconomic roots»ⁱⁱ of these macro-processes, analysing in which ways and to what extent, in specific contexts different economic actors interacted with the market and, in a certain way, also how the market itself was modified by this interaction.

As a huge amount of literature underlines, the point is crucial because of the importance of market dynamics in stimulating agricultural growth and the broader economic development of specific areas. However, the same studies rarelyⁱⁱⁱ observed the (crucial) way and the timing of the interaction of the landowners with market characteristics and changes. In other words, it lacks an observation exactly of the process thanks to which market dynamics stimulate (or not) agricultural growth. On the one hand existing literature that refers to the relationship between the agricultural production and the market in the various areas of Europe often lack the quantitative element, proposing ample overviews for specific countries, regions, or types of land management (sharecropping, leasing of large estates, and so on) with more or less vague references to “market-oriented productions”, “modern” or “proto-capitalists” estates and contracts, or similar descriptions that in most cases aimed at including regional or national cases in the large theories such as the Great and

Little Divergence ones,^{iv} or at determining the timing of a supposed “Agricultural revolution”, comparing then the regional cases with the English one. For France this is particularly true,^v but there are many examples of this kind of studies, at least from the mid of the last century, also in Spain^{vi} or Italy^{vii}.

On the other hand, if we move to the general studies that still dealing in a certain way with the relationship between agriculture and the market adopt a strong quantitative approach^{viii}, we find numerous series of data referred to production, productivity, prices (often used as a “symptom” of production trends) or estimations of the amount of products that reached the market in specific areas, but maintaining these elements separate, without considering the data related to the market. Finally, these studies adopt a macro-economic perspective that, if allows the creation of general pictures, neglects the behaviours of the economic players within it.

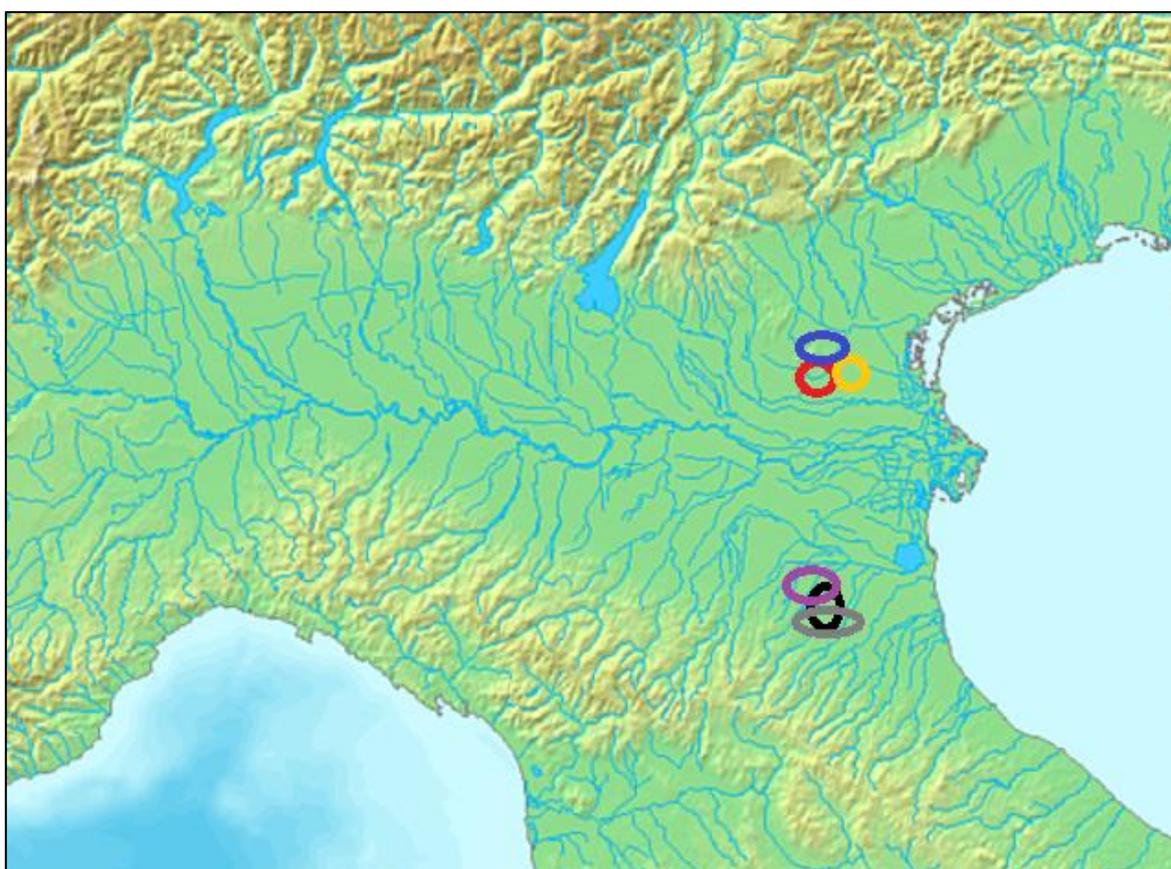
Certainly, some researches also narrow the focus on the functioning of specific rural estates^{ix} (and, therefore, adopt a micro-economic approach), but they mainly focus on some (at best) of the elements that characterize the agricultural production (the level of production, or the productive choices, or the destination of production, and so on), with no attention to the relationship between all these elements and the data series referred to the changes in market conditions. This kind of micro-economic approach, based on the accounting of farms, families, and charitable institutions, was highly recommended already in the eighties of the last century by Giovanni Federico,^x but it is undeniable that the studies that dealt with these topics after almost forty years lacked this kind of approach. On the contrary, its validity is demonstrated in the following pages.

The case studies: between sharecroppers and tenants

The regressions proposed in the section two of the paper rely on a huge amount of data collected in the family archives of Bolognese and Paduan noble families: besides the use of some accounting registers of specific farms, the main sources are the *libri mastri* (ledgers) that contain all the incomes and the expenditures, both related to rural properties and to urban ones, together with the payment of urban and rural workers and the payments for the board of the employees and of the members of the family. Even if farms' accounting books have often been seen as the most relevant source for the reconstruction of agricultural dynamics (listing data on agricultural production, investments, and so on), family ledgers have even a higher potential: indeed, not only they refer to the products stored in rural granaries, the amounts seeded, the investments in buildings or channels, and to the management of agricultural production (self-consumption or marketing) in the families' rural estates, as the farms' accounting books do. The *libri mastri* also display the amounts of products that reached the urban granaries, showing how much grapes were transformed into wine in the city, how much flour was produced from wheat, and, most importantly, the amounts of these products consumed by the family or sold to urban merchants, bakers, or given to urban workers as part of their salary. In other words, they allow to follow the *entire* supply chain of the *entire* agricultural production, giving a complete image of the investments and of the productive and distributive choices of the landowners. As

explained in the introduction, the paper aims at observing how these choices were related to market characteristics and changes in the Eighteenth century. The chronology of the research is due especially to the relevant modifications in public regulation of the grain market^{xi} and to the fact that it is exactly the period in which in some areas – such as England – relevant changes happened in the agrarian sector, leading to the so-called “Agrarian revolution”. Therefore, it is an appropriate period in which observing the behaviour of landlords in front of varying market circumstances. More, as shown in **Fig. 1**, the data refer to noble estates located in the provinces of Padua (Republic of Venice) and Bologna (Papal States), where very different agrarian structures were at play.

Fig. 1 – The case studies



Legend: Frigimelica (red); Obizzi (blu); Selvatico (yellow) / Amorini-Bolognini (black); Boschi (grey); Scappi-Ariosti (purple)

In the case of Padua, the data collected refer to the Selvatico family for the period 1700-1789 (incomplete for the period 1770-1782), to the Obizzi family (1720-1743, 1758, 1780-1783), and, even if for a very short period, to the Frigimelica family (1769-1773)^{xii}. All these families concentrated their properties in the southern part of the province of Padua, close to the Euganean Hills, where they also owned sumptuous manors^{xiii}. The accounting books clearly show the main way of land management: just to give an idea, among

the 50 acres of cultivable land that we were able to trace that the Frigimelica leased out in the period 1769-1773, the larger plot reached 3.5 acres, the smaller 0.04 acres, and the average size was 1 acre. In the period 1755-1769 the Selvatico family rented out 465,35 acres, the larger estate was 9.4 acres, the smaller 0.08 acres, and the average size was 1.5 acres. The Selvatico also cultivated some of their properties directly, using wage workers, but just 2 acres. Finally, in 1728-1729 the Obizzi family rented out 194 acres of land: the larger plot was almost 15 acres, the smaller 0.24 acres and the average size was 3.4 acres. Therefore, the size of the estates rented out by the three Paduan families varies: the Obizzi leased the larger properties, but the common trait for all the three families was the medium-small leasing to peasants' families. Indeed, if we consider that 12 acres was the suitable dimension for the self-cultivation by a family of 5/6 members, it is undeniable that the agrarian structure in the province of Padua was far from the "agrarian capitalism" that characterized other areas of Northern Italy – such as the Austrian Lombardy, where leased estates exceeded 247 acres and reached even 500-750 acres^{xiv}. The landowners collected their rents in cash and partly in kinds: chickens, cheese and, mainly, wheat. If the very small amounts of livestock products were used for the family feeding, wheat was the most important part of the rents (even higher than the in-cash one) and was almost entirely sold by the landowners.

In the area of Bologna the picture was completely different: the sharecropping (*mezzadria*) was predominant^{xv}, and this means very different agrarian structures in terms of dimensions of the plots, agricultural production, and characterization of the revenues of the landowners. Even if in some areas of Southern Italy the sharecropping plots reached even the 240 acres (the so-called "sharecropping latifundium")^{xvi}, in North-Eastern Italy the farms that allowed the survival of the *mezzadri* measured around 37-50 acres^{xvii}. In this area, the so-called "traditional sharecropping" entailed that, very briefly, the agricultural production was divided on equal terms between the sharecroppers and the landowners, such as the expenses for the seeds, the livestock and, broadly, the maintenance of fields, channels, and buildings. This means that the landowners stored in their granaries (and then distributed between self-consumption and the market) a far more diversified range of products than their Paduan counterpart: wheat certainly was also in this case the most important agricultural product both in terms of amounts produced and economic value. However, wheat was flanked by relevant amount of "minor cereals", in the Eighteenth century especially maize^{xviii}, but also by more lucrative products, such as grapes and wine, the *folicelli* (silk cocoons) and hemp. While the minor cereals were employed for the feeding of chickens and pigeons, maize and wine was re-sold to the sharecroppers themselves or used for the payment of rural day labourers. Hemp, on the contrary, reached the urban market or was sold to foreign merchants (especially Venetian ones), producing relevant earnings for the landowners^{xix}. The differences in the characterization of the two case studies means that also the variable used in the statistical regressions varied: while in the Paduan case just the production and distribution of wheat has been traced, being almost the only relevant agrarian product collected by the landowners, in the case of Bologna data on both the supply chain of wheat, grapes, wine, and hemp have been collected, given that these products composed almost entirely the landlords' earnings. Similarly, in the Paduan case just the investments in buildings were reported in the accounting books, given that the

maintenance of the fields or, broadly, the investments needed for the improvement of the cultivations (such as fertilizing) were up to the tenants. On the contrary, in the Bolognese “traditional sharecropping” the landowners participated in the investments in plantations, fertilizers, and in the construction and maintenance of buildings and channels, besides the relevant investments needed for the cultivation of the hemp and its macerating structures. In the Bolognese case the analysis relies on the data collected in the accounting books of the Amorini-Bolognini family (1713-1800), of the Boschi family (1734-1800), and of the Scappi-Ariosti family (1723-1765)^{xx}. As in the Paduan case, the three families shared common traits in the characteristics of their properties and in the way they managed them. In 1789 the Amorini-Bolognini owned around 1500 acres of land, located close to the city of Bologna, in the area with the «highest productivity for the cultivation of wheat and hemp»^{xxi}; the farms of Saletto-Rubizzano and Viadagola, owned by the Scappi-Ariosti family shared similar traits in terms of location, organization and outputs, but were smaller than the Amorini-Bolognini's ones, measuring around 1050 acres^{xxii}. We do not have information about the dimensions of the rural estates of the Boschi family, but they certainly share with the Amorini-Bolognini's and Scappi-Ariosti's ones the geography, the productive structures and, given the size of the harvests, probably also the extension.

The similarities in the ways the families managed their properties both in the Paduan case and in the Bolognese one, mean that the statistical analysis referred to each family will be flanked by regressions based on the average of the values obtained from the families' ledges, respectively, in Padua and Bologna.

Agriculture and the market: a statistical analysis

The observation of the correlation between the evolution of market characteristics and the investments, and the productive and distributive choices of the landowners means a preliminary clarification of which kinds of data will be included in these categories. In general terms, market characteristics can be summarized as follows:

- the trend of the demand and its changes in characterization, given that the increase in population^{xxiii} or the growing embedding in manufacturing activities could lead to an increasing market-orientation of agricultural production^{xxiv};
- the trend of prices. In other words, we will observe the level of elasticity of the production^{xxv}, but also the effects of the prices in the distributive choices of the producers^{xxvi};
- the changes in labour supply and cost, given that especially the amount of labour provided in labour-intensive contexts, such as the pre-industrial one, could relevantly affect the level of production of the agrarian sector^{xxvii}. Knowing the population trends^{xxviii} and the wage levels in agriculture^{xxix} it will be possible to observe how these elements affected the production-side but also the investments in agriculture, being especially the wage level at the same time a potential constraint in spending money for improvements in the fields and, on the contrary, a stimulus for the modernization of the cultivating techniques in order to reduce the cost of the manpower.^{xxx}

Besides these data on market characteristics, the statistical analysis will also include information about the earnings of the families involved, given the potential importance also of money availability in making the investments in agriculture possible.

About the production-side, data will refer to the choices about what and how much produce. Besides the decision about investments in livestock or crops^{xxxii}, the changes in the demand, in prices and, broadly, in market conditions, could lead to precise choices by the landowners about what to be seed in their farms or plots. More, the choices include also how much of the land allocate to one crop or to another one or, in the case of lease, which products to be included in the rent. Data will refer also to the level of investments in fixed and circulating capital^{xxxiii}. The formers include the land purchase^{xxxiv} and improvements, such as canals, plantations, land reclamations^{xxxv}, agricultural buildings (i.e. granaries, stables, but also houses and structures for the sharecroppers/tenants), livestock and agricultural tools and machines. The latter include fertilizers, seeds, salaries and, broadly, the sums employed for the maintenance and cultivation of the lands.^{xxxvi} As anticipated, just in the Bolognese case study I have been able to collect data referring both to the investments in fertilizers, buildings, plantations, and channels, while in the Paduan case just the investments in buildings were available. Besides the production side, I will also observe the related distribution side of the problem, analysing data on the end use of agricultural production. According to variable market conditions, how much of the products were aimed to self-consumption and how much reached the market? Given the importance of “commercialisation” of the agricultural sector in the processes of economic development, the question is crucial. I will therefore analyse how much of the production provided for the needs of the family and of the farm, and how much was sold on the local, regional, and international markets or used for exchanges or remunerations in kinds^{xxxvii}. Data has been elaborated using heteroskedasticity-autocorrelation (HAC) robust tests, constructed using the Bartlett kernel. Regressions have been first conducted for each Bolognese and Paduan family, according to the data availability and the validity of the models using specific variables. Therefore in some models not all the variables have been used – but these are few exceptions – because they produced a strong reduction of the adjusted r-squared, indicating that they were not correlated at all with the dependent variable: this was the case, for example, of the data on wage levels, that in the Paduan case have not been used exactly for this reason, while in the Bolognese case seem to be quite relevant in defining both the investments and the production. Some final clarifications: besides market characteristics, regressions that refer to the production-side also include data on the previous harvest in the case of wheat, as a proxy for seeds availability and use, and in the case of wine because of the potential importance of the carry-over in defining the number of grapes that were transformed into wine. About the use of the previous wheat harvest as a proxy for the investments in seeding, the choice is validated by the analysis of the data about the amounts seeded by the family Scappi-Ariosti in the period 1727-1766 in Saletto and Rubizzano.^{xxxviii} The trend of seeding is flatter than the one related to the amounts of wheat produced, because of the natural “capacity” of seeds that a specific plot can receive, but the correlation index between the two series is 0.5, indicating a relevant positive correlation. This means, mainly, that amounts seeded diminish understandably when the harvest is particularly scarce. Therefore, we must keep in

mind that the use of the production as a proxy of seeding is certainly indicative, but effective. Finally, data of temperatures and rainfall have been also included, given their potential importance in defining the outcomes of the harvests. This allows to observe if natural variables were more or less important in affecting agricultural production than productive choices of the landowners. Data on temperatures are available for Bologna from 1712 onward,^{xxxvii} and they have been used as a proxy for the temperatures' trend in North-Eastern Italy (therefore, for Padua too). Temperatures' time spans have been chosen according to the vegetative cycle of each product, given that excessively high or low temperatures both during the seeding, the growing or the harvest of the crops can compromise the yields. Briefly, temperatures in the period March-April and May-July have been identified as the more critical for hemp, November-January for wheat, and November-January and June-August for grapes. Data on rainfall, are not so easy to generalize, given the stronger localized character of the precipitations compared to temperatures, therefore I used just the data registered in Padua for the Paduan case studies.^{xxxviii} As for the temperatures, in the case of rainfall too I identified the most critical periods for wheat production: therefore, besides the yearly rainfall, I used the data referred to the periods March-May (growth and maturation) and July-August (post-harvest).

Given that there were similarities in the results of the tests referred to specific families, other tests have been conducted using as variables the average of prices, investments, production, and products distribution of, respectively, the Bolognese and the Paduan families.

Tab. 1 – Regressions – Padua (wheat) - Families

	Investments in buildings	Production	Self-consumption	Market
Price	** - N - N		N - N	N - ** - N
Previous year price		N - *		
Available in the granary			*** - *	N - *** - ***
Previous year availability		N - ***	** - N	N - *
Incomes	** - * - **			
Previous year incomes	** - N - N			
Temperatures Nov-Jan		N - N		
Population		** - **	N - N	N - ** - **
Self-consumption				N - N
Market			* - *	
Yearly rainfall		N - **		

Mar-Apr-May rainfall		N - *		
Jul-Aug rainfall		** - N		
Investments		N- N		
<i>Observations</i>	5 - 7 - 38	20 - 38	19 - 30	5 - 20 - 30
<i>Adjusted R-Squared</i>	0,99 - 0,68 - 0,08	0,2 - 0,74	0,23 - 0,28	0,15 - 0,47 - 0,56

Legend: Frigimelica - Obizzi – Selvatico / * p-value<0.1, ** p-value<0.05, *** p-value<0.001, N = No correlation

In the case of Padua, as anticipated, wages trend did not affect neither investments nor the wheat production: the reason is quite predictable, given that the Paduan families rented out their properties, and therefore their incomes in kinds were not affected by the fluctuations of wages' levels. On the contrary, investments seem to be correlated to the incomes of all three the families (being the availability of money a significant constrain for investments), but also in some cases the price of wheat, being a stimulus for the improvement of the productive structures. Looking to the level of wheat production, the price of wheat has not been included in the analysis, given that it produced a clear and preponderant correlation with production that could be misleading: indeed, it was not the level of production that was affected by price, but vice versa. On the contrary, I included in the analysis the previous year price, that, again, could be a stimulus or a deterrent for the improvement of the farms and for the potential increase of the rents paid in kinds. However, the results of the tests^{xxxix} indicate that the correlation is not so significant, such as the rainfall, the temperatures, and the investments in buildings. More relevant was certainly the population level, that means the availability of workforce for the families' tenants, and the previous year harvest (i.e. the availability of seeds). However, we must consider that, at least theoretically, the amounts of wheat that the various families collected were related to the contractual conditions of the tenants: the amounts should be fixed, at least for specific time spans, and varied only because of the changes in the (very small) amounts produced in the lands managed directly by these families, or of the impossibility to collect the payment in kinds of the rents because of critical harvests. Therefore, the results of the tests should be read through this lens, and a more effective analysis of the elements that affected agricultural production would require data from the tenants' accountancy, data that, however, are not available in case of medium-small leases, like the Paduan one.

Looking to the amounts self-consumed or marketed and to the reasons that affected the choices of the landowners toward the first or the secondo solution is certainly more useful. Before showing the results of the tests it is important to underline that in all three the cases wheat was almost entirely sold or used for payment in kinds: on average, 90% of the production was used for these aims. About what affected the amounts marketed and self-consumed, the latter seem to feel the effects of harvests fluctuations, both in terms of current harvest and of the carry-over (previous year harvest) from the previous year. The same happened, at least partially, for the amounts marketed, even if in this case market characteristics seem to play, understandably, a more relevant role: for example the quantity of wheat marketed by the Obizzi family, that seems to be more involved in market dynamics given also the size of the properties rented out, was

correlated with the price trends, but especially the trend in the demand (population) affected both Obizzi's and Selvatico's distribution choices.

In summary, in the Paduan case the regressions suggest that "natural" constraints were more relevant than market dynamics in defining the productive and distributive choices: investments were strongly correlated to the availability of money (in turn, related, at least partially, to the result of the previous harvest) besides the trend in wheat price, while the amounts self-consumed and marketed too depended on how much wheat was collected every year, besides how much remained in the granary from the previous harvest. Besides this general statement, especially in the case of the Obizzi family the "classic" market variables played their role in the definition of the products self-consumed or marketed: indeed, wheat price and, especially, the demand trend weighted on distributive choices of the Paduan landowners.

Tab. 2 – Regressions – Padua (wheat) - Average

	Investments in buildings	Production	Self-consumption	Market
Price	***		N	N
Previous year price		N		
Available in the granary			*	***
Previous year availability		***	N	N
Incomes	*			
Previous year incomes	N			
Temperatures Nov-Jan		N		
Population		N	N	*
Self-consumption				N
Market			N	
Yearly rainfall		N		
Mar-Apr-May rainfall		N		
Jul-Aug rainfall		N		
Investments		N		
Observations	53	43	48	48
Adjusted R-Squared	0,2	0,3	0,06	0,61

Legend: - * p-value<0.1, ** p-value<0.05, *** p-value<0.001, N = No correlation

Tests using the average data of all three the families (**Tab. 2**) confirm the correlations referred to in the previous pages for the Paduan area: investments affected by the money availability (incomes) of the families

and by the price of the products; production strongly correlated to the amounts seeded (i.e. previous year harvest), self-consumption slightly affected by the variables used in the tests (the adjusted r-squared 0.6 is indicative) and specifically by the availability of products; amounts marketed strongly related to wheat availability and, to a minor extent, to demand trends (population).

Despite the different agricultural structure and range of products collected and self-consumed/marketted, the characterization of the relationship between the Bolognese landlords and the market (**Tabb. 3-7**) was not so different compared to the Paduan ones. First, it is important to underline that, as anticipated, beyond the wide range of products (cereals, meat, dairy products, wood, and so on) that the Bolognese noble families received from their properties, wheat, hemp, and grapes/wine were the most relevant goods, both because of the amounts collected and of the related economic value. The Amorini-Bolognini's incomes originated (on average) for the 36% from wheat, 30% from hemp, 22% from grapes/wine, and only for the 12% from other legumes-cereals. Similarly, but with different proportions, the Boschi family earned 34% of their incomes from wheat, 45% from grapes/wine, 9% from hemp, and, again, 12% from other legumes-cereals. Finally, the Scappi-Ariosti derived their earnings mainly from wheat (34%), grapes/wine (34%), hemp (12%), and 20% from other cereals and legumes. Therefore, even if there are differences in the productive choices, on which we will come back also in the following pages, in all three cases between 80 and 88% of the incomes derived from the trio wheat-hemp-grapes/wine. How (and how much) did are the investments and the productive and distributive choices related to these products correlated to market trends?

Tab. 3 – Regressions – Bologna (investments)

	Investments in buildings	Invest. in fertilizers	Invest. in plantations
Rural wages level	N - ***	*** - N - ***	N
Wheat price	** - N	** - N - **	N
Grapes price	*** - N	N - N - N	N
Wine price	*** - N	N - N - N	N
Hemp price	N - ***	*** - *** - **	N
Incomes	N - ***	* - N - ***	N
Previous year incomes	N - N	N - ** - ***	N
<i>Observations</i>	80 - 42	80 - 42 - 42	80
<i>Adj. R-Squared</i>	0,18 - 0,42	0,29 - 0,28 - 0,58	0,26

Legend: Amorini-Bolognini / **Boschi** / **Scappi-Ariosti** - * p-value<0.1, ** p-value<0.05, *** p-value<0.001, N = No correlation

Starting with the analysis of the investments (**Tab. 3**), we must clarify that complete data for all three the families refer only to the investments in fertilizers, while data on investments in buildings are included only in the ledgers of the Amorini-Bolognini and Scappi-Ariosti, and the ones about plantations in the accounting books of the Amorini-Bolognini. So, the analysis is certainly incomplete, but it offers anyway interesting

information. First, it is interesting to observe that wages level played a more important role compared to the Paduan case: indeed, even if in the Bolognese case the lands were assigned to sharecroppers, wage workers were largely employed, and their cost was shared between the landowners and the sharecroppers (who often were themselves both sharecroppers and wage workers).

Another important point is the greater importance of the investments in fertilizers (mainly guano and manure for hemp's plantations) by the Amorini-Bolognini and the Boschi families, compared to the Scappi-Ariosti: indeed, it is not a coincidence that the formers derived a higher percentage of their incomes from the selling of hemp, compared to the latter.

Tab. 4 – Regressions – Bologna (investments) - Average

	Investments in buildings	Invest. in fertilizers
Rural wages level	N	
Wheat price	**	N
Grapes price	*	N
Wine price	N	N
Hemp price	N	N
Incomes	**	**
Previous year incomes	***	
<i>Observations</i>	73	83
<i>Adj. R-Squared</i>	0,23	0,006

Legend: * p-value<0.1, ** p-value<0.05, *** p-value<0.001, N = No correlation

If we analyse the results of the tests made on the averages obtained from the data of all three the families, it seems that especially incomes and wheat prices played a crucial role in defining the levels of the investments in buildings. About the purchase of fertilizers, the model is quite problematic: rural wages and the previous year income was not included in the analysis because the result was a negative adjusted r-squared, but even using the most adequate variables the result is anyway a very low adjusted r-squared, that means that the model cannot be considered particularly representative. Other variables were probably at play in defining the landowners' choices in this field.

Looking to the production dynamics of the three Bolognese families (**Tab. 5**), we can assume that wheat production was strongly affected by the market trends: the wheat price in the previous year (as in the case of Padua, current year price has been excluded), the population (i.e., consumers but also workforce), and partially wages. Investments and the availability of seeds too played their role too, while temperatures seem not to be relevant. In the case of hemp's and grapes' production too, the population trend seems to be the most relevant: given the strong labour-intensive character of preindustrial agriculture, the variations in the amount of workforce available was clearly crucial especially for these products that require a huge amount of

work for their cultivation. This is confirmed by the role played also by variations in wages' level and in investments – especially fertilizers.

Wine is a separate case, given that its production was strongly conditioned by natural factors (i.e. grapes' harvest) but there was room also for more cautious and market-oriented choices by landowners that take into account the trend in the demand, the needs of the family and the carry-over of the previous years. Therefore, the tests show a strong correlation between wine produced and grapes harvested (the most relevant correlation overall), but also interesting results referred to population trend, to the previous year production and to prices.

Tab. 5– Regressions – Bologna (production)

	Wheat	Grapes	Hemp	Wine
Rural wages	N - *** - N	** - N	*** - N - N	N - N - *
Price				N - N - N
Previous year price	*** - *** - N	N	N - N - ***	N - ** - N
Previous year production	* - *** - N			N - N - *
Grapes production				*** - *** - ***
Temp. Mar-Apr			** - N - N	
Temp. May-Jul			N - N - ***	
Temp. Nov-Jan	N - N - N	N - N - N		
Temp. Jun-Aug		N - N - ***		
Population	** - *** - ***	*** - N - ***	N - *** - ***	N - * - **
Investments in plantations	N	N	N	
Inv. in fertilizers	N - N - ***	** - ** - N	N - *** - N	
Inv. in buildings	*** - N	N - N	N - N	N - N
<i>Observations</i>	75 - 28 - 30	66 - 35 - 43	79 - 33 - 42	80 - 41 - 42
<i>Adj. R-Squared</i>	0,22 - 0,64 - 0,14	0,34 - 0,2 - 0,5	0,52 - 0,68 - 0,44	0,8 - 0,45 - 0,7

Legend: Amorini-Bolognini / **Boschi** / Scappi-Ariosti - * p-value<0.1, ** p-value<0.05, *** p-value<0.001, N = No correlation

Aggregate data (**Tab. 6**) confirm the general characteristics of the relationship between production and the market in the three Bolognese case-studies: wheat production was strongly correlated to seeds availability but also with price dynamics and demographic trends and investments (so, briefly, supply of capital and labour); grapes and hemp prove their being labour-intensive cultivations and, therefore their production is strongly correlated to wage and demographic trends, besides the importance of investments. Finally, aggregate data confirm the market-oriented character of wine production, given the importance of investments, price trends, and of carry-over strategies in defining the productive choice of the landowners.

More, also the “natural” side played a crucial role, given that wine production was strongly correlated to the number of grapes harvested.

Tab. 6– Regressions – Bologna (production) - Average

	Wheat	Grapes	Hemp	Wine
Rural wages	N	***	***	***
Price				N
Previous year price	**	*	N	***
Previous year production	***			***
Grapes production				***
Temp. Mar-Apr			N	
Temp. May-Jul			N	
Temp. Nov-Jan	N	N		
Temp. Jun-Aug		N		
Population	***	***	N	N
Inv. in fertilizers	**	**	N	
Inv. in buildings	***	*	**	***
<i>Observations</i>	73	72	73	73
<i>Adj. R-Squared</i>	0,5	0,7	0,5	0,72

Legend: * p-value<0.1, ** p-value<0.05, *** p-value<0.001, N = No correlation

If the tests on investments and production trends suggest relevant considerations, but also show important dissimilarities between the various families, the regressions on the amount self-consumed (**Tab. 7**) and marketed (**Tab. 8**) besides showing a distinct connection with the local agrarian structures are quite clearer and more uniform, as we will observe also in the tests using the average data,

Tab. 7 – Regressions – Bologna (self-consumption)

	Wheat	Grapes	Wine
Price	N – N – N	N – N – N	N – ** – N
Production	N – N – N	*** – *** – ***	** – N – N
Population	N – N – N	* – N – ***	N – *** – ***
Amounts marketed	* – N – N	** – *** – N	* – * – **
<i>Observations</i>	80 – 40 – 43	81 – 42 – 37	88 – 47 – 43
<i>Adj. R-Squared</i>	0,11 – -0,07 – -0,05	0,75 – 0,85 – 0,62	0,09 – 0,57 – 0,4

Legend: Amorini-Bolognini / **Boschi** / **Scappi-Ariosti** - * p-value<0.1, ** p-value<0.05, *** p-value<0.001, N = No correlation

Tab. 8 – Regressions – Bologna (amounts marketed)

	Wheat	Hemp	Grapes	Wine
Price	N - * - N	** - N - N	N - N - N	N - N - N
Production	** - N - N	*** - ** - N	*** - *** - *	*** - * - N
Population	*** - N - N -	** - N - N	*** - N - N	N - N - N
Self consumption	** - N - N	N - N - N	* - *** - N	** - *** - **
<i>Osservazioni</i>	80 - 40 - 43	81 - 42 - 43	81 - 42 - 37	88 - 47 - 43
<i>Adj. R-Squared</i>	0,25 - 0,23 - 0,005	0,51 - 0,38 - - 0,07	0,45 - 0,82 - -009	0,24 - 0,42 - 0,08

Legend: Amorini-Bolognini / **Boschi** / **Scappi-Ariosti** - * p-value<0.1, ** p-value<0.05, *** p-value<0.001, N = No correlation

Hemp was entirely sold by the landowners, so it was not included in the tests. Similarly, the self-consumption of wheat was basically related to the (quite stable) food needs of the family and, at least, of the domestic workers, therefore the amounts self-consumed are not particularly correlated to the price trend or the demand one. Modifications can be ascribed to the variations in the amounts sold, but the regressions underline that this happened only in the case of the Amorini-Bolognini and analysing the averaged data. The quite low adjusted r-squared testify the inadequacy of the variables used especially for the Boschi and Scappi-Ariosti. The situation changes relevantly observing the amounts of grapes and wine self-consumed: especially wine (but also grapes) was sold or used for the board of urban and rural workers accordingly to the amounts produced every year (**Tab. 8**). Even if it was a fundamental element in urban and rural diets, the self-consumption of the noble families could vary according to the amount produced, marketed, and to the need to use wine, as anticipated, for the board of the workers. Beyond this general assumption, differences between the families testify the specific characterization of their incomes and the resulting relationship with market dynamics: the Amorini-Bolognini for example, that derived just the 22% of their earnings from grapes/wine, were less responsive to changes in prices and demand, but their more limited production was more affected by the trend in grapes harvest; on the contrary, the Boschi family (45% of incomes from grapes/wine) and the Scappi-Ariosti (34%) being more involved in the grapes and, especially, wine markets were more responsive to the changes in demand, and their choices related to the self-consumption of wine were strongly correlated to the amounts of product marketed.

Looking to the amounts marketed, therefore, we can observe a symmetrical situation: the amounts of grapes and wine that were used for the payment of the workers or that were sold were strongly correlated to the amounts self-consumed (being the formers that affected the latters, and not vice versa). More, even if the trend of the demand affected in some cases the marketing of wheat and grapes, it was mainly the level of production that conditioned the amounts marketed: i.e., more than market trends, the investments, the

availability of workforce and, for a limited extent, the changes in temperatures, that affected the marketing of the products.

Moving to the tests made using the averaged values of the three Bolognese families (**Tab. 9; Tab. 10**), the general trends emerge even more clearly: for all the products (except for hemp, that was not self-consumed) there is a strong relationship between amounts self-consumed and marketed. More, the size of the harvests was fundamental in defining both the end-uses of the products, apart from wheat. This cereal seems to escape the explanations related to market trends (price and demand) and to the one linked to the outcomes of the harvest. It is may due to the strong institutional control that involves wheat and its derivatives,^{x1} and that probably had more relevant effects than the demand-supply dynamics. Besides this, hemp, grapes, and wine were undoubtedly the most market-oriented production; even if the amounts produced clearly affected the marketing and the self-consumption of these goods, trends in prices and in demand (population) played a fundamental role too.

Tab. 9 – Regressions – Bologna (self-consumption) - Average

	Wheat	Grapes	Wine
Price	N	N	N
Production	N	**	**
Population	N	N	***
Amounts marketed	***	***	***
<i>Observations</i>	82	81	82
<i>Adj. R-Squared</i>	0,9	0,87	0,87

Legend: * p-value<0.1, ** p-value<0.05, *** p-value<0.001, N = No correlation

Tab. 10 – Regressions – Bologna (amounts marketed) - Average

	Wheat	Hemp	Grapes	Wine
Price	N	**	N	***
Production	N	***	N	**
Population	N	***	**	N
Self consumption	***		***	***
<i>Osservazioni</i>	82	82	81	82
<i>Adj. R-Squared</i>	0,99	0,21	0,88	0,98

Legend: * p-value<0.1, ** p-value<0.05, *** p-value<0.001, N = No correlation

In the previous pages we observed how specific market trends (prices, demand, wages) and, broadly, the characteristics of the context (temperatures, rainfall, but also the incomes of the landowners) affected in

various ways the behaviours of the noble families in Padua and Bologna, showing differences related to the diverse agrarian structures and even to the peculiar approach of each family in managing their properties and in its relationship with the market. To complete the picture a final observation is needed. In the Eighteenth century market conditions changed, especially with reference to the grain market; increasing liberalization of the commerce within the provinces of the same State and in some cases also abroad should have produced an increase in market accessibility, integration and, broadly, a relevant stimulus in the growth of grain trade and, consequently, of the market-oriented character of agrarian production.^{xli} Focusing on the Italian area, in 1749 in the Papal States there was a removal of the internal barriers for the grain trade, while the same happened in 1740s in the Republic of Venice and in the 1770s in the State of Milan, even if the import and export of foodstuffs always remained subject to the will of the public authorities through the *tratte* (trades) system in the Papal State or through the setting of a limit price that allowed the import or export of the products, such as in the Republic of Venice.^{xlii} Did these relevant changes (increasing integration and liberalization) affect landowners' choices, especially in terms of increase of products aimed to the market? The data collected in Padua and Bologna seems to indicate a negative answer, suggesting that even if landowners' choices were affected by market variables, the geographical scope of these variables remained local, such as the immediate destination of their production. This assertion is based on the fact that observing the marketing of the wheat production, there is certainly not a positive trend across the Eighteenth century, neither it is possible to identify a turning point toward more market-oriented productive and distributive choices after the liberalization of the internal commerce in the 40s. Amounts produced and marketed continued to be seesawing all across the period analysed, and even the recipients of the production remained the same: mainly urban bakers in the case of Bologna, local merchants in the Paduan case. This suggests that if some market changes (such as changes in demand or prices) had an immediate impact on the behaviour of the landowners – according also to the specific agrarian structures in which they operated –, more “structural” changes may required a longer time span before having consequences on the productive side.

Some final remarks: agriculture and the market in Northern Italy

A limited number of case studies can't certainly justify generalizations or the construction of models able to explain how the landowners who operated in specific agrarian contexts shaped their productive and distributive choices according to market variables; however, common traits can be traced, and, more importantly, specific dynamics can be observed and can be useful in the evaluation of other case studies and, broadly, in the understanding of how the relationship between producers and the market functioned in different contexts, keeping in mind the singularity of each case study because of the geographical, institutional, social, and economic context in which it is located, besides the unpredictability of the behaviours of each agrarian entrepreneur – because of his foresight, entrepreneurial abilities, openness for experimentations, and so on. Besides underlining the relevant variations that characterize each case study, the regressions presented in the previous pages allow at proposing some final statements. First, it clearly

appears the “natural” constraints of the pre-industrial agriculture: besides the importance of price trends and, broadly, of the distributive choices, both in the Paduan and Bolognese case studies the landowners sold what the size of the harvests allow to sell. Investments could be driven by prices, by the aim of improving the production according to glimpsed market opportunities, but the availability of seeds depended on the result of the previous harvests, and the availability of workforce – in a context of low technological resources – on the demographic trends. More, the possibility to invest was strongly correlated to the earnings that came from the previous season. However, in some cases, such as for the hemp production, the importance of the investments especially in fertilizers could be crucial in assuring an increase in the harvests and, therefore, natural constraints can be, to some extent, overcome.

Keeping this general statement in mind, this does not mean that landowners ignored market variables and that they did not act according to them. In the Paduan case the size of the investments in buildings was correlated also to wheat price trend, while changes in the demand-side could affect the amounts of products marketed. In Bologna too prices and the level of wages played their role in shaping the behaviour of the landowners in terms of investments and, consequently, in contributing to define the resulting harvests.

ⁱ Antoine, Annie (2000). “Entre macro et micro. Les comptabilités agricoles du XVIII^e siècle”. *Histoire & Mesure*, Vol. 15, No. 3/4, *Productivité et croissance Agricole*: 247-270, pp. 247, 256

ⁱⁱ Federico, Giovanni (1982), “Azienda contadina e autoconsumo fra antropologia ed econometria: considerazioni metodologiche”. *Rivista di storia economica*, n. s. 1, n. 2: 222-268, p. 227.

ⁱⁱⁱ England in this sense is happy exception given the number of researches on the “Agricultural revolution” and its role in the process of economic growth in the Eighteenth and Nineteenth centuries. See for examples Allen, Robert C. (1992). *Enclosure and the Yeoman: The Agricultural Development of the South Midlands 1450-1850*. Oxford: Clarendon Press; Allen, Robert C. (1999). “Tracking the agricultural revolution in England”. *Economic History Review*, LII, 2: 209-235; Allen, Robert C. (2009). *The British Industrial Revolution in Global Perspective*. Cambridge: Cambridge University Press; Turner, Michael E., Beckett, J., and Afton, Bethanie (1996). “Taking Stock: Farmers, Farm Records, and Agricultural Output in England, 1700-1850”. *The Agricultural History Review*, Vol. 44, No. 1: 21-34; Turner, Michael E., Beckett, J., and Afton, Bethanie (2001). *Farm Production in England 1700-1914*. Oxford: Oxford University Press; Chartres, John A. (1995). “Market Integration and Agricultural Output in Seventeenth-, Eighteenth-, and Early Nineteenth-Century England”. *The Agricultural History Review*, Vol. 43, No. 2: 117-138; Clark, Gregory (1999). “Too Much Revolution: Agriculture in the Industrial Revolution, 1700-1860”. In Joel Mokyr (ed.), *The British Industrial Revolution. An Economic perspective*. New York: Routledge, pp. 206-240; Overton, Mark (1996). *Agricultural Revolution in England. The transformation of the agrarian economy 1500-1850*. Cambridge: Cambridge University Press.

^{iv} Pomeranz, Kenneth (2000). *The Great Divergence. Europe, China, and the Making of the Modern World Economy*. Princeton: Princeton University Press; Van Zanden, Jan L. (2009). *The Long Road to the Industrial Revolution. The European economy in a global perspective*. Boston: Brill; de Pleijt, Alexandra M. and van Zanden, Jan L. (2016), “Accounting for the “Little Divergence”: What drove economic growth in pre-industrial Europe, 1300-1800?”. *European Review of Economic History*, Vol. 20, Issue 4: 387-409.

^v Béaur, Gérard (1996). “Prix, production, productivité agricoles”. *Histoire & Mesure*, Vol. 11, No. 3/4: 201-211; Béaur, Gérard (1998), *La terre et les hommes. France et Grande-Bretagne. XVII^e-XVIII^e siècle*. Paris: Hachette; Moriceau, Jean-Marc (1994), “Au rendez-vous de la “Révolution agricole”: Dans la France du XVIII^e siècle: A propos des régions de grande culture”. *Annales. Histoire, Sciences Sociales*, 49^e Année, No. 1: 27-63; Miller, Stephen J. (2009). “The Economy of France in the Eighteenth and Nineteenth Centuries: Market Opportunity and Labour Productivity in Languedoc”. *Rural History*, 20/1: 1-30.

^{vi} The strong regional tradition of Spanish agrarian history imposes a relevant number of references. Among others see: Rahn Phillips, Carla (1987). "Time and Duration: A Model for the Economy of Early Modern Spain". *The American Historical Review*, Vol. 92, No. 3: 531-562; Ardit, Manuel (2007). "La historia rural de la España oriental durante la edad moderna: un estado de la cuestión". *Studia Historica: Historia Moderna*, 29: 47-82; Vicens Vives, Jaime (1969). *An economic history of Spain*. Princeton: Princeton University Press, pp. 505-523; Ringrose, David R. (1996). *Spain, Europe, and the "Spanish miracle", 1700-1900*. Cambridge: Cambridge University Press; Furió, Antoni (1995). *Història del País Valencià*. València: Edicions Alfons el Magnànim, pp. 402-408; Villares, Ramón (1982). *La propiedad de la tierra en Galicia, 1500-1936*. Madrid: Siglo XXI de España Editores; Arenas Posadas, Carlos (2016). *Poder, economía y sociedad en el sur. Historia e instituciones del capitalismo andaluz*. Sevilla: Centro de Estudios Andaluces; Artola, Miguel, Bernal, Antonio M., and Contreras, Jaime (1978). *El latifundio. Propiedad y explotación, ss. XVIII-XX*. Madrid: Ministerio de Agricultura; Rubio Pérez, Laureano M. (2007). "Campo, campesinos y cuestión rural en Castilla la Vieja en el Reino de León durante la Edad Moderna. Estado de la cuestión, claves y valoraciones de conjunto". *Studia Historica, Historia Moderna*, 29: 131-177; Marfany, Julie (2016). *Land, Proto-Industry and Population in Catalonia, c. 1680-1829*. London: Routledge, pp. 25-53; Congost, Rosa (2003). "Els masos de la Catalunya Vella", in Rosa Congost, Gabriel Jover and Giuliana Biagioli (eds.), *L'organització de l'espai rural a l'Europa mediterrània. Masos, possessions, poderi*. Girona: CCG Editions, pp. 19-123; Jover, Gabriel, and Morey, Antònia (2003). "Les possessions de Mallorca", in Rosa Congost, Gabriel Jover and Giuliana Biagioli (eds.), *L'organització de l'espai rural a l'Europa mediterrània. Masos, possessions, poderi*. Girona: CCG Editions, pp. 127-238; Vilar, Pierre (1966). *Les transformacions agràries del segle XVIII Català. De l'impuls de les forces productives a la formació d'una burgesia nova*. Barcelona: Edicions 62; Vincent, Bernard (1981). "Economía y Sociedad e nel reino de Granada (siglo XVIII)", in Antonio Domínguez Ortiz (ed.), *Historia de Andalucía VI. Los inicios del capitalismo (1621-1778)*. Madrid: CUPSA Editorial, pp. 373-401; Giralt i Raventós, Emili (ed.) (2008). *Història Agrària dels Països Catalans*, Vol. III, *Edat Moderna*. Barcelona: Publicacions i Edicions de la Universitat de Barcelona; Ferrer-Alòs, Llorenç (2019), "Agriculture, ressources naturelles et bien plus. Trois voies de croissance Agricole et d'industrialisation en Espagne, XVIIe-XIXè siècles", in Laurent Herment (ed.), *Histoire rurale de l'Europe XVI^e-XX^e siècle*. Paris: Éditions EHESS, pp. 111-130, pp. 117-122.

^{vii} Biagioli, Giuliana (2002). "La mezzadria poderal e nell'Italia centro-settentrionale in età moderna e contemporanea (secoli XV-XX)". *Rivista di storia dell'agricoltura*, a. XLII, n. 2: 53-102, pp. 76-77, 84-85; Biagioli, Giuliana (2003). "Els poderi de la Itàlia Central", in Rosa Congost, Gabriel Jover and Giuliana Biagioli (eds.), *L'organització de l'espai rural a l'Europa mediterrània. Masos, possessions, poderi*. Girona: CCG Editions, pp. 241-367; Pinto, Giuliano, Poni, Carlo, and Tucci, Ugo (eds.) (2002). *Storia dell'Agricoltura Italiana*, Vol. II, *Il Medioevo e l'Età Moderna*. Florence: Polistampa; Faccini, Luigi (1988). *La Lombardia fra '600 e '700. Riconversione economica e mutamenti sociali*. Milan: Franco Angeli.

^{viii} see for example Béaur, "Prix, production, productivité agricoles"; Álvarez-Nogal, Carlos, Prados de la Escosura, Leandro, and Santiago-Caballero, Carlos (2015). "Agriculture in Europe's Little Divergence: The Case of Spain". *EHESS Working Papers in Economic History*, No. 80; Planas, Jordi, and Saguer, Enric (2005). "Accounting Records of Large Rural Estates and the Dynamic of Agriculture in Catalonia (Spain), 1850-1950". *Accounting History Review*, Vol. 15, No. 2: 171-185; Federico, Giovanni and Malanima, Paolo (2004). "Progress, decline, growth: product and productivity in Italian agriculture, 1000-2000". *Economic History Review*, LVII, 3: 437-464; Tedeschi, Paolo (2006). *I frutti negati: assetti fondiari, modelli organizzativi, produzioni e mercati agricoli nel Bresciano durante l'età della Restaurazione (1814-1859)*. Brescia : Fondazione Civiltà Bresciana; Llopis, Enrique, and González-Mariscal, Manuel (2010). "Un crecimiento tempranamente quebrado: el producto agrario en Andalucía occidental en la Edad Moderna". *Historia Agraria*, 50: 13-42.

^{ix} See for example Lana Berasain, José Miguel (2012). "¿ Rutina, Esquizofrenia o Racionalidad? Los Negocios Agrícolas de los Condes de Murillo et Navarra, 1712-1913". *Revista de la historia de la economía y de la empresa*, No. 6: 363-388; Saguer, Enric, Jover, Gabriel, Benito, Helena (eds.) (2013). *Comptes de senyor, comptes de pages. Les comptabilitats en la història rural*. Girona: Associació d'Història Rural de les Comarques Gironines; Giralt i Raventós, Emili (2002), "Tècniques, rendiments, mutacions agrícoles I aspectes agrosocials del segle XVIII. L'exemple d'una finca del Penedès". *Estudis històrics i documents dels arxius de protocols*, No. 20: 229-322; Casado Alonso, Hilario, and Robledo Hernández, Ricardo (eds.) (2002). *Fortuna y negocios. Formación y gestión de los grandes patrimonios (Siglos XVI-XX)*. Valladolid: Universidad de Valladolid; Morey, Antònia, and Jover, Gabriel (eds.) (2012). *Les possessions mallorquines: passat i present*. Mallorca: Edicions Documenta Balear; Robledo, Ricardo, and López, Santiago (eds.) (2007). *¿Interés particular, bienestar público? Grandes patrimonios y reformas agrarias*. Zaragoza: Prensas Universitarias de Zaragoza; Almaric, Jean-Pierre, and Ponsot, Pierre (eds.) (1985), *L'exploitation des grands domaines dans l'Espagne d'Ancien Régime*. Paris: CNRS; Béaur, Gérard (1996). "Les Chartier et le mystère de la révolution agricole". *Histoire & Mesure*, Vol. 11, No. ¾: 367-388; Amarilla, Jose Antonio Sebastian (1992). "Propiedad señoral, captación del producto agrario y estrategias de comercialización: el ejemplo de un monasterio leonés de comienzos del siglo XVI a 1835". *Noticario de Historia Agraria*, No. 4: 251-282; Chevet, Jean-Michel, and Béaur, Gérard (eds.) (2014). *Measuring agricultural growth. Land and labour productivity in Western Europe from the Middle Ages to the Twentieth Century (England, France and Spain)*. Turnhout: Brepols; Quaderni Storici (1972).

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^x Federico, "Azienda contadina e autoconsumo", p. 227; Federico, Giovanni (1985). "Autoconsumo e mercantilizzazione: spunti per una discussione". *Società e storia*, a. VIII, n. 27: 197-212, p. 205; Federico, Giovanni (1991). "Household Budgets as a Source for the Study of Rural Economy (Italy 1860-1940). Commercialization and Peasants' Behaviour", in Toni Pierenkemper (ed.), *Zur Ökonomik des privaten Haushalts*. Frankfurt/New York: Campus Verlag, pp. 182-200.

^{xi} Persson, Karl G. (1999). *Grain Markets in Europe, 1500–1900: Integration and Deregulation*. Cambridge : Cambridge University Press.

^{xii} Ledgers are preserved in the State Archives of Padua, archival collection Selvatico, sub-collection Frigimelica, folder 435; archival collection Obizzi, folders 527-530, 532-536, 539, 543-545, 548-550; archival collection Selvatico, sub-collection Selvatico, folders 1165-1166, 1217, 1242-1248, 1264-1265.

^{xiii} The most relevant and famous is probably the Catajo Castle, owned by the Obizzi family, that made it the fulcrum of the contemporary artistic and literary scene. See Coppola, Alessandra (ed.) (2017). *Gli Obizzi e la collezione di Antichità al Catajo*. Padua: CLEUP. On the Selvatico family see Franceschi, Alessandra (2003). "Vita privata e impegni pubblici di una famiglia padovana. I Selvatico Estense dalla fine del Cinquecento al tramonto del Settecento". *Archivio Veneto*, serie V, vol. CLX: 5-46.

^{xiv} Coppola, Gauro (1978). "La gestione di una proprietà agricola della pianura lombarda nella prima metà del XVIII secolo". *Quaderni Storici*, Anno XIII – Fasc. III: 994-1010, p. 995; Faccini, Luigi (1983). "L'agricoltura della bassa Lombardia occidentale fra XVII e XVIII secolo. Un approccio aziendale", in Gauro Coppola (ed.), *Agricoltura e aziende agrarie nell'Italia centro-settentrionale (Secoli XVI-XIX)*, Milan: Franco Angeli, pp. 59-78, p. 61; Zaninelli, Sergio (1964). *Una grande azienda della pianura irrigua lombarda nei secoli XVIII e XIX*. Milan : Giuffrè.

^{xv} Poni, Carlo (1963). *Gli aratri e l'economia agraria nel bolognese dal XVII al XIX secolo*, Bologna: Zanichelli; Poni, Carlo (1982). *Fossi e cavedagne benedicon le campagne. Studi di storia rurale*. Bologna: Il Mulino.

^{xvi} Salvemini, Biagio (2002). "L'allevamento", in Giuliano Pinto, Carlo Poni, Ugo Tucci (eds.), *Storia dell'agricoltura italiana*, vol. II, *Il medioevo e l'età moderna*. Florence: Edizioni Polistampa, pp. 255-320, p. 280.

^{xvii} Cazzola, Franco (2002). "Colture, lavori, tecniche, rendimenti", in Giuliano Pinto, Carlo Poni, Ugo Tucci (eds.), *Storia dell'agricoltura italiana*, Vol. II, *Il medioevo e l'Età moderna*. Florence: Edizioni Polistampa, pp. 223-253, p. 246; Cattini, Marco (1978). "In Emilia orientale: mezzadria cinquecentesca e mezzadria settecentesca. Continuità o frattura?". *Quaderni Storici*, Anno XIII, Fasc. III: 864-881, p. 868.

^{xviii} Mocarelli, Luca, Panjek, Aleksander (eds.) (2020). *Maize to the people! Cultivation, Consumption and Trade in the North-Eastern Mediterranean (Sixteenth-Nineteenth Century)*. Koper: University of Primorska Press; Finzi, Roberto (1997). "La diffusione del mais nell'Italia settentrionale fra il secolo XVI e l'inizio del XIX". *Metodi e Ricerche*, n.s. XVI/2; Finzi, Roberto, and, Baiada, Enrica (1985). "L'affermazione del mais nelle campagne bolognesi: un mutamento del regime alimentare?", in *Popolazione ed economia dei territori bolognesi durante il Settecento*. Bologna: Istituto per la Storia di Bologna.

^{xix} Poni, Carlo, and Fronzoni, Silvio (eds.) (2005). *Una fibra versatile. La canapa in Italia dal Medioevo al Novecento*. Bologna: CLUEB.

^{xx} Accounting books are in the State Archives of Bologna, archival collection Amorini-Bolognini, folders 397, 399, 401, 403, 405, 407, 409, 411, 413, 415-417, 419; archival collection Boschi, folders 485, 489, 491-492, 495-496, 499, 501, 503; archival collection Scappi-Ariosti, folders 212, 214, 216, 218, 220, 222, 224.

^{xxi} Martini, Manuela (1999). *Fedeli alla terra. Scelte economiche e attività pubbliche di una famiglia nobile bolognese nell'Ottocento*. Bologna: Il Mulino, p. 130, 411.

^{xxii} Finzi and Baiada, "L'affermazione del mais", p. 286; Balugani, Angela, and Fronzoni, Silvio (1979). "Poderi e mezzadri di una «impresa» bolognese, 1720- 1770", *Quaderni storici*, n. 40.

^{xxiii} About the importance of demographic dynamics both in terms of demand change and as stimulus for technological innovation and investments see the classic Boserup, Ester (1965), *The Conditions of Agricultural Growth: The Economics of Agrarian Change under Population Pressure*. London, G. Allen and Unwin.

^{xxiv} Kopsidis, Michael; Pfister, Ulrich; Scholten, Friederike; and Bracht, Johannes (2017). "Agricultural Output Growth in a Proto- and Early Industrial Setting: Evidence from Sharecropping in Western Westphalia and the Lower Rhineland, c. 1740-1860". *Rural History*, 28, 1: 21-46.

- ^{xxv} Overton, *Agricultural Revolution in England*, pp. 19-20, 199-202; Federico, “Azienda contadina e autoconsumo”, pp. 235-237; Federico, “Autoconsumo e mercantilizazione”, p. 210; Chartres, “Market Integration”; Biagioli, Giuliana (2019). “La voie de la croissance agricole en Italie, XVI^e siècle-1950”, in Laurent Herment (ed.), *Histoire rurale de l'Europe XVI^e-XX^e siècle*. Paris: Éditions EHESS, pp. 69-94, p. 89.
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