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«The debate over grain in the 1750s. A cliometric point of view»

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Notice introductive : **Charlotte Le Chapelain**

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Notice introductive

C'est en 2004, avec l'arrivée de Claude Diebolt à Strasbourg, que la cliométrie a fait son entrée au BETA. Discipline jeune – elle est née dans les années 1950 aux Etats- Unis - la cliométrie se distingue par une proposition méthodologique nouvelle pour l'histoire économique. L'approche quantitative apparaît, à première vue, comme une caractéristique centrale de cette nouvelle histoire économique ; c'est plus précisément en ce qu'elle articule la théorie économique et les méthodes quantitatives dans l'analyse d'une problématique historique qu'elle se distingue. Mobilisant les outils analytiques et conceptuels de l'économie et ses méthodes quantitatives, la cliométrie a contribué à réinstaller l'histoire économique dans le paysage des sciences économiques partout dans le monde. C'est au Bureau d'Economie Théorique et Appliquée que s'effectue cet ancrage en France, par la constitution, en 2004, d'un axe qui lui est consacré. Ce n'est pas tout à fait un hasard, comme le montrent **Diebolt et Hau (2019)**, si c'est en terre strasbourgeoise que cet enracinement s'est produit. L'école cliométrique marche en effet dans les traces de deux illustres figures de l'Université de Strasbourg : Marc Bloch et Lucien Febvre. Fondateurs de l'école des *Annales*, ces devanciers ont initié une profonde rénovation méthodologique de leur discipline, rénovation dont l'article rappelle les tenants pour mettre en évidence les éléments constitutifs de la filiation qui unit la cliométrie strasbourgeoise à l'école des Annales. Nous en retiendrons ici une caractéristique, celle de défendre une analyse historique qui désormais se distancie du singulier pour assumer l'ambition d'identifier des régularités et s'autoriser même à interroger l'existence de relations de causalité entre les phénomènes historiques.

La rénovation méthodologique engagée par Febvre et Bloch durant leur période strasbourgeoise s'est notamment concrétisée par la fondation, en 1929, de la revue des *Annales d'Histoire Economique et Sociale.* Dans le même besoin de voir se constituer un espace de réflexion et de débat qui accueillerait les recherches les plus novatrices dans la discipline, s'est imposée l'idée de la fondation de la revue *Cliometrica*. C'est en 2006, toujours à Strasbourg, cette fois au BETA et à l'initiative de Claude Diebolt, qu'est née la revue. Son premier numéro est paru en février 2007. Le succès de la revue, qui compte désormais au nombre des revues académiques de haut niveau en histoire et en économie, tient à une ligne éditoriale claire, résolument attachée aux principes méthodologique fondateurs de la cliométrie et ses trois pilliers : l'appréhension précise d'un contexte historique, l'ancrage dans la théorie économique et le recours aux techniques quantitatives les plus récentes. Ceux-ci sont rappelés dix ans après la parution du premier numéro de *Cliometrica* dans le second article qui compose ce dossier **(Diebolt 2016)**. Cette dynamique éditoriale a été complétée depuis par la parution, en 2016 et 2019, de la première édition et de la seconde du *Handbook of Cliometrics*. Sa troisième édition est attendue pour 2024-2025.

La cliométrie a d'abord cheminé seule avant de s'unir, en 2009, aux historiens de la pensée du BETA dans un axe nouveau, l'axe Cliométrie-Histoire de la Pensée Economique co-dirigé par Claude Diebolt et Ragip Ege. La nature historique de leurs interrogations respectives explique certes la proximité des deux champs de recherche. Mais cette proximité n'est pas condition suffisante d'un mariage réussi. Celui-ci s'explique certainement davantage par une assise méthodologique commune, une manière partagée d'envisager l'analyse historique et ses enjeux. L'histoire de la pensée économique au BETA a le souci de tenir à bonne distance les écoles, les traditions - et davantage encore les représentations tronquées de ces écoles et traditions - pour concentrer son attention – en tout premier lieu – sur la théorie des auteurs, leurs concepts, leur raisonnement analytique et ses logiques d'articulation (voir Dos Santos, Ege, Rivot (2020) republié en premier numéro de cette collection des documents de travail hors-série du BETA). Lorsqu'elle mobilise modèles théoriques et séries quantitatives pour revisiter un évènement historique, la cliométrie renonce nécessairement à prendre pour acquises les interprétations existantes - et parfois tout à fait dominantes dans l'historiographie - dudit évènement. Là aussi écoles, interprétations, traditions restent à juste distance, à bonne proximité. Cet ADN commun - la perspective d'abord analytique- est un puissant moteur du rapprochement des deux champs de recherche désormais unis dans un nouvel axe. L'article de **Boyer, Jaoul-Grammare et Rivot (2019)** constitue une illustration marquante de ce dialogue fructueux entre histoire de la pensée économique et cliométrie. Il revisite un débat fondateur dans le développement de l'analyse économique, celui sur la liberté du commerce des grains sous l'Ancien Régime, en confrontant les arguments respectifs des partisans de la liberté et de la réglementation du commerce à l'analyse empirique rendue possible par la reconstitution de séries temporelles, de prix des grains notamment.

C'est enfin une histoire en prise avec les grands enjeux et défis de nos sociétés actuelles, une histoire qui prend au sérieux l'idée de la persistance, de la dépendance au sentier, que défend la cliométrie. Dans un article en l'honneur de Lucien Febvre, publié en 1957 dans les *Annales* et intitulé « Lucien Febvre et l'histoire », Fernand Braudel signait ces lignes :

« Dans cette élaboration de l'avenir, je pense que l'histoire peut jouer un grand rôle, si elle daigne se pencher sur le problème : à savoir comprendre, et faire comprendre, à travers l'étude de la continuité historique, le sens même de notre époque ; percevoir le présent comme un maillon de la chaîne, comme un moment dans une évolution de longue durée. Ou bien l'histoire aboutit à cet élargissement de la vision de l'historien, - et par lui de celle de ses contemporains, - ou bien elle n'est que jeu stérile, jeu de patience pour adultes érudits. »

Les deux derniers articles de ce dossier témoignent de ce que la cliométrie fait sienne cette vision de l'histoire. S'engageant sur des thématiques telles que celle du changement climatique (**Damette, Diebolt, Goutte et Triacca 2020**) ou celle du rôle de l'égalité femmes-hommes dans la croissance de long-terme (**Diebolt et Perrin 2013**), elle révèle une démarche intellectuelle qui n'écarte ni le présent, ni l'avenir de son champ de vision. Tristes perspectives pour le lecteur de 2022 que celles qui émergent de l'entreprise d'identification de liens de causalité entre les changements climatiques liés au petit âge glaciaire (1560-1700) et l'avènement de troubles sociaux (guerres, épidémies…). Ici laboratoire d'expérimentation, l'histoire intéresse nécessairement la politique publique actuelle.

Plus réjouissantes sont les perspectives liées à la mise en lumière du rôle de l'égalité femmes-hommes dans le processus de développement économique de long-terme. L'intraduisible « *female empowerment »* a compté dans la transition démographique et économique qui a ouvert sur le régime de croissance moderne. Là aussi l'histoire regarde vers le présent et l'avenir.

D'une identité singulière, l'histoire économique à Strasbourg poursuivra sa trajectoire en nous réservant, nul ne peut en douter, d'heureuses surprises. Longue vie à l'histoire au Beta !

Charlotte Le Chapelain, Mai 2022.

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The Debate over Grain in the 1750s. A Cliometric Point of View [1]

Version pre-print

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1. Introduction

The French debate on grain of the 1750s played an extremely important structural role for the birth of economics in France, initiating the constitution of economics as a science (Charles 1999, Depitre 1910, Kaplan 1976). Grain supply was a central issue in Ancien Régime France.[2] In the mid-eighteenth century not only did the general condition of the economy depend upon the price of grain and the provisioning of urban markets, but also social and political order.[3] It is therefore not surprising that the nature of the regulation of the grain trade was of such central importance to political and economic debate.

In order to limit high prices, secure the subsistence of the kingdom, and maintain social order[4] the French monarchy had established an administrative system – at the time referred to as a "police"[5] – which aimed to guarantee the "social pact of

1 We are very grateful to three anonymous referees for trenchant criticism, which was of great help in our final revision of this paper.

2 The generic term "grain" includes the bread grains hard and soft wheat, spelt, rye and barley, from all of which bread can be made, and so all these grains form part of popular nutrition in France. In this article we distinguish lexically between grain, a generic term, and wheat, a particular type of grain. Grain is central to subsistence, and for urban wage-earners a necessity. The availability and price of grain determines the conditions of subsistence, even survival, for the majority of the urban population. The level of wages, the real cost of goods, the competitiveness of national products as well as the general state of the economy and socio-political stability were all thought to flow from the price of grain, the yield from the annual harvest and the way that the harvest is channelled towards urban markets.

3 For the importance of grain for political order see Tilly (1972), Kaplan (1976).

4 Fear of shortage and of high grain prices prompted the French monarchy to introduce related legislation from the later sixteenth century (Delamare 1722: 57ff.). Its importance was given emphasis during the seventeenth century, such that the fate of the French monarchy was thought to be intimately connected to regulation of the grain trade. Any interruption of supply placed in question social and political stability.

5 Delamare's *Traité de la police* (1705) identified twelve domains of intervention for police: "religion, morality, health, the supply of victuals, roads and bridges, public buildings, the liberal arts, trade, manufactures, domestic servants, the poor". The supply of victuals was an essential part of this organised administration of urban social control. The general functions of police ran from the "regulation of both wet-nurses and prostitutes to the control of guilds and prisons and the enforcement of rules pertaining to the observance of religious holidays, the cleaning and lighting of streets, and the production and sale of a host of goods and services. In other words they were concerned with every aspect of daily life, moral and material, not just the affairs of deviance and disorder". (Kaplan 1976: 11-12)

subsistence"(see Kaplan 1976: 5-11). Its importance was constantly emphasised from the end of the sixteenth century and well into the eighteenth.[6] In spite of episodes of dearth and of high prices, this system of regulation encountered little in the way of criticism before the 1750s.[7] On the contrary, it was even thought that regulation was "most valuable and most important for public order",[8] making it possible to work against speculation and the self-interested practices of merchants.[9] But in the early 1750s one section of lettered opinion in frequent contact with the merchant class[10] took up the issue of the regulation of the grain trade, and questioned its capacity to further the reforms needed to revive the kingdom. These writers denounced administrative controls and the constraints with which merchants were burdened. They also sought to justify the economic and social functions of the merchants, pointing out the prejudices and misunderstanding that they encountered. There were very many essays, pamphlets

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6 For details of the administrative organisation of grain police and its activity with respect to the commercialisation of grain see Kaplan (1976: 1-51) and Kaplan (1984). In general, urban provision was organised geographically. "The main rules for local markets were the following: 1. grain had to be sold in the market, and only in the market; 2. final consumers had priority as customers over bakers, merchants and millers; 3. officials were responsible for the use or verification of weights and measures; 4. once grain had been brought to market it could not be withdrawn unsold, whatever its condition; 5. if there was grain unsold after three successive market days it had to be offered for sale at a low price; 6. the only permitted granaries were those belonging to farmers who produced the grain, and only their grain had the right to be kept there; 7. every grain merchant had to register with the police authorities, and every physical movement of grain had to be duly declared to these authorities and recorded." (Charles 2004: 2).

7 On the contrary, these crises tended to add to the legitimacy of grain police, since more relaxed regulation would have seemed incapable of limiting the self-interested claims of corn merchants accused of speculating in cereals and consequently of playing with the lives of the poorest. There were some writings that did question the existence of the grain police – such as for example Boisguilbert (1695), but their impact was limited. Vauban, for instance, who was very critical of the French taxation system and who in this regard shared some of Boisguilbert's conclusions (Vauban, 1707: 2), departed from him over the freedom of trade in defending grain regulation (Virol, 2003, 214-15). In the view of Depitre (1910: VII), before 1750 there was little questioning of police; he regarded Boisguilbert's writings to be the exception, and not representative.

8 D'Argenson, letter of 8 November 1699, cited in M. de Boislisle, *Correspondance des Contrôleurs généraux*, t. II No. 38, cited by Depitre 1910 p. V. Nicolas Delamare's *Traité de la police*, which first appeared in 1705, likewise considered grain police to be the essential guarantee of social order which at the same time was favourable to the conditions of production and commercialisation of foodstuffs in general, and of corn in particular (Delamare 1722: 1).

9 Traders were in effect seen as members of a profession that was prone to vice. Buying and reselling goods, their profits could only come from the trickery of their prices and trumpery.

10 Debate really began with those who were close to the "Gournay circle", among them Herbert (1753) and Gournay himself, who in 1752 had been working on reform of the grain trade in his function as Intendant at the Bureau du commerce. The debate was recorded in the *Journal Œconomique*, which was also a publication with connections to the circle (see Orain 2013). On the connections between the de Gournay circle and the merchant class see Charles, Théré, Lefebvre (2011), Meyssonnier (1989), Skornicki (2011).

and periodical articles[11] along these lines, and they helped shape a developing line of economic argument (Charles 1999, Kaplan 1976).[12]

Liberalisation of the grain trade and suppression of grain police was often treated in this literature as the best means for improvement of grain provisioning, homogenising the price of grain, both in time and space, and permitting the increase of cereal production. To read Depitre (1910) or Kaplan (1976), the superiority of the principles espoused by partisans of free trade in grain over those expressed by defenders of grain regulation seems to go without saying. Principles issued from the Enlightenment, rationally grounded, contrast with principles based on tradition and the dark ages. Free trade would seem a rational necessity. Nonetheless, popular resistance and the shortages of 1768-1769 and 1775-1778 that followed the establishment of free trade raised real doubt about the validity of its principles (Thompson, Bertrand, Bouton 1988). These episodes contradicted the economic rationale for free trade. The return to the previous system of regulation only a few years after liberalization, (between 1770 and 1774, and again after the fall of Turgot in 1776), appears to demonstrate that these initial liberal arguments did not entirely succeed in persuading contemporaries, and that they were often aggressively refuted by the facts.

In this paper, our purpose is to use cliometric tools to assess the positions adopted by these two opposing sides, namely the proponents of the grain police on the one hand and the advocates of free trade on the other. In particular, cliometrics might help to assess whether this debate was economically grounded in echoing real economical problems or, on the contrary, if it was launched for other (social or political) purposes. Indeed, a number of socio-political issues cut across each other here, and this

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11 ---------- As Voltaire wrote, "around 1750 the nation already replete with verse, tragedy, comedies, opera, novels, romantic fiction, moral reflections even more romantic and theological disputes over grace and disturbances – this nation finally threw itself into *arguments about corn*." (Voltaire 1764: 54). For a synthesis of contemporary economic reviews see Steiner (1996).

12 ---------- It was this grain debate that lent shape to new analyses, especially within the Gournay circle and, later, Physiocracy. Jacques Vincent, Marquis de Gournay, was made Intendant at the Bureau de Commerce in 1751. He became the centre of a circle of writers including Véron de Forbonnais, Butel-Dumont, Cliquot-Blervache, Abeille, Plumard de Dangeul, Montaudoin de la Touche and also Turgot. These writers favoured free trade within France and so supported moves to reform grain police in order that freedom of trade might be established for grains. The emergence of Physiocracy is also related to these disputes over grain police. Quesnay's *Encyclopédie* articles - "Fermiers" in 1756 and "Grains" in 1757 – likewise denounced these regulations and promoted free trade of grains. The sect of "économistes" formed around Quesnay, was joined in 1757 by Mirabeau, and this has been widely treated as the first identifiable school of economic thought.

may have helped initiate the debate.[13]

Applying current econometric techniques to the historical database that we have assembled, our main task will be to isolate the determinants of grain prices as well as the determinants of the volatility in these prices. We will then try to focus specifically on the liberalisation issue: is it true that free trade (internal or external, depending on the periods investigated) was capable of stabilising prices? Or on the contrary, was the functioning of the agricultural sector mainly determined by exogenous factors, such as the weather? Our long-term study of grain prices will also try to establish causality between grain prices and agricultural production: were agricultural yields mainly dependent on external factors (as one might guess for a pre-capitalistic economy); or were some internal incentives towards economic growth already at work?

Our argument is organised as follows. In the first part of the paper we synthesise and reformulate the terms of a debate in the early 1750s between two opposing camps regarding the determination of the price of wheat. We also review the consequences of the arguments put forward with respect to economic growth in Ancien Régime France. This is followed by an econometric study of the path taken by grain prices in the eighteenth century in comparison with that of the nineteenth century. By isolating the factors determining fluctuations in the price of wheat our aim is to assess whether it is possible, through cliometric techniques, to resolve the debate on grain at the beginning of the 1750s, and to determine what would have been the most effective policy.

2. The Grain Debate in the 1750s: Synthesising the Positions

Despite differences among various authors, we distinguish two major trends in the grain debate that took place in France during the 1750s: respectively, partisans of grain police, and partisans of grain free trade. In practice, things are more nuanced (See Harcourt 2011, Miller 1999). First of all, police was mainly used during the periods of high prices, and the trade was freer during times of abundance. Moreover, taking account of Miller's analysis (Miller 1999; see also Bourguinat 2001, 2002) we are forced to admit that the

[13] ---------- The grain debate raised questions relating to the place of merchants in the society of Ancien Régime France, and also related to the need for the reinvigoration of French agriculture, and so was part of a wider concern with a revival of the kingdom's fortunes, touching on a much broader debate about the power and political foundations of the French kingdom. See on these questions especially Shovlin (2007).

meaning of free trade is not unambiguous during the 18th and 19th centuries. Free trade can be the right of merchants to act without being controlled by officers, to buy and sell where they want. It can also mean free internal circulation, but not free external circulation. In order to simplify the antagonism we propose two ideal-types.

2.1. The Perspective of Partisans of Grain Police and Regulation

Police has to guarantee the "social pact of subsistence" linking the King and his people (Kaplan 1976: 5-11). To ensure this, promoters of grain police in the Ancien Régime were in favour of both municipal and state regulation of the grain trade. According to Kaplan (1976: 1-51), they represented most members of the monarchic state, regional administrations and municipalities concerned with preserving the political stability of the kingdom. They also included financiers whose business was the administration of the monarchic fiscal order. Barriers to trade made it easier to tax goods (Durant 1980: 101).

More generally, partisans of grain police did not trust the practices of merchants, who they conceived as economic agents dominated by selfishness, cupidity and vice. Merchant initiatives had therefore to be kept in check. That is one of the reasons why they thought that trade could not be allowed to be free. Partisans of police believed that, without regulations and controls, the price of corn would be too vulnerable to the chicanery of merchants seeking surplus profits. According to them, merchants would not hesitate to speculate in taking advantage of any situation of shortage; even seek to create one artificially, by holding back grain in the expectation of a rise in price. One of the roles of police was therefore to counter the corrupt practices of merchants and to guarantee the stability of the social order.

Good police was therefore regulation that succeeded in maintaining affordable prices for the urban consumer, limiting the surplus profits of the merchant, and dealing with the crises created by the caprice of providence. Promoters of grain police favoured regulation and controls aimed at keeping grain in the province and channelling it to urban markets, so that sufficient grain might there be available at a reasonable price. This market model was elaborated in particular by Nicolas Delamare in his voluminous work, *Traité de la police* (1705). The justification advanced by Delamare was repeated by Le Camus in the *Journal Œconomique* (1753a, 1753b, 1754).

For those supporting regulation, the output of wheat was primarily limited by the natural fertility of soil, which was a given, a gift of God. The maximum production was consequently considered as fixed, although constantly threatened by unfavourable meteorological conditions, by damage to sown crops,[14] by the fact that land has to lie fallow, or because the production of grain has to compete against other agricultural products (Delamare 1722: p. 21).[15] Regulation had therefore to ensure that the land was properly used, and that the area under sown crops was adequate. There was also a need to find the most effective means of protecting the harvest. So there was a consequent need to make sure that growing crops were not damaged or destroyed, that harvests took place under the best of conditions, that sufficient seed was held back for future sowing, and that the harvest was properly stored (Delamare 1710: 19-31). Despite all such precautions, harvests were nonetheless constantly threatened by adverse meteorological events (hard winters, drought or very bad weather in the spring, hail, thunderstorms).

Given the limitation set upon production by the natural fertility of the land, and the constant threat of adverse weather, a secondary aim of regulation was to secure the management of grain provision so that it could supply urban markets throughout the year until the following harvest.[16] This is why strict administrative control of the grain trade was required: in order to secure the most regular possible provisioning of urban markets, to limit surges in grain prices, and to prevent their export to other provinces, or abroad. The aim of such regulation was to prevent scarcity. That explains why the regulations sought to keep back as much grain as possible in the provinces, so as to be capable of guaranteeing the constant provisioning of urban markets. Its aim was therefore to restrict domestic free trade, and to forbid external trade. Only on the occasions when there was an abundant harvest, or indeed a bumper harvest, was grain permitted to be moved to other provinces, or to foreign countries.

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14 ---------- Damage to crops being mainly done during hunts (Delamare 1722: 29), by troop movements, and by livestock (Delamare 1722: 19). Agricultural labourers therefore enjoyed royal protection, which allowed them to cultivate their land without having to endure any nuisance that would reduce their harvest.

15 ---------- Following a rise in the consumption of wine in the 1720s land devoted to grain production had to contend with the extension of vineyards. Faced with this threat, an edict of 5 June 1731 prohibited the laying down of new vineyards so as not to threaten the sown area of wheat. On this issue see Dion (1959: 593ff.)

16 ---------- See Kaplan (1984) for an account of the substantive organisation of Parisian markets that police regulation favoured.

Hence, if shortages arose following periods of poor weather, police had to intervene more directly to prevent scarcity and limit grain price increases. Police interventions were especially marked during periods of shortage or dearth, when corn was requisitioned and taken to market. At such times, police was seen as the only means of limiting a strong surge in prices. The authorities had to requisition from private granaries, and import grain from other provinces or from abroad. Strict regulation of grain markets was also used to ensure moderate grain prices.[17] (On the different practical means used by the police during the 18th century, see Miller, 1999: 25-107).

These are the main principles of the subsistence pact that bound the king and his authorities to the urban population.

2.2. The Partisans of Free Trade

Opposition to Ancien Régime police became explicit in the early 1750s. The restraints on the free flow of trade imposed by police were questioned first in Herbert's *Essai sur la police générale des grains* (published first in 1753 and then in 1754 and 1755), by Quesnay's articles in the *Encyclopédie* named "Fermiers" and "Grains', and also by various writings of the de Gournay circle (Forbonnais 1754: 554, Plumard de Dangeul 1754: 20-26, 82-101).[18] The argument put forward was that grain police did not succeed in efficiently securing urban provision in times of shortage and dearth. Administrative complication meant that any response to urgent situations was too slow, and did not foster the optimal allocation of what had been produced (Herbert 1753: 36; 1755: 112). For that reason they were in favour of free trade, essentially conceived as a matter of internal trade and as a freedom for grain owners to sell how, where, and for how much they wished (Miller 1999: 11). But police was also accused of creating prices that failed

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17 ---------- As Edgar Depitre noted, "the farmer is not able to choose the best moment to take his corn to market; he was in principle forbidden from retaining his grain for more than two years; in practice, at the least rise in price of corn the cultivator was forcibly compelled to sell all available grain without delay. Commissioners were appointed to establish the amount of grain possessed throughout the territory by merchants, landowners and farmers. … In the market … the seller was not permitted to do as he liked, if he had not sold off his corn in the course of two consecutive markets he had to pass it on to the third, even at a reduced price; sometimes a maximum price was set for him. Similarly, once a price had been set it could not be raised, not even in the subsequent market. - Sale in the market was overburdened with taxes, with duties payable for access to the town and market taxes themselves accounting, according to Baudeau, for a fiftieth or a sixtieth of the value of corn sold, in general, and one thirtieth in Paris." (Depitre 1910: XV-XVI)

18 ---------- Those in favour of free trade in grain tended to be optimistic. Contemporary enthusiasm for agriculture (agromania) and the positive results shown by new agricultural experiments explain this belief in the possibility of agricultural progress.

to properly remunerate producers. Ancien Régime police was therefore accused of creating the shortages that they claimed to be countering (Herbert 1753: 4-5; 1755: 304, Forbonnais 1754: 552, Plumard de Dangeul 1754: 100; Quesnay 1756). It was also criticized for creating price volatility, as also a price that was too low during periods of abundance, and which provided no incentive for agricultural producers. Regulation was therefore itself to blame for the small amount produced, and for weak economic growth.

Contrary to the partisans of police, those supporting freer trade did not assume that the production of agricultural wealth was fixed. They believe it was capable of improvement, as witnessed by the growth of agricultural production in contemporary Britain (Forbonnais 1754a; Plumard de Dangeul 1754: 82-101. See also Bourde 1967). They considered that the intensification of production, and agricultural progress in general, demanded grain prices that were less volatile, and which gave more to producers.

Less volatility would help agricultural producers in their estimates and expectations, and would provide an incentive to produce more. A reduction in price volatility would also suit urban consumers, urban employers (since the nominal wages that they paid would also be less volatile) and generally promote the stability of the social order. That is why, Herbert wrote, "there are two equally possible pitfalls: a decline in grain prices, and their great dearness." (Herbert 1753: 17) Quesnay also put forward the same argument in his first articles for the *Encyclopédie* (1756, 1757).[19] In his view, price stability meant that on average the urban consumer would not be harmed, while at the same time aiding the farmer in making economic calculations and contributing to the increase of his income (Charles 1998: 51)[20]. As we will see, it was thought that this reduction in price volatility would be achieved by the introduction of free trade, enabling variations in grain prices to be smoothed out. Another means envisaged by some critics of grain police was the development of private granaries, which were thought to be more efficient than public granaries.[21]

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19 ---------- For Quesnay, one feature of a good price is that it is a middling price stable over five years of production, something that Charles emphasises (1998: 49-52).

20 ---------- Quesnay was therefore in favour of homogeneous prices both in time and international space. His "bon prix" corresponded therefore to the international price within a competitive situation of complete freedom of trade.

21 ---------- The creation of magazines and stores was intended to secure more regular supply to markets, and smooth prices by holding back grain in years of abundance and releasing it for sale in those years where supply was more limited. The establishment of public granaries was first introduced by Dupin (1748) to create a more uniform grain price. The policy was questioned by Herbert (1753, 1755)

Those in favour of free trade in grain generally believed that it would reduce price volatility and permit a better allocation of the quantities produced. By removing the constraints preventing the commercialisation of grain, merchant interests – guided both by prices and personal interest – would assure that markets were efficiently supplied, while prices would be subject to less fluctuation. High prices in provinces affected by bad harvests would automatically attract grain sellers – and also grain – from the provinces where the harvest was ample, or from places the grain price was low (on this question see Charles 2008: 73-79). To remedy volatility in the grain price, and to allow cereals to be allocated more efficiently, merchants had to be freed of the administrative constraints to which they were subject.[22] The mechanism would be effective particularly on national territory, but also within an international framework (see for example Steiner, 1994). Thanks to free trade and market mechanisms the price would become more homogeneous, and the allocation of production more efficient.

If everyone did agree on the good effects of internal free trade, not all of these writers went as far as to put their faith in free international trade. Herbert, for instance, adopted a more cautious position, fearing massive exports at cheap prices if external frontiers were opened up. He did not go as far as the Physiocrats, and especially not as far as Quesnay. For them, the "bon prix" of grain would be the price imposed once complete free trade in grains was introduced. The international liberalization of commerce would contribute to this international price – higher than the French price – becoming the prevailing price in France, as soon as the measure was enacted (Charles 1998: 48).

Aside from this creation of a uniform price for cereals, those who criticised grain police were also against the way it produced persisting low prices of grain, and discouraged agricultural producers. Some, like Quesnay, suggested a policy of serving the interests of manufacturers and international merchants, limiting the labour costs of the urban proletariat and favouring a French commercial surplus (Quesnay 1757: 812).

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who queried its effectiveness. He thought that private initiative would be more likely to create grain stores than public commissioners, since they would have better information and a direct interest. On this question see Charles (2008: 75-76).

[22] ---------- Grain dealers should no longer be repeatedly checked by police; . they should be allowed to buy and sell grain wherever they could hope for a price that suited them.

They blamed police for the impoverishment of the countryside and the decline of French agriculture. All writers, from Herbert to Quesnay, via Turgot, shared the idea that the disappearance of low agricultural prices would stimulate the countryside. Moreover, a slight increase in the average price of grain would increase the profits of the farmer and give him an incentive to produce more. It would allow him to invest more easily, in a context where access to credit was problematic. Altogether, slightly raising slightly the price of grain would be more favourable to capitalist production and would provide a stimulus to agricultural production.

By preventing the collapse of prices in provinces enjoying abundant harvests free trade would also enable a price to emerge that would give a better return to producers, providing an incentive for agricultural production and so stimulating general economic growth.[23] Free trade would restrain a decline in prices fatal to agricultural production (Herbert 1755: 109-10).

Let us take stock of the arguments of these protagonists in the debate over grain during the 1750s and reformulate the terms of debate accordingly, even if we must simplify things. If the analyses of those favouring police were right, then the production of grain would was actually fixed, determined by the fertility of the soil (thought to be constant) in the long run, as well as by weather conditions in the short run. Since one can presume that, under the Ancien Régime, the level of population adapted to the level of agricultural production (this opinion is also shared by many writers on political economy from Petty to Cantillon and Mirabeau to Malthus), any short-run fall in output should be reflected in an increase in agricultural prices.[24] Under these conditions, variations in the price of grain would be chiefly determined by weather conditions. Every meteorological catastrophe produces a strong surge in prices. For these reasons, the freedom of trade must be limited otherwise the surge in prices would be more important owing to merchant's speculations. Merchants would indeed take advantage of such a situation. Moreover, supporters of police also assumed that any trend rise in price did not have a positive impact on the potential for agricultural production, which was

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23 ---------- For these writers agriculture was the foundation of the production of manufactured wealth. Among them are Herbert (1753: 1; 1755: 1-2), Forbonnais (1754a: 552) and of course Quesnay and other Physiocratic writers.

24 ---------- According the King-Davenant law, grain prices are very sensitive to quantities. Any decline in supply creates a more than proportional increase in price.

thought to be stable in the medium term. Instead, they considered that such a price rise would destabilise the social order and hinder economic growth by making all goods more expensive. Following a poor harvest, a rise in the price of corn would have harmful short and medium term effects upon the production of manufactured goods, and upon economic growth.

By contrast, for those in favour of the liberalization of the grain market, the volatility of grain prices would be limited by free trade. Bad harvests following bad meteorological conditions would admittedly generate a rise in prices, but a limited one thanks to exchanges of grain between geographical areas permitted by the free circulation of grain. Moreover, according to them, this lesser volatility and also a tendency of a smooth increase of the grain price over a long period would stimulate production. Indeed, production is mostly determined by grain prices in the preceding years. Over the long run we could therefore establish a positive relationship between the increase in the average price over several years and an increase in the volume of grain production. According to the proponents of liberalization, this growth in grain output would in addition have a positive impact upon the production of other goods, and so upon economic growth in general.

3. Empirical Analysis

In order to test these positions empirically we examine fluctuations in the corn price using various econometric methods. We seek to reveal the factors that determined the level as well as the volatility in grain prices. That is the reason why we test the possible relationships between rents, wages and the price of grain. We also examine the influence of the regulation of trade. By present-day standards, the data available for the eighteenth century are scarce and incomplete. Even more problematic is the fact that several important statistical series are missing, especially those relating to agricultural production and GDP.

We try to address these pitfalls as follows. First, it should be noted that from 1726 to 1789 Ancien Régime France benefited from an unusually long period of political stability, together with monetary stability and relatively unchanging techniques of production (Labrousse 1933: xv). This stability does help our study, in that we can focus attention on the functioning of agricultural markets as such.

Second, from 1756 to 1790 the royal administration set up "subsistence tables" so that they might follow the impact of fluctuations in cereal prices. We can also make use of this reliable information regarding the fluctuations of corn prices during that period.

Lastly, the most serious deficiency of our inquiry is the lack of data regarding corn production in Ancien Régime France. However, aggregate data are available for the nineteenth century. Could we make use of this information relating to the nineteenth century to assess our results concerning Ancien Régime France? Labrousse (1970b) makes use of the statistics available during the nineteenth century to evaluate agricultural returns during the eighteenth century. Labrousse referred to Morineau's work to argue for "a parity between the figures of the eighteenth century and those of the great inquiry of the nineteenth century [i.e. of 1840]" (Labrousse 1970b: 444).[25] Indeed, Morineau (1971) established that there was no agricultural revolution, or at least a very slow one, until the later nineteenth century. He establishes in particular that the statistics provided in the 1840 campaign sustain the argument of the lack of agricultural take-off before that time. Labrousse also argues that "contemporaries did not feel a significant change of this kind" (Labrousse 1970b: 445). Moriceau (1994) seems to make a similar case. For him, there was probably a break around 1750 regarding acceleration and the generalisation of agricultural innovations. But this agricultural take-off took about a century to fully disseminate. Before 1880, one cannot speak of a general transformation of methods of cultivation, nor of productivity (Moriceau 1994: 63). There might not have been a revolution, but there was a slow evolution during the eighteenth an nineteenth centuries. Since agricultural take-off came relatively lately in Ancien Régime France we will make use of the data available for the nineteenth century, but only up to 1890.

Following this, our analysis is in three parts. In what follows we will first present our data set. We present our statistical results in the second section, and our methodology in the third. The last section provides the interpretation of our results.

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[25] According to Hobsbawm (1962), it could be said that the French Revolution of 1789 was mainly a political revolution that did not bring about any major change in the pattern of accumulation prevailing during the Ancien Régime.

3.1 The Data

To study fluctuations in the price of wheat in France under the Ancien Régime we constructed our own database, drawing upon several sources that have until now remained unused.

First, we focus on the Parisian area during the eighteenth and nineteenth centuries, while in a second part we extend the analysis to the whole of France. We did not consider the period 1789-1815 because of its political instability. Moreover, as for wheat production, the Paris region seems to have been one of the most productive (Convert 1901), so that we can assume that the Parisian market is a significant indicator of the French market, Paris being the capital city that tended to attract grain from all provinces.

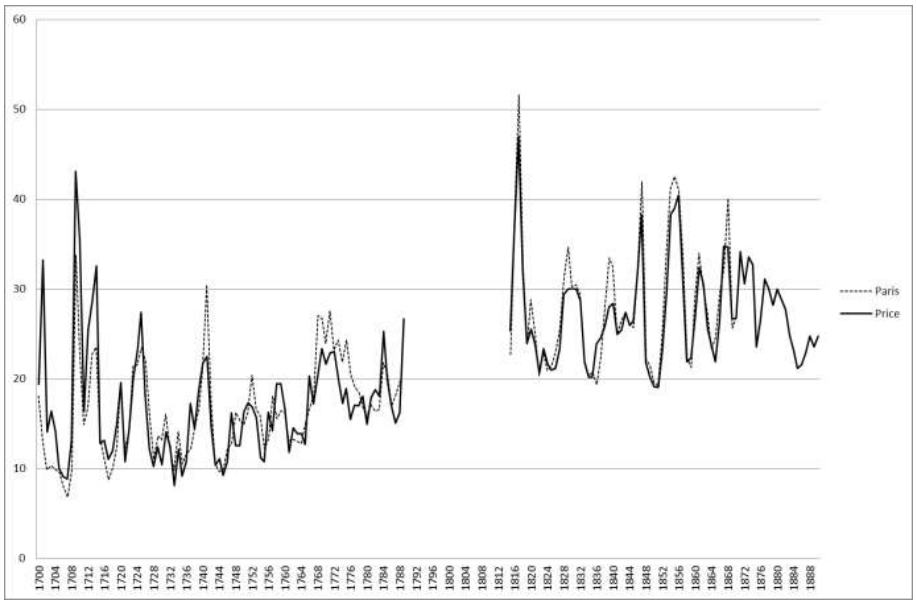
We first detail the sources for Paris, then we present the data sources for France.

The price of wheat – for the eighteenth century, the Parisian data is taken from an article by Baulant (1968) who assembled the path taken by the price of wheat in France at Les Halles in Paris from 1431 to 1789. During the period 1700-1788, quantities were measured in *setiers*, 1 *setier* being about 120 Kg. of grain.[26] Prices were an average of the four seasons, given as *livre tournoi* (1 French germinal franc = 1.0125 LT). From 1815 to 1870 the data comes from Labrousse et al. (1970), and gives the annual average price for a hectolitre (1hl is worth about 75Kg depending on the humidity level) of wheat in francs for the French Department "Seine".

Our final series therefore presents an estimate for the price of a *quintal* of wheat in *francs* from 1700 to 1870 (Fig. 1). The first part of our series has been verified and corrected by Baulant (1968) from many data sources. She provided a reliable series in *livre tournoi* (nominal value). After the Restauration, series are in franc with the official equivalence 1LT= 0,987 franc. This exchange rate rests on a "silver-metal" equivalence based on 4.5g of silver, that is to say 1F=1.0125LT=4.5g silver. This equivalence was in force until 1914.

26 ---------- Although as noted above a *setier* is a measure of volume, not of weight.

Fig. 1 Price of Wheat in Paris 1700-1890 (per *quintal* in *franc*)



For the period 1700-1789 we also use the data from the *Mercuriales* published by Dupâquier, Lachiver and Meuvret (1968) which provide for each year a summary price for each trimester (Spring, Day of St. John (24 June), Martinmas & Christmas) in two different markets (Pontoise, and where data is missing, Chaumont. (Appendix 1)

Finally, for the period 1815-1870, we use the monthly data published in Labrousse et al. (1970), who provide the monthly price of a Hectolitre of wheat in francs (Appendix 2).

From this seasonal series we estimate annual volatility (Fig. 2) of the prices of wheat and oats. We also calculate the volatility during various sub-periods in order to study the impact of free trade (Table 1).

Fig. 2 Annual volatility in Parisian prices of wheat and oats 1700-1870

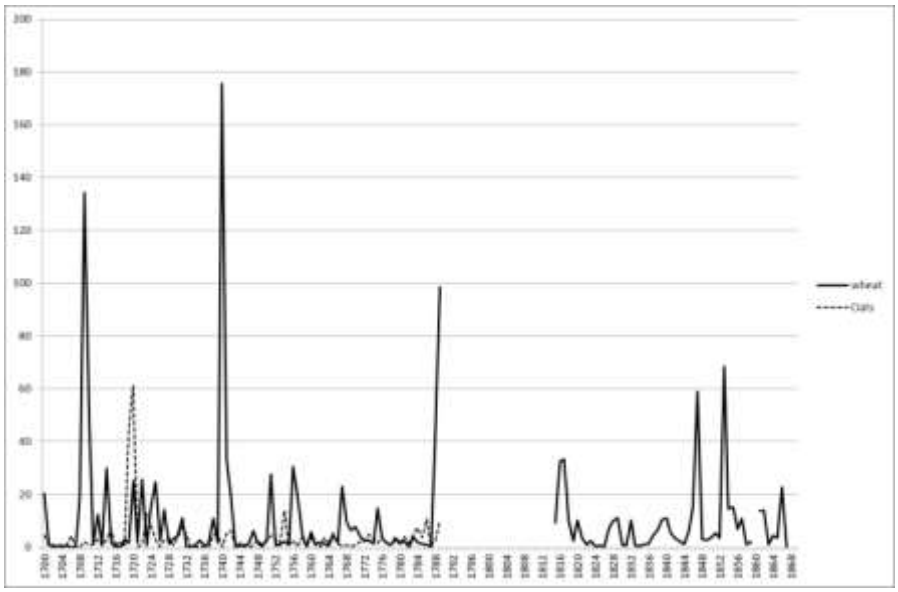


Table 1 Volatility and Free Trade for Paris and France

		France	Paris	
	Description	**Wheat**	**Wheat**	**Oats**
1700-1763	No free trade	-	52,45	13,09
1764-1770	Domestic and partial international free trade	-	39,64	3,46
1771-1774	No free trade	-	5,10	4,34
1775-1776	Domestic and partial international free trade	-	18,05	2,71
1777-1787	No free trade	-	6,15	8,45
1815-1852	Domestic free trade	22.95	34,59	
1853-1870	Domestic and international free trade	17.41	41,26	

Rent of land – For the period 1700-1788 we use the annual index of real land rentals in the Parisian area provided by Leroy-Ladurie and Veyrassat-Herren (1968) (Appendix 3). *Wages* - We use the wages of bricklayers in Paris and Strasbourg since the work was the same from town to town, and because variations in the pay of bricklayers were relatively small over time. Moreover, the prices prevailing in these two cities followed a similar path (Mestayer 1963). From 1700 to 1726 we use the nominal daily wage in Paris calculated in sous tournoi (1 LT = 20 ST) as presented in Baulant (1971); from 1727 to 1789 and for the period 1815-1870, we use the data assembled by Hanauer (1875) which gives the wage in francs in Strasbourg. Our final series provides an

estimate of the wage of bricklayers in sous tournois for the period 1700-1870 (Appendix 4).

Annual rainfall in Paris – We have reconstructed from different sources a series for annual rainfall in Paris for the years 1700-1890. For the sub-period 1700-1754 the data comes from Cotte (1774); in this period the quantity of rainfall was measured in *lignes* (1 *ligne* = 2.256 cm.); for the periods 1773 to 1788 and 1815 to 1890 the data comes from INSEE (1951) and are given in millimetres (Appendix 5).

For the entire France, data used are detailed in the table 2.

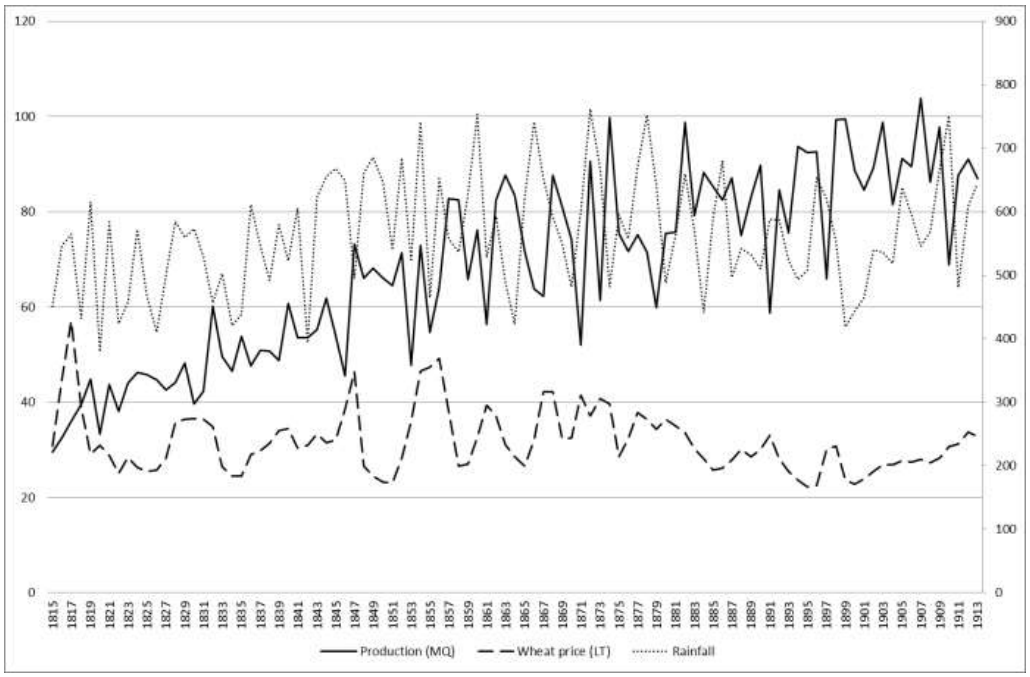
Table 2 Data for the entire France

Variable	Period	Description of the data	Sources
Wheat price	1700-1789	Annual Wheat Price per hectolitre in francs	D'Avenel, T2 (1894)
	1815-1890	Annual Wheat Price per quintal in francs	INSEE (1951)
Land rentals	1700-1890	Annual index of nominal land rentals with 1905 as the base year (Appendix 6)	Rouzet (2005)
Wages	1700-1890	Annual index of nominal wages with 1905 as the base year (Appendix 6)	Rouzet (2005)
Annual Rainfall	1700-1789	Annual rainfall in Paris	Cotte [1700-1754] INSEE [1773-1789]
	1815-1890		INSEE (1951)
Wheat Production	1815-1890	Production in millions of quintals	INSEE (1951)
Price Volatility	1815-1890	Monthly price of an Hl of wheat in francs	Labrousse et al. (1970)

Annual output of wheat – We use the data published by INSEE (1951), which gives annual production in millions of quintals for the years 1815 to 1913 (Fig. 3).

Other prices – We compare the price of wheat with the prices of other manufactured products, such as tallow for candles, wool and linen. The price series covers the period 1726-1913. For the period 1726-1789, data comes from Labrousse's price index (1933). Labrousse's figures have a base of 100 for the period 1771-1789 (Appendix 7). For the period 1820-1913, prices come from INSEE (1951) and are given in francs (Appendix 8).

Fig. 3 French Output, Parisian rainfall and the price of wheat 1815-1913



3.2 Methodology

Our analysis is in two parts. First we study non-structural relationships and especially Granger's causality links. Then we focus our analysis on shocks and the outlier methodology.

3.2.1 Non structural analysis

Granger's causality requires that we work within the framework of the non-structural Vector Autoregressive Model (VAR), introduced into historical research by Eckstein *et al.* (1984). According to them, "*The methodology of vector autoregression appears useful for studying historical series on climatic, economic and demographic variables where we do not yet have a sufficient theoretical foundation for specifying and estimating structural models*". (Eckstein et al. 1984: 295). Causality is often used in the analysis of the agricultural prices (Chevet & Saint-Amour, 1991; Gilbert, 2010) and they appear as useful tool in history (Grenier, 1995).

Non-structural VAR models have the advantage of taking into account the intrinsic structure of the series and the dynamic effects between variables, offering more reliable

analyses at the dynamic level than traditional models.[27] They also offer the possibility of considering all causal relationships between variables without *a priori* considering their potential endogeneity. In a VAR model variables are both exogenous and endogenous.[28]

Despite their historical opposition there is a link between the non-structural and the structural model, and it is easy to move from one to another (Monfort and Rabemanajara 1990, Hendry and Mizon 1993). In such models each equation describes the evolution of a variable as a function of its own lagged values and of the lagged values of other variables of the system[29].

The use of this type of model requires a prior test for various assumptions. First of all, it is necessary to work with stationary variables. Therefore we use the unit root test of Elliott, Rothenberg and Stock (1996) – that is considered more efficient (Salanié 1999) than the classic test of Dickey-Fuller (1979). Once variables are stationary, we select the optimal number of lags, which need to be sufficiently large for residuals to become white noise. Several criteria contribute to the determination of optimal lags. All of them are based on the maximization of the log-likelihood function. Next the presence of cointegration relationship(s) has to be tested (Engle and Granger 1987, 1991) and if necessary corrected (Vector Error Correction Model) in order to avoid any problem of fallacious regressions (Granger and Newbold 1976). To do this we use the Johansen test (1988). Variables are said to be cointegrated if they exhibit long-run stable relationship(s), that is, if they share common trends.

It is then possible to consider the dynamic analysis and the causality analysis (short term relationship). There are two approaches to causality (Granger, 1969; Sims, 1980), which are generally equivalent (Bruneau 1996). We choose here a Granger test (1969). The main difference between correlation and causality is the temporality. Granger-Sims causality relies on the fundamental axiom that '*the past and present may cause the future, but the future cannot cause the past*' (Granger, 1980, p. 330). It is the temporal ordering that allows dependence to be interpreted as a causal relationship (Kuersteiner, 2010). It can be explained by the fact that correlation is a symmetric

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[27] The intrinsic structure of the series is related to its identification in the ARIMA classification (Box and Jenkins, 1976); this methodology has been applied to the price of wheat by Chevet and Saint-Amour (1991) in order to analyse to market integration during the nineteenth century.

[28] Non-structural VAR models are sometimes criticised for requiring a number of variables matching the degree of freedom to be included in the model so as to avoid estimation problems (Johnston 1999), and for the lack of any theoretical foundation.

[29] For the reader interested in the presentation of the VAR methodology, see Boyer, Jaoul-Grammare and Rivot (2017).

concept without information about the direction of influence, whereas the causal direction can be established through 'the arrow of time' (Granger, 1980, p. 349).

To study the direction and sign of causality we investigate how the variable in which we are interested reacts when a change occurs in the second variable.

These developments are studied in depth by dynamic analysis, which considers the effects of exogenous variables on endogenous variables. Although VAR models consider all the variables exogenous and/or endogenous, the dynamic analysis requires that innovations be considered as exogenous variables. The simulation of shocks on innovations for each variable helps us to understand how (impulse response function), and to what extent/proportion (variance decomposition), other variables are affected. In other words, we observe how a simulated shock on the variable X affects the variable Y.

3.2.2. Shock analysis

As an extension of the causality pattern, we introduce here an alternative econometric technique for shock analysis: the methodology of outliers.[30] It consists in the detection of atypical points affecting the evolution of a time series. Contrary to the VAR analysis where shocks are simulated, the outliers methodology relies on real shocks; it is therefore more suitable for historical analysis.

In this paper, three main outliers are classified as:

– ---Additive Outliers (AO) that affect only a single observation at some points in a time series, and not its future values.

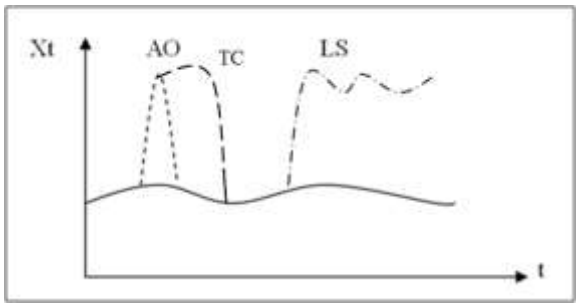
– ---Level Shifts (LS) that increase or decrease all the observations from a certain time point onward by some constant amount.

– ---Temporary Changes (TC) that allow an abrupt increase or decrease in the level of a series which then returns to its previous level rapidly and exponentially.

It is considered that AOs are outliers that are related to exogenous and endogenous changes respectively in the series, and that TCs and LSs are more in the nature of structural changes. TCs represent ephemeral shifts in a series, whereas LSs are more the reflection of permanent shocks (Figure 4).

30 ---------- For the reader interested in the complete mathematical and statistical presentation of the outlier methodology, please see Darné and Diebolt (2004, 2006).

Fig. 4 Different outliers impact on a time serie Xt



3.3. Results

To avoid the French Revolution distorting our findings unduly we analysed two different periods: firstly 1700-1789, and secondly 1815-1890 (1870 for Paris). For each sub-period we first test bivariate causality relationships; when causality tests highlight many bivariate relationships we build a global model, taking into account the different variables. We then present the variance decomposition (the degree of the variance of one variable due to the variations of another) and we analyse what the reaction of a variable is when a positive shock is simulated on other ones (impulse responses).

3.3.1. Causality analysis

First of all, it must be noted that ERS unit root tests establish that, whatever the period, the wheat price in France is a stationary process;[31] for the Parisian market, tests reveal a TS process for the eighteenth century (with a slight positive trend) and a stationary process for the nineteenth century.[32]

Secondly, Johansen tests show that there is no cointegration between variables; this means that there is no long-run stable relationship between the wheat price and other variables. This underlines the importance of the historical and economic context in the development of the series; this context generates events conditioning the evolution of the series (Darné and Diebolt, 2006).

Causality results (short term relationship) show that the path of the Parisian wheat price is influenced by one component: the annual rainfall (Table 3).

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31 ---------- For the period 1700-1789 tests indicate that rainfall in France is a TS process; rentals and wage indexes are DS processes, but they are no cointegrated. For the period 1815-1890, we find the same results, except for wages, which appear as a mixed process (DS and TS).

32 ---------- For the period 1700-1788 ERS tests and the Johansen test highlight the same results for Paris as for France; for the period 1815-1870, rainfall and wages are TS processes, whereas rent appears as a DS process.

Whatever the period, the annual amount of rainfall has a positive causal impact upon the wheat price; this means that the rainfall and the wheat prices follow a similar pattern: an increase in annual rainfall implies an increase in wheat prices. Indeed, a rainy year implies lower production, and so an increase in prices. On the contrary, a drought implies a decrease in prices.

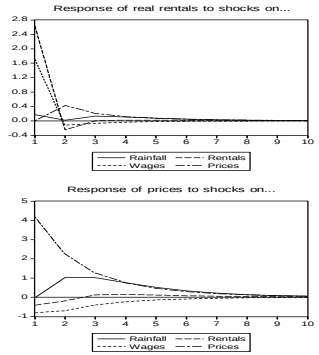
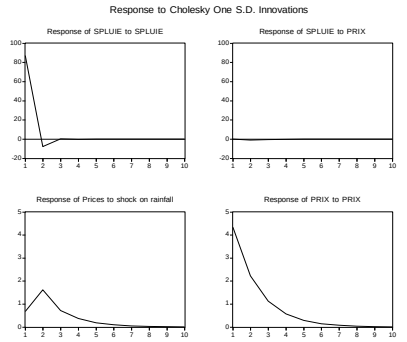
During the eighteenth century it appears that an increase in prices essentially benefits real land rentals. Indeed, we underline a positive causal effect from prices to land rentals: an increase in prices implies an increase in rentals. However, this influence is quite small (2.3%).

This is confirmed by the analysis of France as a whole (Table 4), combining wheat prices, annual wheat production and annual rainfall over the period 1815-1880, showing that the rainfall affects the wheat price through its effect upon output.

What can be established for the second period (because of a lack of data before 1815) is that the second variable influencing the wheat price is agricultural rents. However, this relationship only appears in a bivariate model, and when we take into account the previous ten years; so it cannot be considered robust.[33]

33 ---------- When we take into account all variables all the relationships remain, whereas the relationship from rent to prices disappears; this is due to the optimal lag chosen to build the model. In all bivariate models the optimal lag equals 2, whereas in the global model the optimal lag is 1. This underlines the weakness of this relationship.

Table 3 Causality analysis and variance decomposition for Paris

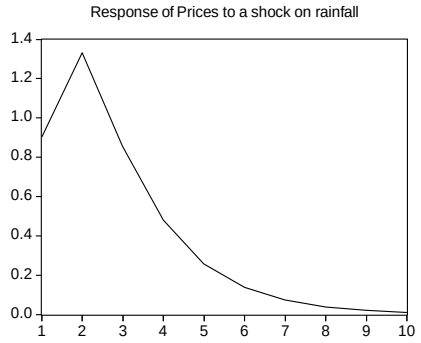
Period	Variables	Causality relationships	Variance	Impulse response
1700-1788	Wheat price, annual rainfall, real land rentals, nominal wages[34]	Rainfall (+)→Wheat price (+)→ Land Rentals (1) (2)	(1) 10%* (2) 2.3%**	
1815-1870	Wheat price and wages	No relationship		
	Wheat price and annual rainfall	Rainfall (+) → Wheat price	13%	

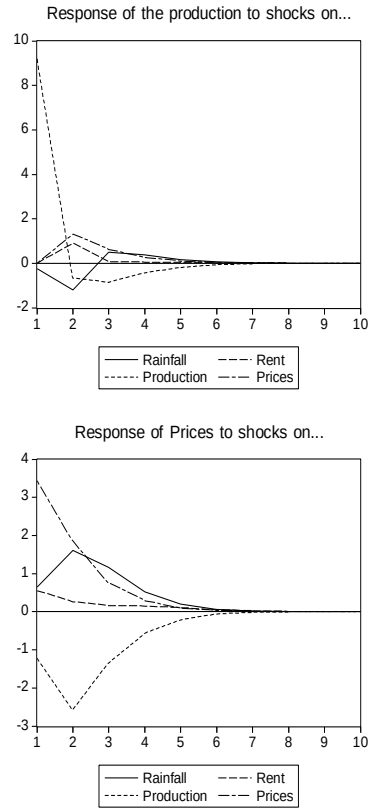
* 10% of the wheat price variance comes from variations in annual rainfall

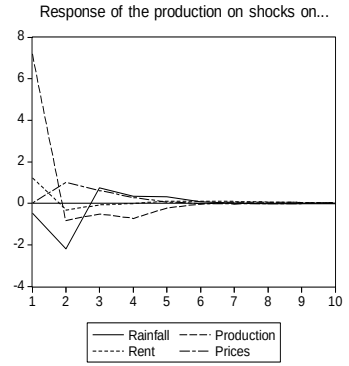
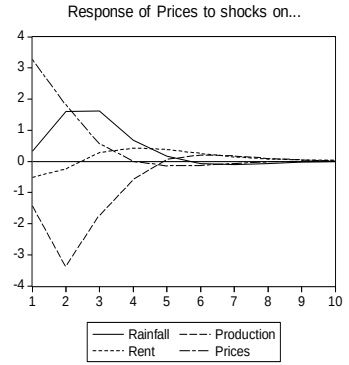
**2.3% of the land rentals variance comes from variations of the wheat prices

34 ---------- Granger tests on bivariate causal relationships show that i) there is a positive causal relationship from rainfall to prices; ii) there is a positive causal relationship from prices to real land rentals; and iii) there is no relationship between wages and prices. Therefore we build a global model taking into account rainfall, wheat prices and real land rentals.

Table 4. Causality analysis and variance decomposition for France

Period	Variables	Causality relationships	Variance	Impulse response
1700-1789	Wheat price and nominal wages ; Wheat price and nominal rent	No relationship		
	Wheat price and Parisian annual rainfall	Rainfall (+) →Wheat price	14%**	
1815-1890	Wheat price and annual rainfall	Rainfall (+) → Wheat price	16%	
	Wheat price and nominal rent	Rent(+) → Wheat price	[7% ; 20%)	
	Price and	Price (+)→ production	7%	

	production	Production (-) → Wheat price	31%	
	Wheat price and nominal wages index	No relationship		
	Rainfall, rent, production and wheat price	Rainfall (+)→ Price (+)→Production (-)	Price variations are due to 33% of the variations of the production, 15% of those of the rainfall and of 1.3% of those of the rent	

1815-1880	Rainfall, rent, production and wheat price	Rainfall (-) →Production + - Price	Price variations are due to 44% of the variations of production, 15% of those of rainfall and of 2% of those of rent; 9% of the production variations are due to rainfall.	 

3.3.2. Outliers detection

We complete our study with outlier analysis on the wheat price series (Tables 4 and 5) and on its volatility (Tables 6 and 7). Contrary to the previous shock analysis, here shocks are not simulated: they are real.

This analysis seems to confirm our previous results concerning the impact of meteorological variables on wheat prices. Even if the causality analysis does not show an impact of temperature on wheat price, it does seem that colder winters have a significant impact on wheat price. According to Le Roy-Ladurie (1960), cold winters favour wheat production, except for very cold winters. However, a rainy winter is always unfavourable to production. In the Seine and Oise "the normal winter being 3.8 degrees, the years when the winter temperature was less than 3 degrees were succeeded by large harvests, while those where the winter temperature was more than 5 degrees were followed by poor harvests". (Sanson 1929: 458) By contrast, a rainy winter has a very bad impact upon the following harvest.[35] According to meteorologists, 1708-1709 is one of the coldest winters (Legrand and Legoff 1987).[36] The winter of 1708-1709 was very cold and rainy, and there were 29,300 deaths in Paris. On 6 January 1709 the temperature fell below -15°C and remained there for 11 days. On 13, 14 and 18 January temperatures fell to under -18°C, and reached -21°C on 13 January. Snow fell on the 8, 11, 12 and 15 January. The thaw began around 25 January and it also began to rain. At the beginning of February 1709 and at the end of that month two new cold spells struck France (the temperature reached -13.5°C on 24 February); during the intervening period it was warmer, with temperatures higher than 12°C. This alternation of frost and thaw was catastrophic for plants,[37] and especially for crops (Cotte, 1774).

Table 4 Outliers detection for Parisian wheat prices

Year	Type	Value	Effect	Event
1709	TC	1.2	Temporary	Very cold winter*

*Rousseau (2013)

35 ---------- In France less than 540 hours of sunshine in spring and a temperature of less than 9 degrees can have an adverse impact upon the harvest (Sanson 1929: 34).

36 ---------- A hard winter is considered to be one with an average temperature below 2 degrees Celsius, and with more than 40 days of frost.

37 ---------- Following the winter of 1709 almost all French vineyards were destroyed, except those in the Mediterranean region.

Table 5 Outliers detection for French wheat prices

Year	Type	Value	Effect	Event
1709	TC	1.2	Temporary	Very cold winter*
1848	LS	-0.58	Permanent	Revolution

*Rousseau (2013)

Table 6 Outlier detection in the volatility of Parisian annual wheat prices

Year	Type	Value	Effect	Event
1709	AO	127.2	Temporary	Very cold winter*
1710	AO	43.2	Temporary	
1740	AO	169.2	Temporary	Very cold winter*
1788	AO	38.8	Temporary	
1816	TC	28.2	Temporary	
1847	AO	52.3	Temporary	Very cold winter*
1853	AO	59.8	Temporary	Free Trade
1866	AO	20.2	Temporary	

*Rousseau (2013)

Table 7 Outlier detection in the volatility of French annual wheat prices

Year	**Type**	**Value**	**Effect**	**Event**
1816	TC	10.7	Temporary	
1817	AO	16.5	Temporary	
1832	AO	7.7	Temporary	
1847	AO	**47.5**	Temporary	Very cold winter*
1853	AO	24.3	Temporary	
1854	TC	3.4	Temporary	
1857	AO	16.3	Temporary	
1866	AO	7.01	Temporary	
1868	AO	17.5	Temporary	
1873	AO	4.5	Temporary	
1874	AO	22.03	Temporary	

*Rousseau (2013)

3.4. Interpretation

According to Le Roy Ladurie (1966, 1977) Ancien Régime France was an economy without growth. There were many reasons for stagnation, and it has been the object of many studies.[38] The Malthusian idea that wages and population were related inversely has been employed to explain this absence of economic growth, demographic growth

[38] See for example Labrousse (1933), Hobsbawm (1962), Kaplan (1976) and Hoffman (1996).

being used to explain the absence of economic growth. It would also be possible to cite the inherent defects of the institutional structure of Ancien Régime France: a society based upon rental payments, with an inefficient fiscal system, with individual initiative discouraged in the productive sphere. The low level of agricultural surplus and the associated low level of capital accumulation likewise would explain the limits to economic growth.

---------- Our idea is that behind the debate of the 1750s between the proponents of the "grain police" and their opponents, one can find an issue regarding the growth pattern of a pre-capitalist society. The grain price was of such critical concern to contemporary political authority that it was the subject of very detailed studies by the King's inspectors (Kaplan 1976). It must therefore be possible to isolate traits particularly characteristic of a precapitalist economy and which can be used as explanatory factors for the absence of growth that was observed in Ancien Régime France.

Our discussion of the results presented below will turn on two questions: first, the specific question of volatility in wheat prices, and the role played by regulations (police or free trade); second, a causal explanation of the price of wheat. For each of these questions we will try to evaluate the positions taken by the partisans of grain police and by their adversaries, those who advocated a free market in grains.

3.4.1. Volatility in the Wheat Price and the Question of Free Trade

As we have shown, climatic conditions had a very marked impact upon the price of wheat. Accordingly, we should consider the possibility that this very strong volatility in the price of wheat reflects above all the speculative activities of sellers able to wait until the end of the season (the notorious gap between two years of harvest) so that they could benefit from very high prices in the years following poor harvests. The phenomenon of stock-building alternating with running stocks down tended to accentuate price fluctuations which would in turn make supply relatively inelastic, although in a more moderated form.

This point seems to support the arguments made by writers like Boisguilbert (1695, 1705) or Delamare (1705) when they pointed to this highly speculative character of grain markets. For the final consumer who had no substitute at his or her disposal, and who was not able to build stocks during periods of low prices; for the small cultivator, the small farmer or the small landowner unable to wait for prices to rise

towards the end of the season to sell his crop at the best price (following a poor harvest), or not able to wait for prices to rise and build stocks while prices were low (as happened when output was higher and meteorological conditions good) – for all these parties price fluctuations were extremely harmful to their living standards, in both relative and absolute terms. It was the largest landowners and major merchants who were in a position to speculate on variations in prices by stocking up or selling off stocks, and who did therefore benefit from this volatility.

What about the opening up of trade? Did the free circulation of wheat, both domestic and external, contribute to price stabilisation? Here, the issue seems to be far from definitely settled. It is from 1700 to 1763 that the volatility in the price of wheat is the greatest. The domestic and partial international free trade that follows from 1764 to 1770 significantly dampens the volatility of prices. But for the other periods, just the reverse is true: barriers to trade dampen the price fluctuations during the periods 1771-74 and 1777-87. Strikingly, the volatility is higher after 1815 than during the pre-revolutionary period.

Depending on the periods considered, our results tend to confirm or to invalidate the argument that free trade would have little impact upon the reduction of short-run price volatility during the Ancien Régime and into the nineteenth century. As it is shown in Table 1, the first period in which trade was liberalised (1764-70) was linked to reductions in price volatility, especially when liberalisation included foreign trade. But for latter periods, fluctuations are lower when the market is regulated. In fact, for the last periods our statistical results seem to provide support for the arguments advanced by supporters of grain police.

We can conclude finally that grain regulation was not of critical significance in Ancien Régime France. Instead, we find that volatility, but also perhaps the entire organisation of grain production and marketing, were essentially dependant on meteorological conditions. And so the question now is: what are the factors that explain the price of grain?

3.4.2. Factors Explaining the Price of Grain

Unfortunately, there are no figures available for agricultural production in Ancien Régime France; statistics were only collected for the prices in different markets, entirely ignoring the information that could have been collected about the volumes transacted. For the Pontoise market, for instance, statistics were collected, but only from 1752 to 1761. The royal authorities were less concerned in collecting information related to fluctuations in agricultural production than they were about the volatility and heterogeneity of prices prevailing in different markets.[39] We do nevertheless have aggregated data on the production of wheat for France from 1815 onwards, data that we use to test the arguments advanced by those participating in a debate that took place during a later period.

During the long period of the Ancien Régime (from 1700 to 1789) our analysis of causality, our decomposition of variance, as well as the analysis of the atypical intervals discussed in the preceding section demonstrates the way in which the price of wheat depended very strongly on climatic conditions, especially that of rainfall. Except for especially harsh winters, it is primarily the quantity of rainfall (during spring in particular) that influences price. The causal mechanism runs as follows: meteorological conditions have a determining influence upon production, which in turn determines price. Given the very high degree of inelasticity of demand, adjustments in quantity demanded were quite small because of the crucial role of wheat in the popular diet and the lack of substitutes. This tends to lend support to the arguments of those in favour of grain police, for whom agricultural production was driven mainly by exogenous factors independent of market mechanisms.

All the same, the data which we have for the period after 1815 allows us to modify this perspective a little. Our analysis of the more recent period shows up a more complex relationship than a simple negative impact of rainfall upon production, and a positive impact upon price. While it seems that production influenced price negatively (good harvests led to low prices), prices did have a positive impact upon production. Strikingly, production has a direct impact on the price level, while the latter influences

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39 ---------- "The collection of agricultural statistics, and especially price statistics, was not done by the Inspector General in a disinterested manner: it helped develop an understanding of varying fiscal capacity, about the volume of agricultural production according to harvest conditions and its product, and according to the prices arising. The outturn of the harvest could only be estimated in a very approximate manner; but price conditions reflected with much greater sensitivity and precision, other things being equal, the supply situation together with local production, and they gave an explanation of the emergent surplus from the fluctuations in recorded market prices." (Labrousse 1933: 19)

the former with some delay of about two years (see table 4). There were certainly some incentive effects here of the kind advanced by those who are opposed to structural low prices of grain. High prices encouraged greater effort in production and the adoption of progressive techniques and of more capital, but also the extension of the sown area. In this context, the production of wealth is not entirely depended on meteorological conditions. An endogenous factor, the level of price, played its role and determined agricultural growth.

Regarding the role played by the costs of production, our empirical results show that the price of wheat is influenced neither by wages nor by nominal rent, in the case of Paris as well as for France considered as a whole, until 1880.[40] But yet we have shown that the price has a positive influence on *real* rent in the case of Paris (for which we have data). This positive relationship between the price of wheat and *real* rent is a good reflection of the ability of the landed proprietor to take advantage of his market power in the course of price fluctuations.

4. Conclusions

Our results might be thought tentative and partial. A reader who expects trenchant and unquestionable results will remain disappointed here, since we find neither totally in favour of one or the other side of the debate. The question is therefore whether one should abandon any attempt to test economic reasoning in a long term historical perspective. To put it slightly differently, the issue is whether cliometrics can help us illuminate economic debates, despite the inevitable limitations of such an approach. Our claim is that cliometrics can provide us with significant assistance in testing economic reasoning. More generally, the indications given to us by cliometrics lead us to question the socio-historical frame that has been provided for the emergence of economic debates. Cliometrics can therefore be of real help for historians of economic thought.

In this article we have shown that both the price of grain and grain production were mainly determined by meteorological hazards during the eighteenth and the nineteenth centuries. More precisely, rainfall more than temperature determined both the level of the wheat price and its volatility

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40 ---------- A relation between wage and price also appears, but with a significance of only 11%.

---------- Thanks to our econometric analysis, we have shown that the cost of production was not the essential determinant of grain price. Indeed, during the eighteenth and the nineteenth centuries the price of wheat was neither determined by the nominal rent nor by wages. The fact that meteorological factors still strongly influenced the price of wheat during the nineteenth century is an indication that the dissemination of innovations in the agricultural sector (which would have weakened the relationship between rainfall and price) was very slow, and that grain had as yet no real substitute in popular nutrition. In pre-capitalist systems based upon agriculture the prospects for economic growth were extremely dependent upon exogenous factors.

But yet we have also been able to demonstrate that the output of wheat in Ancien Régime France was positively influenced by prices, with a significant delay that is worth emphasising. The incentive effect of high prices can be seen as a relationship that supports the arguments advanced by those who were in favour of the liberalisation of grain markets, especially the Physiocrats or Herbert. Prices that are too low are not favourable to grain production. High prices provide incentives to produce more.

Our analysis also shows that free trade has a variable impact on the volatility of grain prices. Only in 1764-1770 does free trade clearly limit the volatility - as the opponents of the police of grain supposed it would. But it was not the case just before the Revolution, nor during nineteenth century, when volatility increases with free trade. So, contrary to economic reasoning, free trade is not always a viable solution to limit volatility. Regulations can be a means to limit speculation. Does this mean that grain regulation had no effect at all on volatility, or on prices? Here the issue cannot be finally decided either way, since we do not have precise data on production and on the quantities of grain that circulated (or were prevented from circulating) in Ancien Régime France. If grain regulations had no critical impact on volatility and prices, then our analysis suggests that the grain debate can best be understood as a debate about changing the rules according to which the products of agriculture were shared among the population and between classes. In a pre-capitalist economy where agricultural production is at least around half of all output (Ridolfi 2016), and where grain is a central part of this production, the issue of price fluctuation plays a crucial part in the stability of the social and political system as a whole, and not only for the strictly economic sphere. The prime beneficiaries of such fluctuation have to be identified. The distribution of wealth, as also the market organisation and regulation, were quite

logically the object of class conflict between landowners, farmers but also merchants and urban manufacturers and workers. It is all the more probable that during the period 1726-1789 there was a conflict between classes over the division of the agricultural product. Rentiers captured the greatest part of the rise in the price of wheat, with the average day labourer lagging behind and gaining a smaller proportion of this general rise. Farmers themselves seemed to have benefited the least from this movement; this impeded their ability to accumulate, and was in itself no kind of incentive to expand production.

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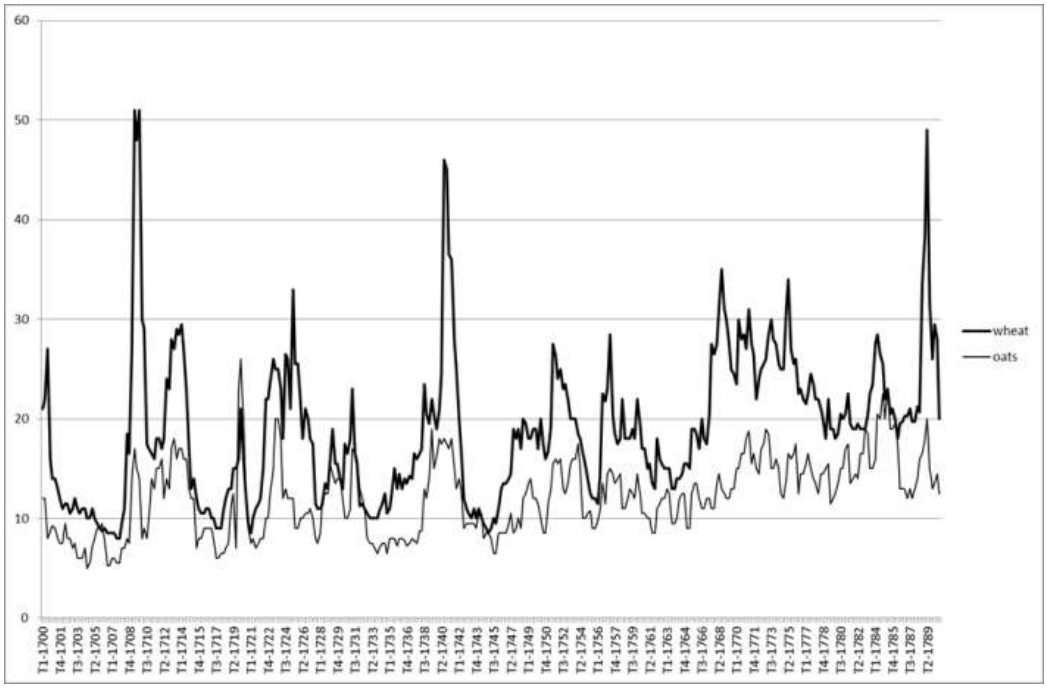
Abstract

During the 1750s the grain debate agitated French opinion and contributed to the creation of the new science of political economy. It was notable as a confrontation between those who defended the regulation of commerce and partisans of free trade. In this paper we test some of the arguments made at that time, using cliometric techniques which we apply to existing data as well as to new, reconstituted data.

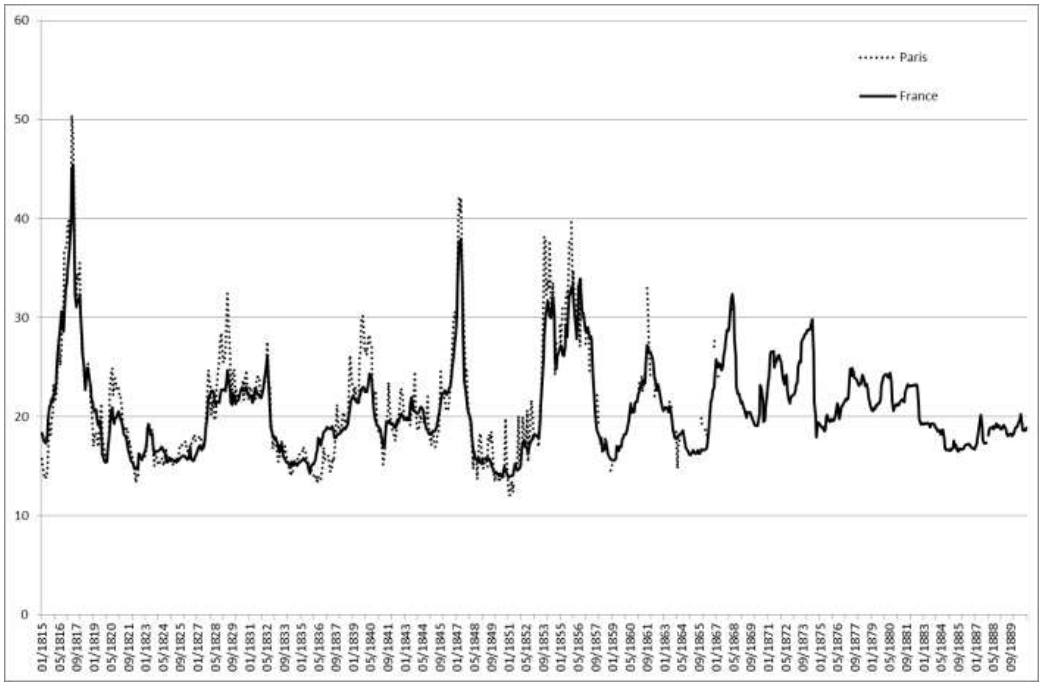
Key words: growth, price of wheat/corn, free trade, the de Gournay circle, Physiocracy, grain police

Appendix

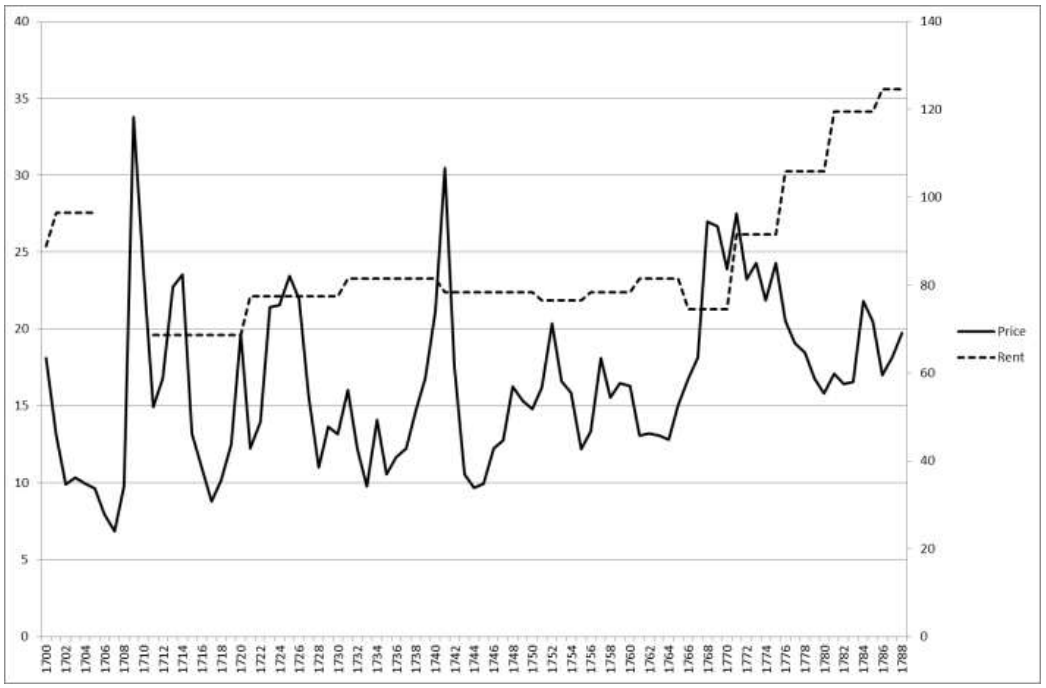
Appendix. 1 Quarterly prices of wheat and oats in Paris 1700-1790 (per *setier* in *livre tournoi*)



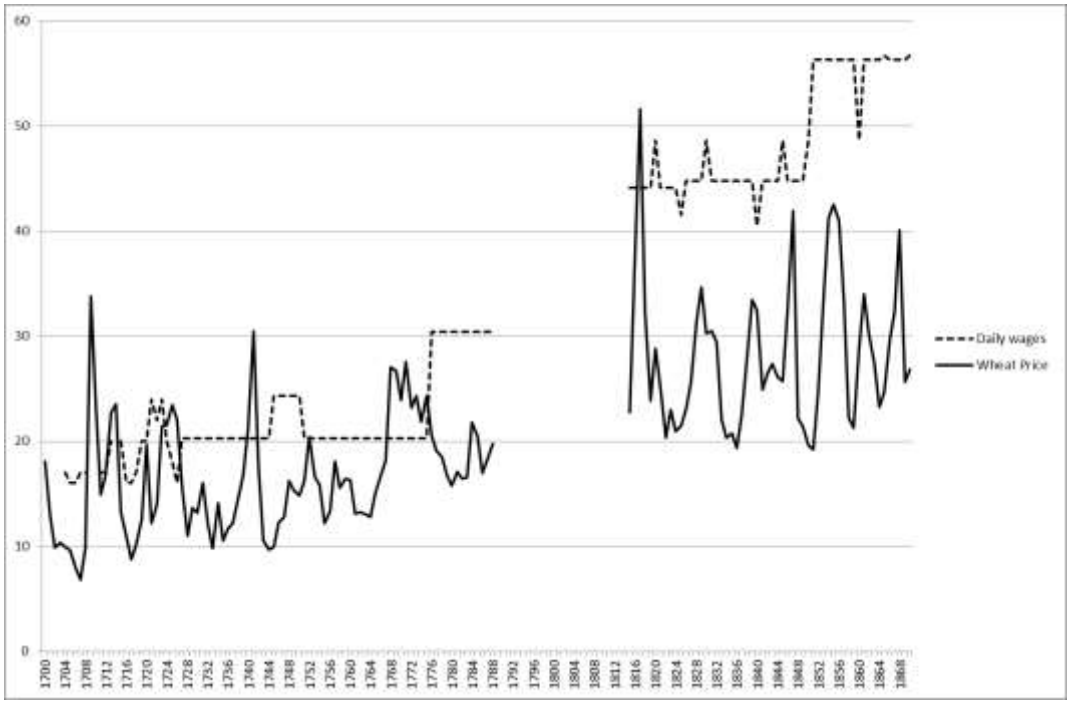
Appendix 2. Monthly wheat prices 1815-1890



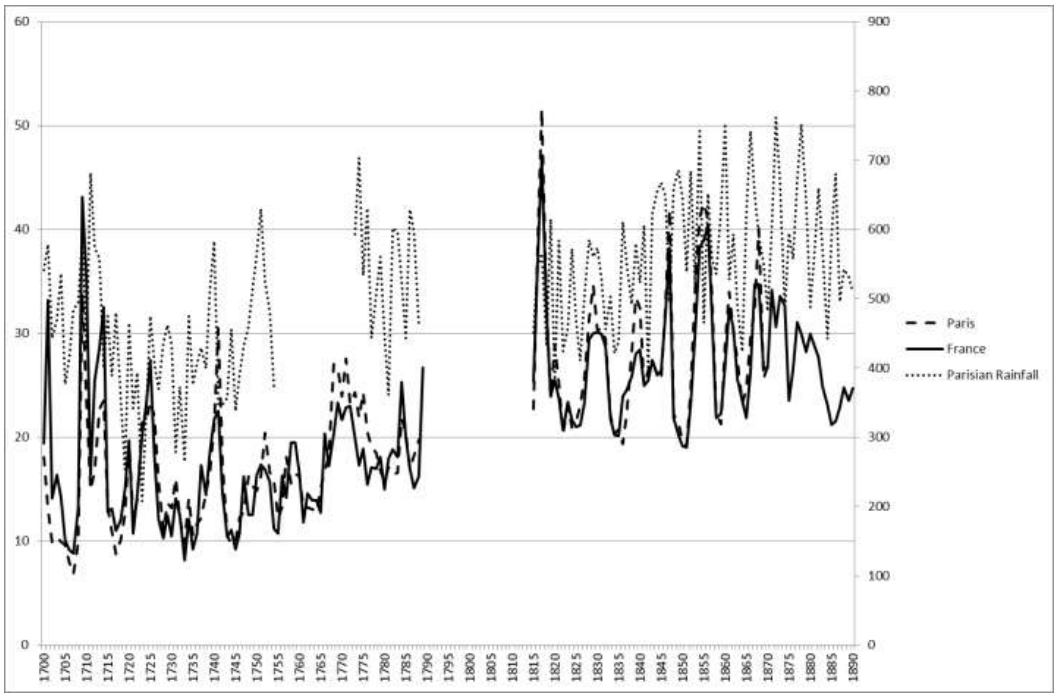
Appendix 3. Prices and annual index of Parisian real land rentals 1700-1788



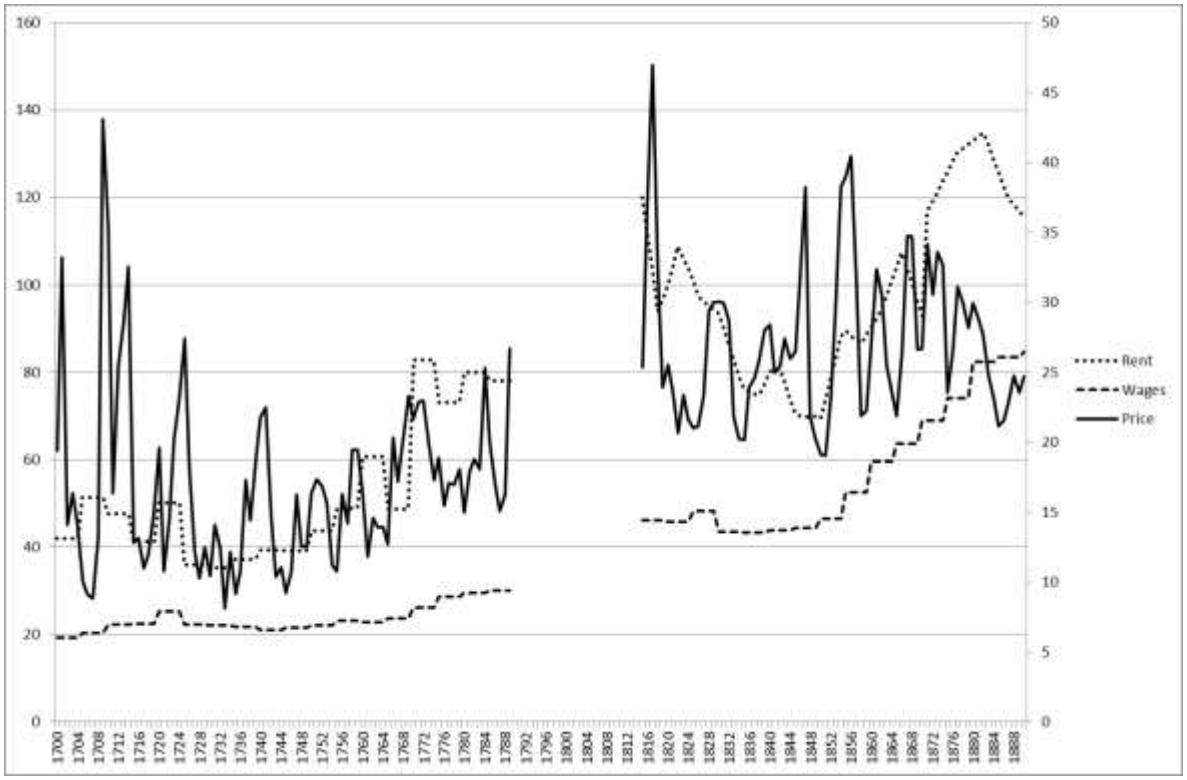
Appendix 4. Wheat prices and wages in Paris 1700-1870



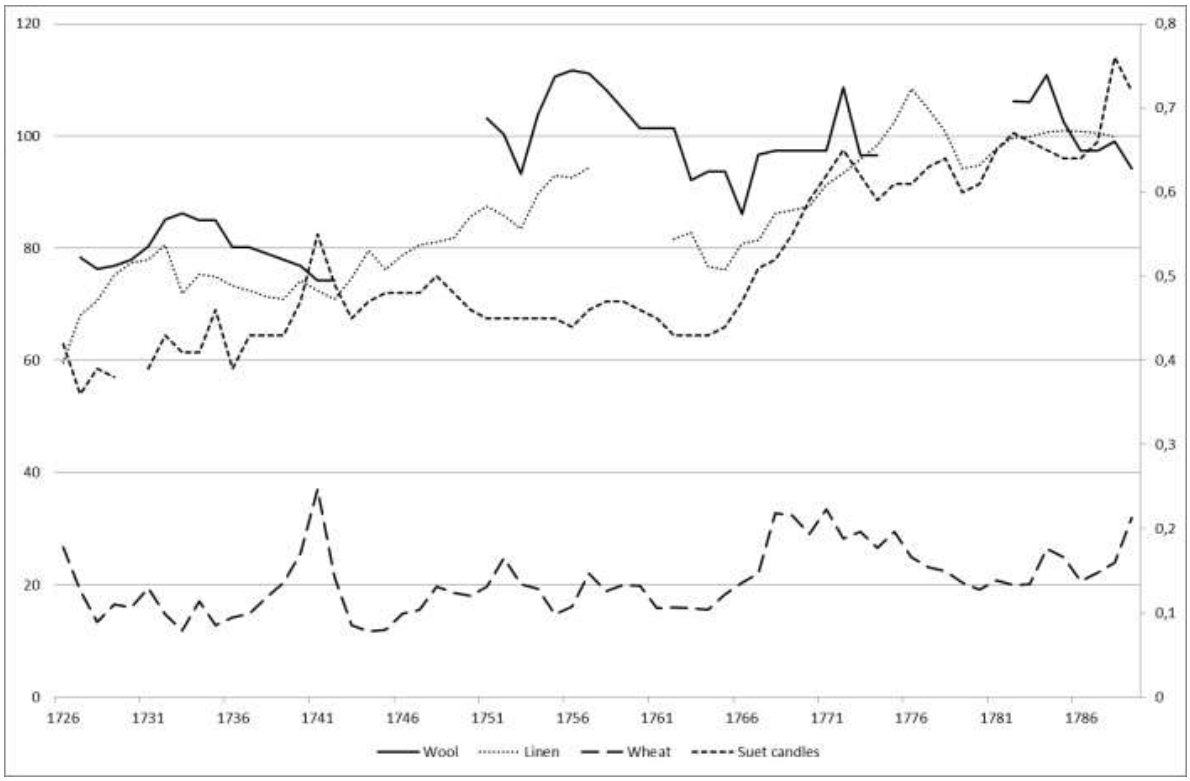
Appendix 5. Wheat prices (in *francs*) and Parisian rainfall (mm.) 1700-1890



Appendix 6. Annual index of nominal land rentals and nominal wages and wheat prices in France 1700-1890



Appendix 7. Price Index 1726-1789



Appendix 8. Prices 1820-1913