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L'histoire immobile? A reappraisal of French economic growth using the demand-side approach, 1280–1850

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We construct a new series of GDP per capita for France for the period 1280–1850 using the demand-side approach. Our estimates point to a long-run stability of the French economy with a very gradual acceleration toward modern economic growth. In comparative perspective, our new estimates suggest that England and France were characterized by similar levels of economic performance until the second half of the seventeenth century. It is only after that period that the English economy "forges ahead" in a consistent way.

1. Introduction

Historians interested in the study of economic performance of preindustrial societies owe a major intellectual debt to Angus Maddison. Before the publication of Maddison (2001, 2003), there were only few scattered estimates of GDP per capita for the period before the eighteenth century. Maddison (2001), even if by means of somewhat speculative methods, produced a comprehensive set of estimates of GDP per capita for a large group of countries which resulted in an intriguing account of the dynamics of economic growth since the end of the Middle Ages (Maddison 2007). Furthermore, this preliminary global quantitative assessment has prompted historians to embark in more refined statistical reconstructions of the long-term evolution of GDP per capita in several countries. These revised estimates have been constructed, on a country-by-country basis, by historians specialist of the sources of the country in question. Concomitantly, there have been also efforts in ensuring a systematic compatibility and integration of these revised country-specific statistical reconstructions, so that they can be used for comparisons both across countries and over time (Bolt and van Zanden 2014, Bolt and van Zanden 2020, Broadberry 2021).[1]

At the European level, the state of the art of this ongoing research agenda is as follows: Broadberry et al. (2015) have provided estimates of GDP per capita for England and Britain for the period 1270–1870, Van Zanden and Van Leeuwen (2012) for Holland for the period 1347–1807, Malanima (2011) for central and northern Italy for the period 1300–1913, Álvarez-Nogal and Prados de la Escosura (2013) for Spain for the period 1270–1850, Pfister (2011) for Germany over the period 1500–1850, Palma and Reis (2019) for Portugal for the period

[1] For an extensive discussion of the recent GDP estimates in the early modern period in global perspective, see Goldstone (2021) and Bolt and Van Zanden (2021).

1527–1850, Schön and Krantz (2012) and Krantz (2017) for Sweden over the period 1300–2000, and Malinowski and Van Zanden (2017) for Poland for the period 1410–1910.[2]

It should be noted that these estimates of GDP per capita have been reconstructed using two different approaches and different kind of data (Fouquet and Broadberry 2015, Broadberry 2021).[3] The series of England and Holland have been, by and large, constructed using a standard "output approach": GDP is computed as the sum of all the outputs of the different sectors of the economy. Clearly, this method involves major efforts of data collection and elaboration. Not surprisingly, therefore, many historians have settled for a less exacting approach, which does not require the systematic measurement of the outputs of all economic activities. The available alternative is an indirect method, usually referred to as "demand side approach" in the literature. The approach consists of two steps. The first step involves the reconstruction of agricultural output using a simple demand function featuring wages and prices. The second step is the estimation of the size of the non-agricultural sector using suitable proxies. The chief advantage of this "indirect" method is that it is essentially based on series of wages and prices which are, for many countries, more easily available than comprehensive direct measures of sectoral outputs. On the other hand, the quantitative reconstructions obtained adopting this indirect approach ought to be regarded, using Paul David's term, as "conjectural estimates" to be progressively improved and refined (David 1967, pp. 157–158), rather than a firm and conclusive picture.

Interestingly enough, notwithstanding the riches of source materials dealing with prices and wages, France has been left at the margins of the ongoing efforts of reconstruction of these "second generation" estimates of GDP per capita. In this paper, we tackle this issue, by providing new estimates of French economic growth over the period 1280–1850 using the demand side approach.[4]

Concerning our understanding of the dynamics of economic performance in pre-industrial Europe, the French case is interesting for two main reasons. The first is that an important historiographical tradition has regarded France as a paradigmatic case of an inherently stagnant economy dominated by Malthusian checks and other institutional and cultural constraints (Le Roy Ladurie 1977). Hence, in this perspective, the French case may perhaps provide new materials for assessing the overall plausibility of the Malthusian model as a suitable empirical characterization of the long-run evolution of living standards in Europe before the industrial revolution.

The second reason is that the current historiography on the origins of modern economic growth in Europe has been informed by the notion of a "Little Divergence". In a nutshell, the "Little Divergence" is a historical phase spanning the period between the fourteenth and eighteenth centuries in which the countries of the North Sea region (England and Holland) forged ahead and firmly overtook in terms of economic performance the rest of the continent, including Italy which so far had been the world economic leader (Allen 2003, De Pleijt and Van Zanden 2016). Overall, the available evidence on GDP per capita (Broadberry 2020) and real wages (Allen 2001), even with some discrepancies in terms of timing, is indeed consistent with the notion that the North Sea region witnessed an economic dynamism

2 The estimates of GDP per capita for Spain have been recently updated (Prados de la Escosura, Álvarez-Nogal, and Santiago-Caballero 2021). The new results are rather consistent with the previous ones.

3 For the case of England, Clark (2010) has also provided estimates of GDP per capita constructed using the so-called "income approach" (GDP is computed as the sum of all property incomes plus wages).

4 Ridolfi (2016) contains some preliminary exploratory estimates. Figure A1.1, online Appendix 1, compares our series with Ridolfi's (2016) estimates.

that had no counterparts elsewhere in Europe. In this context, a fresh assessment of French economic performance, a neighboring country with multiple political, economic, and military interactions with both England and Holland could contribute to shed light on the drivers of this initial phase of modern economic growth by allowing systematic comparisons between the historical experiences of these three countries.[5]

The rest of the paper is organized as follows. In the next section, we provide a concise overview of the historiography on French economic growth in the long run. In Section 3, we introduce the sources and the methods that we use to construct our estimates of GDP per capita. In Section 4, we set out our estimates and we compare them with previous contributions. In Section 5, we consider our reconstruction of GDP per capita in international comparative perspective. Section 6 concludes.

2. Historiographic background

Views on the economic performance of France have curiously oscillated between "pessimism" and "optimism". After the Second World War, the so-called "retardation-stagnation" thesis dominated historical accounts of the emergence of modern economic growth in France (Crouzet 2003). Accordingly, the nineteenth-century French economy was described as essentially stagnant and backward. Adjectives such as "hesitant", "languid", and "modest" were frequently used to describe French growth performance in this period (Crouzet 2003, p. 221), and the search for the retardation factors dominated scholarly debates. Poor entrepreneurship, slow innovation dynamism, backward agricultural practices which delayed structural change, as well as pervasive social conflicts were regarded as drags that delayed industrialization and resulted in modest growth rates of output (Landes 1949, Dunham 1951, Sawyer 1951, Trebilcock 1981). It was argued that France underwent such a gradual transformation that "never went through an industrial revolution" (Clapham 1921) comparable with the English one (Fohlen 1978, Morazé 1957).

The 1960s witnessed the publication of the first comprehensive set of French historical output series and marked an important watershed in French economic history. This research project, led by a team of economists at the ISEA (Institute for Applied Economics), namely Jean Marczewski, Tihomir Markovitch, and Jean-Claude Toutain, was published in various stages between 1961 and 1987. This collective endeavor produced the first series of agricultural (Toutain 1961), industrial (Markovitch 1965), and total output (Toutain 1987) for France since the eighteenth century using direct output measures.[6] Overall, the results painted a far more optimistic picture of French economic growth than previously thought. Although the new series were received with skepticism and in some cases were strongly criticized, they sharpened the scholarly debate and contributed to the emergence of a "revisionist" view of French nineteenth-century economic history.[7] In this new perspective, the French rate of growth in the nineteenth century appeared as "respectable and quite

[5] A somewhat older historiographic tradition has also insisted that a systematic comparison between England and France, the most powerful 'nation states' of eighteenth-century Europe, could represent a useful vantage point for studying the origins of the industrial revolution (Crouzet 1966, 1985).

[6] For useful compact accounts of this research project and of its limited fortune in French economic historiography see Grantham (1997), Crouzet (2003), and De Rouvray (2005).

[7] In the same years other economic historians have produced their own series of GDP (or other indicators of real output) which substantially confirmed this relatively optimistic view. Chief among them were the work of Lévy-Leboyer (1968), Bairoch (1976), and O'Brien and Keyder (1978).

creditable" (Crouzet 2003, p. 225) compared with that of other European countries. Some scholars argued that average real income has increased at roughly the same rate in Britain and France throughout the nineteenth century (O'Brien and Keyder 1978), while others posited that the debate over the causes of French economic backwardness was a waste of scholarly resources and effort (Cameron and Freedeman 1983).

However, during the 1980s and 1990s, the revisionist account was, in turn, challenged by a number of contributions trying "to strike the appropriate balance between the extremes of gloom and exaltation" (Heywood 1992, p. 16) and stress both the positive and negative aspects of French development. Bairoch (1997) summarized this view with the expression "honnête moyenne", to stress the fact that the French economic performance was not outstanding and substantially close to the European average (see also Crafts 1984).

A distinctive feature of the "retardation-stagnation" debate is the focus on the eighteenth and nineteenth centuries, but a relative neglect of the growth dynamics during the early modern period. To some extent, this can be accounted for by the widespread notion that the pre-industrial French economy was a motionless economic system which remained essentially stable between 1300 and 1700. Specifically, in this view, there was no systematic economic growth at least before the 1720s but only temporary deviations of output per capita from the long-term equilibrium subsistence level. In this way, the picture of nineteenth-century France as a *société bloquée* (Hoffman 1963) was mirrored in Le Roy Ladurie's (1977) characterization of France as a *société immobile* in the early modern period.

However, the thesis of a long-term stagnation during the early modern period was also challenged by what could be termed as the gradualist view, suggesting that a small but steady acceleration of output growth in France was taking place by the late Middle Ages. Toutain's (1961) series of agricultural output already pointed to a certain dynamism of French agriculture in the eighteenth century. In 1972, Spooner (1972) reasserted the same gradualist interpretation using a crude proxy of gross national product, prompting some years later Braudel (1984, vol. III, p. 314) to conclude the following: "if Frank Spooner is correct, France's GNP had been rising since the reign of Louis XII and probably even longer." Interestingly enough, this gradualist viewpoint resonates with the estimates by Maddison (2001) based on urbanization growth and other indirect evidence which show the French GDP per capita growing of 56 percent between 1500 (727 $1990) and 1820 (1,135 $1990). However, the quantitative basis for these assessments of French economic performance in the early modern period was fragile. As pointed out by several historians, Toutain's (1961) eighteenth-century series of agricultural output were based on indirect evidence drawn from the often conflicting assessments of contemporary observers (Chaunu 1964, Le Roy Ladurie 1968). Similarly, Spooner's (1972) estimates were obtained by considering a rough measure of gross national product, namely the price of a fixed quantity of wheat multiplied by population, while Maddison's (2007) guesstimates were based on the assumption that French per capita growth was the same as Belgium between 1500 and 1700. Be this as it may, this gradualist interpretation has been substantially confirmed by recent work in economic history. Research on agricultural productivity in particular suggests that total factor productivity and agricultural output per worker gradually increased since the early modern period (Hoffman 1996, Allen 2000). As Hoffman pointed out, although French economic growth during the Old Regime was piecemeal and inconsistent, the countryside displayed a certain dynamism which challenged the picture of pre-industrial France as an inherently stagnant economic system.

At the roots of these divergent views of French economic history, there is a general scarcity of reliable quantitative data charting the long-run evolution of aggregate production. Against this background, this paper sets out to construct some new estimates of French GDP per capita for the period 1280–1850. Even if our estimates should be regarded as preliminary and tentative, they have the merit of sketching a comprehensive picture of long-run economic performance that can contribute to enhance our understanding of the dynamics of growth in preindustrial Europe.

3. Methods and materials

3.1. Estimating GDP per capita using the demand-side approach

We estimate GDP per capita using the demand-side approach. This method consists of a two-step procedure. The first step is the estimation of agricultural output using a simple demand function (Allen 2000). The starting point is equation (1) which considers total agricultural output (Y_A) as the product of three terms:

$$Y_A = r \bullet c \bullet N \tag{1}$$

In equation (1), $r = \frac{Y_A}{C_A}$ is the ratio between total agricultural output (Y_A) and total agricultural consumption (C_A). If $r = 1$, then domestic agricultural production is exactly equal to total agricultural consumption. c indicates the per capita consumption of agricultural goods and N is the total population, so that $c = \frac{C_A}{N}$. Dividing both sides of equation (1) by N, we get the following equation which yields per capita agricultural output (y_A):

$$y_A = r \bullet c \tag{2}$$

Following Allen (2000), we assume that c can be represented using a very simple demand function:

$$c = W^{\alpha} \bullet {P_A}^{\beta} \bullet {P_M}^{\gamma} \tag{3}$$

where W is the real wage per day (which is used as proxy for per capita income); P_A is the real price of agricultural products (i.e., the price index of agricultural products divided by the consumer price index); P_M is the real price of manufactures (i.e., the price index of manufactures divided by the consumer price index); and α, β, and γ are the income, own price, and cross price elasticities of demand. Standard microeconomic theory suggests that $\alpha + \beta + \gamma = 0$ (Deaton and Muellbauer 1980, pp. 3–24).[8] Using equations (2) and (3), provided that suitable wages and price data are available, after having made an assessment of r, it is possible to construct a series of per capita agricultural output y_A.

In the second step, we estimate real GDP per capita by assessing the contribution of agricultural output to total GDP. Different approaches have been proposed for estimating non-agricultural output. In this work, we follow the one developed by Nuvolari and Ricci

[8] The assumption underlying equation (3) is that the real wage can serve as a plausible proxy of per capita income. Since most wage data refer to male workers, this method does not consider explicitly the role of women and children. In principle, one could formulate equation (3) as a household demand function considering activity rates, days worked, and earnings of all family members. Unfortunately, for most European pre-industrial economies, data on these variables are extremely scarce and very fragile.

(2013) for England. We define the share of agriculture in total output, S_A, as follows:

$$S_A = \frac{Y_A}{Y} \tag{4}$$

where Y_A is total agricultural output and Y is total production. Equation (4) can be written as follows:

$$S_A = \frac{\pi_A \bullet L_A}{\pi \bullet L} \tag{5}$$

where L_A is the number of workers employed in agriculture, L is the total number of workers in the economy while π_A and π represent, respectively, the labor productivity in agriculture and the labor productivity in the entire economy, measured in terms of output per worker. If we assume competitive labor markets, real wages will track closely labor productivity.[9] We can then use the ratio of real wages between the two sectors as a proxy for the relative productivity of agriculture with respect to the entire economy $\left(\frac{\pi_A}{\pi} \cong \frac{W_A}{W}\right)$, so that equation (5) can be rewritten as follows:

$$S_A = \frac{W_A \bullet L_A}{W \bullet L} \tag{6}$$

Finally, GDP per capita (y) is obtained using the following expression:

$$y = \frac{y_A}{S_A} = \frac{r \bullet W^{\alpha} \bullet {P_A}^{\beta} \bullet {P_M}^{\gamma}}{\left(\frac{W_A}{W}\right) \bullet \left(\frac{L_A}{L}\right)} \tag{7}$$

3.2. Data and sources

The estimation of real output per capita requires data for all of the variables involved in equation (7), namely continuous series of real wages in agriculture (W_A) and the overall economy (W), price indices of agricultural products (P_A) and manufactures (P_M), data on the share of agricultural workers in the total working population $\left(\frac{L_A}{L}\right)$ and the ratio between agricultural production and domestic consumption of agricultural goods (r) as well as plausible values for the elasticities α, β, and γ.

The main data used in this paper are the recent wage and price series constructed by Ridolfi (2019). These are based on a new sample of 26,332 wage observations retrieved from more than 150 wage sources and a new price dataset including 46,600 quotes of 12 commodities drawn from a large set of printed primary and secondary material.[10] Overall, the newly constructed samples have a fairly large spatial coverage and the resulting price and wage series can be considered as representative of national trends.[11]

Some contributions that have adopted the demand-side approach for estimating GDP per capita have used urban wages as a proxy of overall labor income (Pfister, 2011; Álvarez-Nogal

[9] This assumption is indeed common in formal models of pre-industrial European economies. See, for example, Sharp et al. (2012) and Voigtlander and Voth (2013).

[10] For a detailed discussion of the sources, their coverage, and the construction of the series, see Ridolfi (2019; both the published paper and the online Appendix).

[11] Regional disaggregation of the series (North, Centre, East, and South) suggests that wages followed similar patterns over time (Ridolfi 2019, online Appendix).

and Prados de la Escosura, 2013, Palma and Reis, 2019). In other cases, a weighted series of urban and rural wages has been used (Malanima, 2011; Nuvolari and Ricci, 2013). In the case of France, suitable data are available for both agricultural and urban wages. The series of wages in agriculture concern day laborers while urban wages refer to building's craftsmen wages. The average wage is computed as the sum of agricultural day laborers and building craftsmen's wages weighted for their respective employment shares. Although pre-industrial labor markets were characterized by a remarkable degree of heterogeneity in terms of occupations and skill levels, focusing on these two occupational categories has two main advantages. First, day laborers in agriculture accounted for the largest group of the French labor force (Ridolfi 2019). Hence, their inclusion allows to capture a significant component of the historical evolution of real wages. Second, since urban and rural wages did not necessarily follow the same pattern of change, our average series comprising both agricultural and urban wages seems a more suitable proxy of the dynamics of labor incomes than those based on only one of these categories.[12]

In order to estimate real wages, we deflate nominal wages by the cost of living index constructed by Ridolfi (2019). This is a Laspeyres index whose weights reflect the quantities consumed per person per year as originally proposed by Allen (2001). The consumption bundle provides 1,940 calories per day and includes some expenditure on lodging, lighting, and clothing (table 1).[13]

The price index of agricultural products comprises seven items, namely bread, legumes, beef, butter, cheese, eggs, and wine while the price index of manufactured goods includes five goods: soap, linen, candles, lamp oil, and firewood. The price indices are obtained using a Laspeyres weighting scheme in which the quantity of each good are specified and total expenditure computed by valuing those quantities at the prices prevailing in each time and place. This weighting scheme implies that the expenditure shares on individual items changed over time as suggested by tables 2 and 3. By and large, bread accounted for the largest spending share followed by wine and beef. Conversely, clothing and lighting accounted for over 80 percent of total expenditure in manufactures. When seen in a long-term perspective, these shares, corresponding to a pre-modern low-income household spending pattern, display a broad stability, suggesting that alternative geometric weighting schemes based on fixed expenditure shares will provide similar results. Since we are interested in relative prices, we deflate the price series of agricultural products and manufactures using the general consumer price index illustrated in table 1.

We also construct a new series of the employment share in agriculture from 1300 to 1850. We rely on Allen's data (Allen 2000) for the benchmark years 1400, 1500, 1600, 1700, and 1750. Allen's estimates are based on the approach originally developed by Wrigley (1985) which consists in assessing the size of the population employed in non-agricultural occupations on the basis of the rates of urbanization adjusted for the share of rural population engaged in non-agricultural occupations (Allen 2000, pp. 4–13). Using the same

[12] Figure A3.4 (online Appendix 3) compares the GDP per capita series obtained using the average wage series with that using urban wages only.. This allows one to highlight possible differences that must be taken into account when comparing our GDP per capita estimates with that of countries for which only urban wages have been used.

[13] The resulting cost of living index is robust to plausible variations in the weighting scheme of the Laspeyres index (see the online Appendix 2, figure A2.1 for a comparison with a basket of 2,500 daily calories) and in the specification. See Ridolfi (2019, Online Appendix S2) for a comparison between Laspeyres and geometric consumer price indices.

Table 1. *The structure of the consumer price index and average expenditure shares over sub-periods*

Good	Quantity per person per year	Unit	1300–1400	1400–1500	1500–1600	1600–1700	1700–1800	1800–1850
Bread	182	kg	0.340	0.322	0.365	0.362	0.354	0.360
Legumes	52	l	0.047	0.057	0.085	0.073	0.066	0.066
Beef	26	kg	0.095	0.095	0.103	0.115	0.121	0.151
Butter	5.2	kg	0.060	0.059	0.055	0.060	0.057	0.056
Cheese	5.2	kg	0.039	0.039	0.036	0.040	0.035	0.037
Eggs	52	unit	0.016	0.010	0.014	0.018	0.018	0.013
Wine	182	l	0.152	0.179	0.119	0.104	0.104	0.095
Soap	2.6	kg	0.037	0.034	0.036	0.034	0.032	0.023
Linen	5	m	0.095	0.078	0.056	0.066	0.075	0.054
Candles	2.6	kg	0.034	0.034	0.035	0.033	0.032	0.033
Lamp oil	2.6	l	0.025	0.027	0.029	0.025	0.030	0.023
Firewood	5	Millions BTU	0.013	0.017	0.019	0.021	0.029	0.042
Rent	5	% of total cost	0.048	0.048	0.048	0.048	0.048	0.048
Total			1.000	1.000	1.000	1.000	1.000	1.000

Sources: see text. Following Allen (2001), we assume that the rent corresponds to 5 percent of the cost of the bundle.

Table 2. *The structure of the agricultural price index and average expenditure shares over sub-periods*

Good	Quantity per person per year	Unit	1300–1400	1400–1500	1500–1600	1600–1700	1700–1800	1800–1850
Bread	182	kg	0.45	0.42	0.47	0.47	0.47	0.46
Legumes	52	l	0.06	0.07	0.11	0.09	0.09	0.09
Beef	26	kg	0.13	0.12	0.13	0.15	0.16	0.19
Butter	5.2	kg	0.08	0.08	0.07	0.08	0.08	0.07
Cheese	5.2	kg	0.05	0.05	0.05	0.05	0.05	0.05
Eggs	52	unit	0.02	0.01	0.02	0.02	0.02	0.02
Wine	182	l	0.20	0.24	0.15	0.13	0.14	0.12
Total			1.00	1.00	1.00	1.00	1.00	1.00

Sources: see text.

methodology, we construct an additional benchmark estimate for 1300. In particular, we first subtract urban population (Bairoch et al. 1988) from total population (Malanima 2009) to get an estimate of total rural population in 1300. Following Allen (2000), we then assume that 80 percent of this rural population was employed in agricultural occupations. In this way, we find in 1300 an agricultural population of 16 million inhabitants and an employment share in agriculture $\left(\frac{L_A}{L}\right)$ of 74 percent.[14] Finally, the share of agricultural workers for the years 1800 and 1850 is taken from Grantham (1991). This set of benchmark estimates allows us to chart the evolution of the employment share in agriculture for France, from 1300 to 1850

[14] We use this estimate also for all years before 1300.

Table 3. *The structure of the manufactures price index and average expenditure shares over sub-periods*

Good	Quantity per person per year	Unit	1300–1400	1400–1500	1500–1600	1600–1700	1700–1800	1800–1850
Soap	2.6	kg	0.19	0.18	0.20	0.19	0.16	0.13
Linen	5	m	0.45	0.41	0.32	0.36	0.38	0.31
Candles	2.6	kg	0.17	0.18	0.20	0.18	0.16	0.19
Lamp oil	2.6	l	0.13	0.14	0.17	0.14	0.15	0.13
Firewood	5	M BTU	0.06	0.09	0.11	0.12	0.14	0.24
Total			1.00	1.00	1.00	1.00	1.00	1.00

Sources: see text.

Table 4. *The structure of employment in France: 1300–1850 (millions)*

Year	Total	Urban	Agricultural	Rural non-agricultural	Share of agricultural workers
1300	16.0	1.19	11.85	2.96	0.74
1400	12.0	1.29	8.57	2.14	0.71
1500	17.0	1.49	12.41	3.10	0.73
1600	19.0	2.05	12.88	4.07	0.68
1700	22.0	2.72	13.90	5.38	0.63
1750	24.5	3.11	14.97	6.42	0.61
1800	28.3	3.65	16.76	7.89	0.55
1850					0.52

Sources: Allen (2000) for the period 1400–1800. Total population for 1300 is retrieved from Malanima (2009) while urban population is from Bairoch et al. (1988). Following Allen (2000), the share of agricultural population in rural population in 1300 is assumed to be 80 percent. The share of agricultural workers for 1800 and 1850 is taken from Grantham (1991). For 1800, Allen gives a share of agricultural workers of 0.59.

(table 4). We fill the intervening values between these benchmark estimates by interpolation. According to our estimations, the share of workers employed in agriculture averaged about 70 percent over the period 1300–1500 and gradually declined from the seventeenth century onward, reaching the value 0.52 in 1850.

Following Allen (2000), we also assume that the ratio between agricultural production and domestic consumption of agricultural goods (r) was equal to one meaning that, on average, domestic agricultural production matched total agricultural consumption in France. We also test this assumption against alternative scenarios that imply a time-varying r between 1716 and 1850 using the detailed data on imports and exports collected in the Toflit18 (Charles et al. 2021) and Montesquieu datasets (Becuwe et al. 2019).[15] As shown in figure A3.1 of the online Appendix 3, it turns out that the effects of these alternative reconstructions of r on the dynamics of GDP per capita are extremely limited.

In our baseline estimate, we set the own price, cross price, and income elasticities at −0.6, 0.1, and 0.5, respectively, as suggested by Allen (2000). Based on studies of modern

[15] See the online Appendix 3 for details about sources and methods used to construct “r”. The Toflit18 dataset (Charles et al. 2021) is available at http://toflit18.medialab.sciences-po.fr.

developing countries, this parameter set reflects reasonable demand patterns in pre-industrial France and implies low absolute values of the own price and income elasticities so as to capture changes in demand of agricultural goods that were relatively less income elastic. In the (online) Appendix section, we also explore different sets of parameters and their effect on the final estimates of output per capita. Again, as shown in figure A3.2 of the online Appendix 3, these changes have no substantial bearing on the final estimates of output per capita.

Finally, we construct a new series of the French population at current borders drawing on the information scattered across the three volumes of Dupâquier's (1988) French population history. Prior to 1550 population data are uncertain and rely on two conjectural estimates for 1330 and 1450 (Dupâquier 1988, vol. 2, pp. 515–516). Between 1550 and 1729, the French population is the average of the minimum and maximum values reported in Dupâquier (1988, vol. 2, p. 68) while from 1740 to 1790 we use Henry and Blayo's data corrected by Dupâquier (1988, vol. 2, p. 64) to account for under-registration of deaths (especially children aged less than 5 years). The population estimates for the period 1801–1861, based on the first official population censuses, are retrieved from the third volume of Dupâquier's (1988, p. 123) French population history. We fill missing values by interpolation.

4. French GDP per capita, 1280–1850

4.1. Agricultural output

Figure 1 shows our series of total agricultural output in France over the period 1330–1850. This is obtained by multiplying our estimates of agricultural output per capita reconstructed using equation (3) with an index of population. In order to highlight long-run patterns, the series has been smoothed using an 11 year moving average. The figure also displays per capita agricultural output which is characterized by on overall long-run stability.

Figure 1 suggests that the evolution of total agricultural output can be suitably interpreted using a three-stage account. The first phase, covering the period 1280–1580, is characterized by a typical U-shaped pattern which largely reflects the demographic trend. After the Black Death, total agricultural output plunged by over 40 percent. Yet, when population started to recover by the mid-fifteenth century, agricultural product soared, to regain pre-crisis levels by the mid-sixteenth century. This Malthusian phase is followed by a second period spanning from the late sixteenth century to the eve of the French revolution which is marked by an almost steady increase in total agricultural output. Specifically, the index increased from 60 in 1600 to about 100 in the 1780s. Finally, the third phase, covering the period 1790–1850, is marked by a further significant acceleration in the pace of economic growth with an almost 50 percent increase in half a century. Compared to previous literature, these results tally fairly well with Allen's (2000) estimates, although our series provides a less optimistic reading of the mid-fifteenth century recovery and implies a slightly higher trend growth between c.1580 and 1750. Interestingly enough, our estimates appear also in line with the chronology of expansions and contractions of agricultural output reconstructed by Le Roy Ladurie and Goy using tithes (Le Roy Ladurie, 1982, pp. 193–202). Conversely, our series sits uneasily with the three-fold increase in total agricultural production between 1700 and 1850 implied by the first Toutain's (1961) optimistic account of French agriculture. Yet, our estimates chime with successive output-based revisions supporting a more gradualist interpretation of the development of French agriculture (Toutain 1987, Lévy-Leboyer and Bourguignon 1985). Finally, our series seems also relatively consistent with Hoffman (1996, p. 135) whose estimates of total food supply are characterized by an average yearly rate of

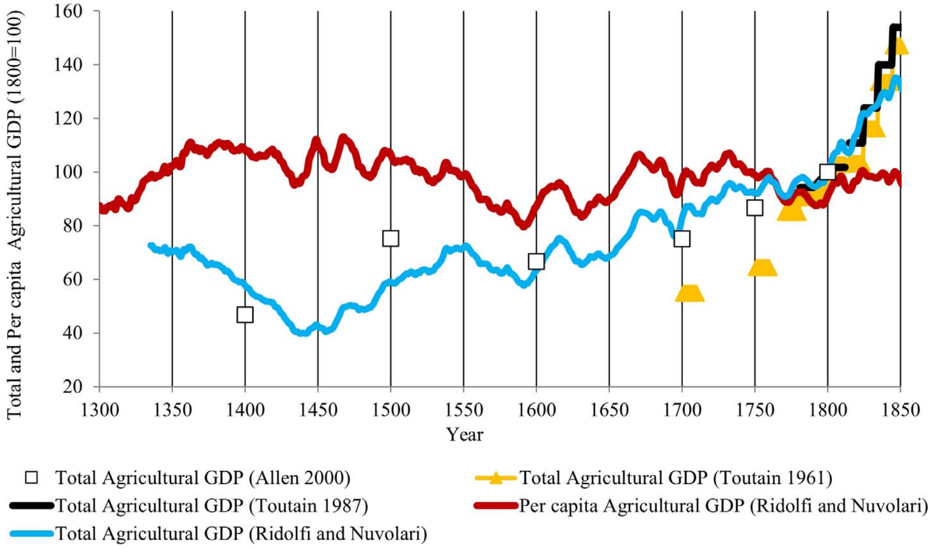

Figure 1. *Agricultural output, 1330–1850 (1800 = 100)*
Notes: the series of total and per capita agricultural GDP (Ridolfi and Nuvolari) are 11 year moving averages.

growth comprised between −0.01 and 0.22 percent in the period 1500–1800 and between 0.15 and 0.33 percent in the period 1700–1800. The average growth rates of our series fit well in the range of variations estimated by Hoffman being equal to 0.15 percent for the period 1500–1800 and 0.32 percent for the period 1700–1800. Overall, given the significant differences in the estimation procedures and in the underlying sources, we consider these results as a reassuring corroboration of our estimates.

4.2. The share of agriculture in total output

The estimation of the sectoral composition of output has traditionally proven difficult for the pre-industrial period because output data, especially for industrial and service sectors, are scarce before the first nineteenth-century official statistics (Grenier 1985). For this reason, most literature has relied on alternative procedures which derived non-agricultural output indirectly, from the assessment of the share of agriculture in total output. These approaches can be classified in two groups. The first includes methods based on urbanization which rely on the assumption of a stable relation between the urban share of the population and the size of the secondary and tertiary sectors. In practice, the link between the share of non-agricultural GDP and urbanization is inferred by looking at periods in which both variables are available and data are more reliable.[16] The estimated parameters are then used to extrapolate backward the share of agriculture in total output using urbanization data (Malanima 2011).

[16] For instance, Malanima (2011) regressed the share of non-agricultural output in total GDP on urbanization rates over the period 1861–1936.

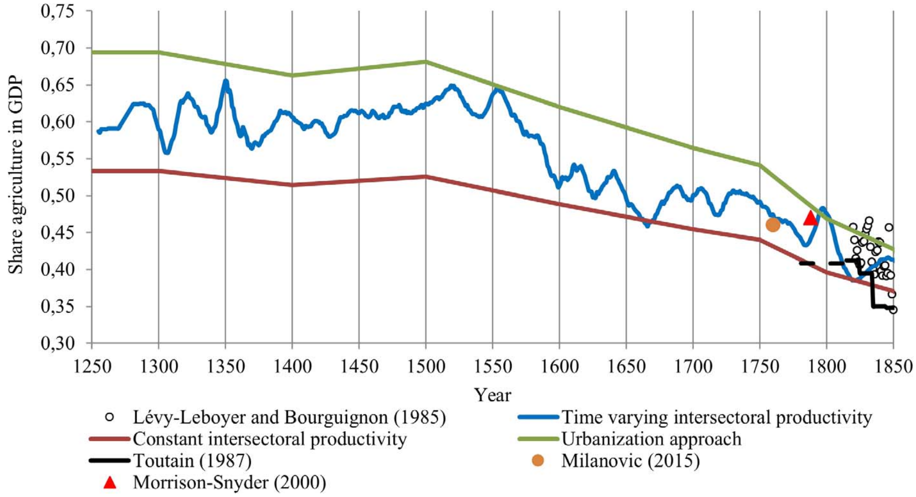

Figure 2. *Agriculture output share, 1250–1850*

The second methodology instead is based on the study of the inter-sectoral productivity gap (p) between agriculture and non-agriculture. Again, the gap is inferred on nineteenth century figures and the resulting estimates together with urbanization data are used to project backward the series of the share of agriculture in the economy (Palma and Reis 2019). Clearly, the accuracy of these estimates is based on the assumption that nineteenth-century figures reflect the sectoral composition of the economy before the beginning of industrialization and therefore they can be used to provide an assessment of the structure of the economy throughout its preindustrial stage. In other words, the underlying assumption is that the inter-sectoral productivity gap (p) between agriculture and the rest of the economy is relatively constant over the period in question (time invariant).

In this study, we adopt the alternative approach introduced by Nuvolari and Ricci (2013) for the estimation of output per capita in England, which relaxes this assumption taking into account the time-varying sectoral composition of the economy (cf. equation (6) above). This comes at the expense of using a proxy for estimating the labor productivity gap between sectors (the ratio between wages) and not a direct measurement.

Figure 2 shows the share of agriculture in total output from 1250 to 1850 based on expression (6) and compares it with two benchmark estimates for the late eighteenth century, namely Milanovic (2015) for 1760 and Morrisson and Snyder (2000) for 1788 as well as the series of Lévy-Leboyer and Bourguignon (1985) since 1820 and Toutain (1987) since 1781.

We also compare our estimates with alternative series obtained by means of urbanization and constant productivity gap's approach. Specifically, the constant productivity gap series is obtained by multiplying our series of the employment share in agriculture by a constant inter-sectoral productivity gap of 0.72. This is suggested by examining the relative productivity, measured in terms of output per worker, of agriculture and non-agriculture in 1820 using Lévy-Leboyer and Bourguignon's (1985) figures. Conversely, the urbanization-based series is obtained using the same approach as Malanima (2011, p. 185) setting the share of non-agricultural output in total GDP to 54 percent in 1820 (Lévy-Leboyer and Bourguignon 1985) and again using our estimates of the employment share in agriculture.

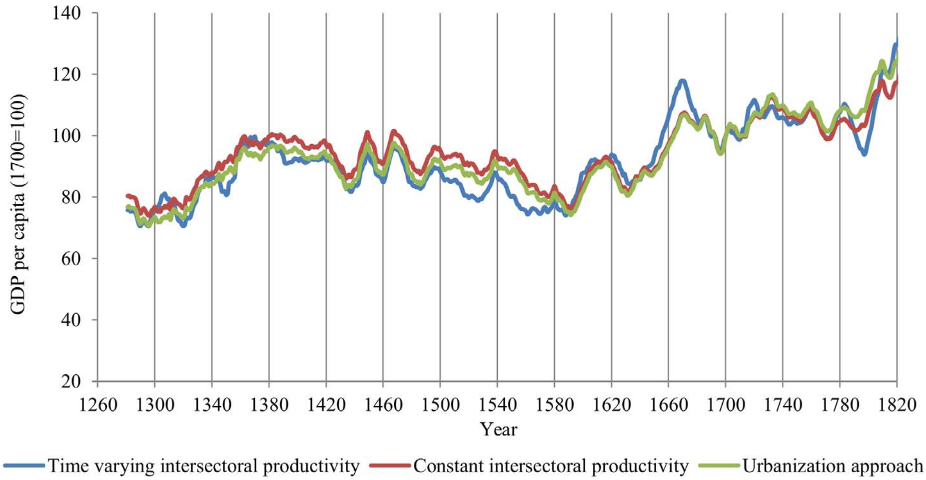

Figure 3. *GDP per capita, sensitivity analysis: share of agriculture*
Notes: all series are 11 year moving averages.

Two conclusions emerge. First, compared to independent assessments of the weight of agriculture in total output, the time-varying sectoral productivity approach provides the best fitting. For instance, according to Quesnay's social table (Milanovic 2015), agriculture averaged about 46 percent of total GDP in 1760. For the same year the time-varying sectoral productivity approach predicts a value of 0.47, the urbanization approach implies a 0.53 while the constant productivity gap approach 0.43. Morrisson and Snyder's (2000) social table for 1788 offers an additional check. Again, the prediction of the time-varying sectoral productivity model is closer to the benchmark than the prediction of the constant productivity gap's approach. Furthermore, our estimates are broadly consistent with the long-term developments of Lévy-Leboyer and Bourguignon's (1985) agriculture output share.

Second, the three approaches result in different levels of the share of agriculture in total output. The urbanization-based approach provides the upper level estimates, the constant productivity gap's approach implies the lowest levels while the predictions of our model lie somewhat in the middle. As shown in figure 3, despite these differences, these methodologies provide very similar predictions of output per capita.

4.3. GDP per capita

We have developed two methods to convert our series in 1990 Geary–Khamis dollars. The first approach consists in directly linking our index, based on equation (7), to Maddison's GDP per capita estimate for France in 1820 corresponding to 1,135 dollars. In the second method, we construct a new benchmark based on our estimate of the relation between the employment share in agriculture and GDP per capita in this period. The intuition underlying this approach is the notion that levels of economic performance in preindustrial Europe were reflected, in a major way, in changes in economic structure (Allen 2009, pp. 16–21).

Using a panel regression framework based on a sample of seven European countries (Belgium, England/UK, Central-Northern Italy, Netherlands, Portugal, Spain, and Germany) over the period 1500–1850, we regress GDP per capita on the employment share in

Table 5. *Panel regression of GDP per capita ($1990, Maddison 2013) on the share of agricultural workers*

Dependent variable: GDP per capita ($1990)				
Covariates	(1)	(2)	(3)	(4)
Share of agricultural workers	−3,637***	−2,108***	−4,226***	−2,141***
	(510.0)	(402.7)	(578.8)	(529.1)
Year 1600			−73.01	57.12
			(188.7)	(124.8)
Year 1700			−323.9	−95.51
			(194.2)	(132.8)
Year 1750			−351.8*	−51.30
			(200.5)	(141.2)
Year 1800			−398.2*	−43.16
			(206.4)	(148.7)
Year 1850			−185.4	132.9
			(202.3)	(143.5)
Constant	3,444***	2,593***	3,999***	2,611***
	(288.7)	(226.6)	(400.0)	(359.8)
Observations	41	41	41	41
R-squared	0.566	0.454	0.634	0.539
Fixed effects	No	Yes	No	Yes

Standard errors in parentheses ***p < 0.01, **p < 0.05, *p < 0.1 *Notes*: the panel regressions (within estimator) are based on a sample of seven countries, i.e., Belgium, England/UK, Italy (Centre-North), Netherlands, Portugal, Spain, and Germany over the period 1500–1850. *Sources*: GDP per capita in $1990 comes from the Maddison project 2013 release (Bolt and van Zanden 2014) while we take the employment share in agriculture for Belgium and Italy from Allen (2000, tables 1 and 2); for England, Germany, and Spain from Allen (2000, table 1) and Simpson (1995, table 1.2); for Netherlands from Allen (2000, table 1) and De Vries and Van der Woude (1997, table 11.5); and for Portugal from Palma and Reis (2019).

agriculture. We retrieve GDP per capita in 1990 dollars from the 2013 release of the Maddison project (Bolt and van Zanden 2014) and the data on the employment share in agriculture for Belgium and Italy from Allen (2000, tables 1 and 2); for England, Germany, and Spain from Allen (2000, table 1) and Simpson (1995, table 1.2); for the Netherlands from Allen (2000, table 1) and De Vries and Van der Woude (1997, table 11.5); and for Portugal from Palma and Reis (2019).

As expected, we find a significant negative correlation between the levels of output per capita and the shares of workers employed in agriculture (table 5). When estimating a fixed effect model (within estimator) with time dummies, this procedure yields an estimated value of 1,498 dollars for France in 1820 (table 6). This second method should allow to construct a series of GDP per capita in 1990 dollars that can be consistently integrated in the already available cross-country evidence of the Maddison project.

We then use the benchmark estimate obtained using this regression approach to project backward our series and link it with that of the 2013 Maddison project version for the period after 1820. We have spliced the two series using the "mixed splicing" approach described in de la Fuente (2014) (see Prados de la Escosura 2016, for a discussion of the merits and limitations of different splicing methods) which allows a tapered adjustment between the post

Table 6. *Implied benchmarks for 1820*

Model	Benchmark
Model (1): no year dummies, no FE (OLS)	1,625
Model (2): no year dummies, FE (within estimator)	1,539
Model (3): year dummies, no FE (OLS)	1,488
Model (4): year dummies, FE (within estimator)	**1,498**

Notes: the various benchmarks for France in 1820 are estimated using the regression coefficients of Table 5. The benchmark in bold is our preferred specification. This is obtained using the following expression: (8)

$$\hat{y}_{1820} = \hat{\alpha} + \hat{\beta} \bullet S_{a1820} + \hat{\gamma} \bullet D_{1800}$$

where $\hat{y}_{1820}$ is the predicted value of GDP per capita in 1990 dollars for 1820, $\hat{\alpha}$ is the estimated constant (where $\hat{\alpha}$ is the average of the individual fixed effects), $\hat{\beta}$ is the estimated coefficient on the share of agricultural workers in total workforce, S_{a1820} is the share of workers employed in agriculture in 1820 and this is set to 0.5 (see text), and $\hat{\gamma}$ is the estimated coefficient on the year dummy D_{1800}. We use a similar approach to get the other benchmarks.

1820 Maddison series and our series before 1820.[17] This splicing adjustment makes a gradual allocation of the discrepancy between the two 1820 levels over the period 1802–1819.

Figure 4 displays the estimates of GDP per capita obtained with the two methods, together with those of other contributions. The first approach, based on Maddison 1820 benchmark, results in a series of output per capita which is rather low in comparative perspective. For example, the value of GDP per capita in 1500 is 794 dollars, an estimate that is not far from the benchmark ($727) suggested by Maddison (2007), but significantly lower than Malanima's (2011) reckoning. Conversely, the second series, obtained using the regression-based benchmark, provides an upward revision of the previous estimates which is in line with Toutain's (1987) series since the early nineteenth century and also closer to Malanima's benchmark estimates.[18] For these reasons, we regard the regression-based benchmark series as our favorite estimate of French GDP per capita in 1990 dollars.[19] However, it is worth noting that our estimates are characterized by a relatively high degree of volatility during the period 1810–1820, with a much more regular behavior thereafter with the splicing with the Maddison series. The volatility of the estimates in the 1810–1820 period is essentially due to the fluctuations of the cost of living and of the agricultural price index which reflect some of the extreme events of that decade such as the agricultural crisis of 1816 ("the year without summer").[20] As noted by Nuvolari and Ricci (2013) for the English case, GDP per

[17] Let us denote with Y_t the Maddison series (2013 release) of GDP per capita starting in 1820 and with X_t our GDP per capita series extrapolated using our regression-based benchmark for 1820. Both series are expressed in 1990 dollars. We use the following formula to link the two series over the splicing interval 1802–1819: $\hat{Y}_t = X_t \bullet d_T{}^{(i/T)}$ where $\hat{Y}_t$ is the spliced value for year t; $d_T = \left(\frac{Y_T}{X_T}\right)$ measures the discrepancy between Y_t and X_t at the linking year T (T = 1820 in our case); $0 \leq i \leq I$ where $I = 17$ as the splicing interval includes 18 years. Hence, the final spliced series Y_s equals Y_t for $t \geq 1820$, X_t for $t \leq 1801$, and $\hat{Y}_t$ for $1802 \leq t \leq 1819$.

[18] The plausibility of our level and trend predictions of output per capita is also confirmed by comparison of the days of work that are "implicit" in our GDP per capita estimates (implied working days) with independent assessments of the actual working year (online Appendix 3, figure A3.3).

[19] In the online Data Appendix, we also provide estimates in $2011 constructed using the 2020 release of the Maddison project (Bolt and van Zanden 2020). Since most of the literature is still using the $1990 standard, we discuss our results using this metric.

[20] See Vauchez (2015) for an intriguing account of the events which followed the eruption of the Indonesian volcano Tambora based on the family account book of a French winegrower, Louis Verger.

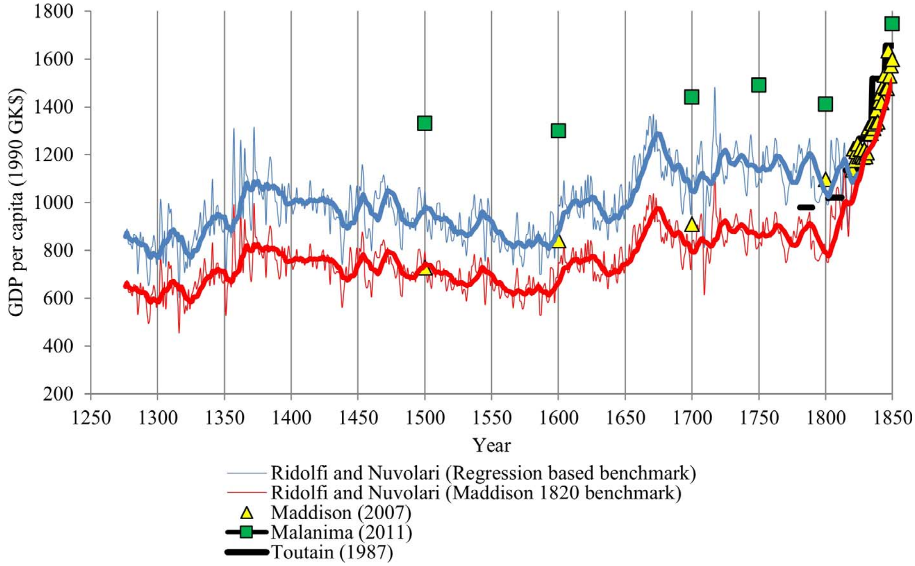

Figure 4. *GDP per capita, 1276–1850*
Notes: We converted in GK$1990 Toutain's (1987) GDP per capita series using Maddison's GDP per capita estimate for 1820 ($1,135).

capita estimates constructed with the demand-side approach during the revolutionary and Napoleonic wars period must be considered with special caution.

Table 7 compares the average yearly growth rate of our series with alternative estimates. Overall, the picture of long-run economic growth emerging from our estimates is indeed one of broad stability and can be perhaps regarded as somewhat consistent with the notion of "motionless history" put forward by Le Roy Ladurie (1977). The main exception to this pattern is the sub-period 1600–1700. In this phase, output per capita increases at an annual average compound growth rate of 0.13. It is also interesting to note that the estimates for the periods 1700–1800 and 1800–1850 suggest that France embarked on the path of modern economic growth in a very gradual manner.

Table 7. *Rates of growth of GDP per capita, annual average compound growth rates (%)*

Period	Ridolfi and Nuvolari	Maddison (2007)	Malanima (2011)	Toutain (1987)	Lévy-Leboyer and Bourguignon (1985)
1300–1400	0.18				
1400–1500	−0.04				
1500–1600	−0.01	0.14	−0.02		
1600–1700	0.13	0.08	0.10		
1700–1800	−0.02	0.19	−0.02		
1800–1850	0.68	0.74	0.42	0.97	0.80

Notes: Annual average compound growth rates are estimated using the 11 year moving average series.

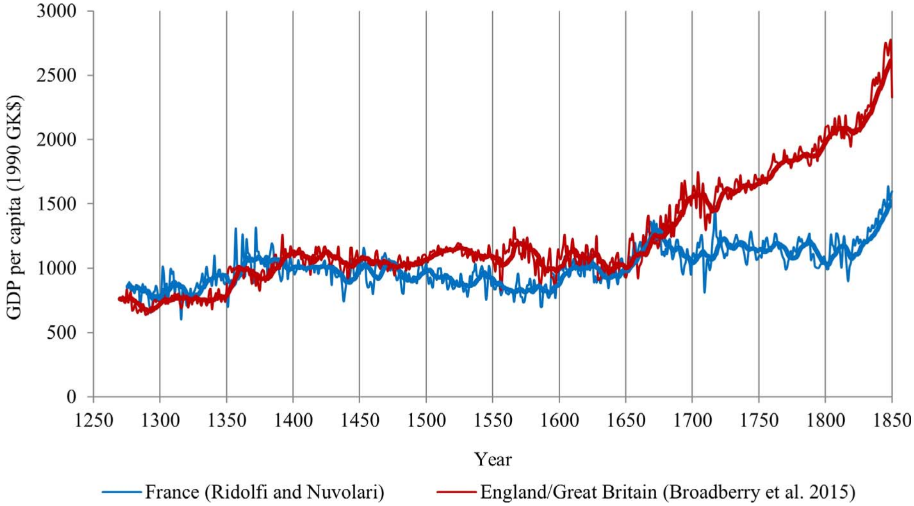

Figure 5. *GDP per capita in France and England (GK$1990)*
Notes: the smoothed series are 11 year moving averages.

5. France in international comparative perspective

5.1. France and England

Figure 5 compares our estimates of French GDP per capita against Broadberry et al.'s (2015) series for England. The evidence emerging from figure 5 can be interpreted in terms of a three-stage account.

During the first phase, spanning from the late thirteenth to the early fifteenth century, French output per capita was higher than in England. Nevertheless, there was a clear tendency of English GDP per capita to converge to the French levels. As already pointed out by Ridolfi (2019), this trend gained momentum after the Black Death when the combined effects of broad demographic trends and institutional factors (warfare, political turmoil, debasement) curbed output growth in France. By the early fifteenth century, the levels of output per capita appear to be broadly on par in the two countries.

The second phase stretches from the fifteenth century until the 1680s. The economic performances of England and France are substantially similar over this period. Phases of growing and shrinking alternated in both countries but decline was more long lasting in France where the protracted turbulence of the Wars of Religion precipitated output per capita to its pre-Black Death levels during the late sixteenth century. This result chime with Hoffman's (1996) estimates pointing to large drops in total factor productivity in those areas of France where fighting was more intense during the Wars of Religion.

Finally, the period after 1680 is characterized by a sharp break, with England definitely forging ahead and France lagging behind. In this perspective, the notion of a divergence between the two countries starting from the end of the Middle Ages (Allen 2001) does not appear confirmed by the new French data on GDP per capita. This result is consistent with recent evidence on comparative real wages in the two countries pointing to a relatively late divergence between England and France (Ridolfi 2019).

Table 8. *Rates of growth of GDP per capita in France and England, annual average compound growth rates (%)*

Period	England	France
1300–1500	0.18	0.07
1500–1600	−0.03	−0.01
1600–1700	0.40	0.13
1700–1780	0.22	0.09
1780–1850	0.47	0.30

Sources and notes: France: our estimates; England: Broadberry et al. (2015). Annual average compound growth rates are estimated using the 11 year moving average series. The growth rates for the period 1780–1850 are based on the time window 1780–1840.

Table 8 sets out the comparative performance of England and France in terms of yearly growth rates of GDP per capita. The table confirms that the English economy forged ahead during the seventeenth century. As noticed, the French experience of the early phases of modern economic growth is characterized by a much more gradual acceleration than the English case.

From an interpretive point of view, England's forging ahead is concomitant with a rather dramatic expansion of its proto-industrial sector, while in France the growth of the proto-industrial sector during the period 1700–1800 is much less rapid (Allen 2001). It is interesting to note that, according to Allen's estimates, the size of the proto-industrial sector was roughly the same in England and France in 1600 (Allen 2003). On the basis of this evidence, we can speculate that the different fortunes of the two countries in the exploitation of international commerce may have played an important role for their aggregate economic performance (Allen 2003, 2009, pp. 106–131, see also Davis, 1973).[21] If this is the case, the proper context to understand England's forging ahead during the eighteenth century is the so-called Second Hundred Years War as suggested by Crouzet (1996): England's repeated victories in the long-lasting struggle with France provided the foundation for the expansion of commerce that drove its economy forward leading to the divergence between the two countries during the eighteenth century.[22]

5.2. *The European context*

Much discussion surrounds the timing and causes of what is usually termed as the "Little Divergence", the process whereby the North Sea Area became the most prosperous and dynamic part of Europe. Prevailing interpretations situate the key turning point of this major regional shift in the history of Western World in the late Middle Ages or the early modern

[21] Crouzet (1985) highlights that, between 1715 and 1784, French foreign trade was possibly even more dynamic than English trade. However, notwithstanding this remarkable performance, by 1780s in per capita terms it was still just one-third of the English level (Findlay and O'Rourke 2007, pp. 261–262).

[22] This interpretation also connects with Braudel's reflections on the economic heterogeneity of France during the eighteenth century. Braudel, rehearsing suggestions by Fox and Toutain, argues for a major distinction between Northern France more economically advanced and exploiting the opportunities of Atlantic trade ("an England in miniature") and Southern France poorer and essentially rural (Braudel 1984, pp. 338–351). In this respect, an important issue for further research will be to ascertain to what extent our national estimates of GDP are actually the result of the aggregation of heterogeneous economic systems.

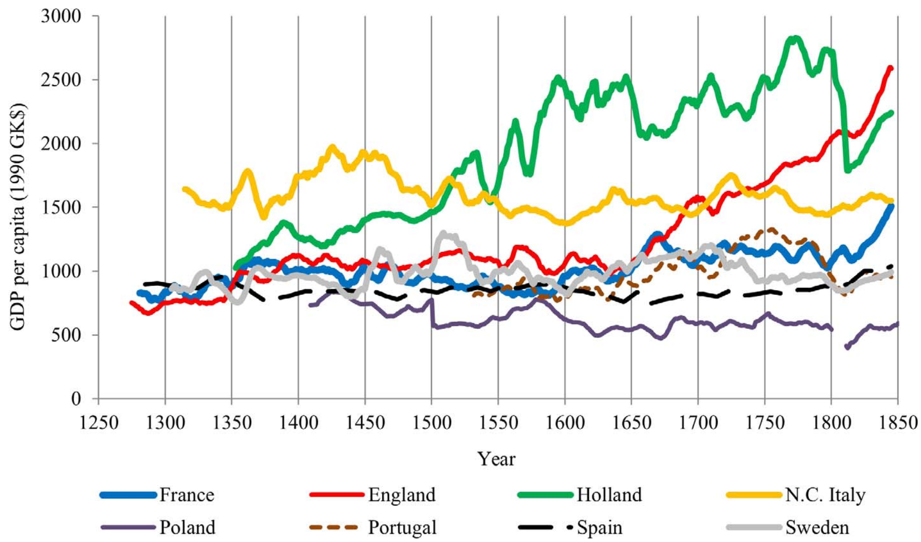

Figure 6. *French economic performance in international comparative perspective, 1276–1850. All series are 11 year moving averages*
Sources: France: our estimates; England: Broadberry et al. (2015); Holland: Van Zanden and Van Leeuwen (2012); Italy (Centre-North): Malanima (2011); Poland: Malinowski and Van Zanden (2017); Portugal: Palma and Reis (2019); Spain: Álvarez-Nogal and Prados de la Escosura (2013); Sweden: 1300–1560, Krantz (2017); 1560–1850, Schön and Krantz (2012). *Notes*: the values in GK$1990 are those reported by the authors except for Italy (Centre-North), Poland, Spain, and Sweden because the authors did not report annual series in GK$1990. In these cases, we made the conversions using the following benchmarks: Italy (Centre-North), $1,486 in 1861 (Malanima 2011, p. 218); Poland, $946 in 1870 (2013 Maddison project); Spain, $1,079 in 1850 (2013 Maddison project), and Sweden $1,076 in 1850 (2013 Maddison project).

period (Allen 2001, Broadberry 2013). This paper adds France to the picture. In particular, figure 6 compares our new estimates with those of other European countries.

The substantive result emerging from this comparison is that France occupies an intermediate position between the Southern Europe and the North-Western core. The economic performance of France indeed differs from both the forging ahead North Sea Area and the Mediterranean countries. France did not embark on a path of sustained growth as Holland and then Britain did since the sixteenth and seventeenth centuries, respectively. Yet, French growth performance appears also different from that of the rest of Europe. In Northern-Central Italy and Spain, output per capita fluctuated without trend between 1300 and 1800 alternating phases of growing and shrinking. Except for Holland and Britain, still in the nineteenth century in all countries, output per capita was lower or broadly on par with the levels prevailing during the Middle Ages. France constitutes an exception in this regard. During the early seventeenth century, output per capita seemingly shifted from a low to a higher equilibrium level and never reverted to its pre-crisis level, stabilizing, after 1660, at about 17–20 percent above the values prevailing during 1300–1500. Interestingly enough, this picture is corroborated by other pieces of evidence on living standards. The evidence on heights since the mid-seventeenth century suggests a similar dynamics of improved living standards in roughly the same period. According to Komlos (2003), the stature of French military recruits increased by about 6 centimeters between 1660 and 1740 while evidence on the male and female heights in Southwestern France drawn from the hospital entry registers (Ridolfi 2020) indicates that, in this phase, nutritional status and health conditions were generally improving also in the most rural parts of France. Overall, this anthropometric evidence, especially if one considers a possible delay between relative economic prosperity and heights, is consistent with the growth spurt of the end of the seventeenth century and beginning eighteenth century that is visible in our estimates. Notably, after 1750, French heights experienced a phase of stagnation and slow decline (Komlos 2003).[23]

Furthermore, our estimates seem also in line with some recent accounts of the origins of the French revolution. For instance, Weir (1991) suggests that the pre-revolutionary phase was characterized by a long-run stability in income per head rather than the dramatic fall in output per capita implied by Labrousse's (1944) account of the French revolution.

Hence, in our reappraisal of French economic performance, the seventeenth century assumes an intriguing role. From an Anglo-French viewpoint, it is the period in which England "forges ahead" and France is definitely losing ground. On the other hand, in comparison with other European countries, the seventeenth century seems the "Great Century" (Grand Siècle) that saw the emergence of France as one of Europe's most powerful nation states. This prominence seems to be coupled with a shift to a higher level of economic performance. However, this "spurt" does not gain further momentum until the 1820s. Accordingly, from the perspective of the "Little Divergence", the French growth experience appears to be as an 'intermediate case' between the sustained growth of the North Sea region countries and the stagnating or declining pattern of the rest of Europe.

6. Concluding remarks

In this paper, we have introduced a new series of GDP per capita for France during the period 1280–1850. The series has been reconstructed using the demand side approach. As it is well known, this approach relies on a number of exacting assumptions and simplifications so that, as noted by Nuvolari and Ricci (2013), it should be more properly considered as a framework of inquiry for formulating broad "reasoned" conjectures on the economic performance of a preindustrial economy, rather than a method yielding water-tight statistical estimations. Reassuringly, it turns out that our estimated series is relatively robust to variations in the parameters and the procedures adopted for estimating the size of the non-agricultural sector of the economy.

In terms of findings, there are two results that merit attention. The first is the relatively long-run stability of our estimated series in the early modern period, with perhaps the exception of a modest "efflorescence" of economic growth during the seventeenth century. In general terms, the long-run pattern of our series is actually in tune until the seventeenth century with Le Roy Ladurie's (1977) notion of "motionless history". However, this result should be regarded, at this stage, as a speculative conjecture to be corroborated by further research.

[23] Our estimates of GDP per capita seem also consistent with Riley's (1987) assessment of French economic growth during the eighteenth century.

The second is that the performance of the French economy is comparable with that of England until at least the second half of the seventeenth century. In this perspective, the notion of an early divergence between the two countries since the end of the Middle Ages (Allen 2001) is not confirmed by our new series of GDP per capita.

Acknowledgements

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Supplementary material

Supplementary material is available at *European Review of Economic History* online.

References

Allen, R.C. (2000). Economic structure and agricultural productivity in Europe, 1300–1800. *European Review of Economic History* **4**, pp. 1–25.

Allen, R.C. (2001). The great divergence in European wages and prices from the middle ages to the first world war. *Explorations in Economic History* **38**, pp. 411–447.

Allen, R.C. (2003). Progress and poverty in early modern Europe. *Economic History Review* **56**, pp. 403–443.

Allen, R.C. (2009). *The British Industrial Revolution in Global Perspective*. Cambridge: Cambridge University Press.

Álvarez-Nogal, C. and Prados De La Escosura, L. (2013). The rise and fall of Spain (1270–1850). *Economic History Review* **66**, pp. 1–37.

Bairoch, P. (1976). Europe's gross national product: 1800–1975. *Journal of European Economic History* **5**, p. 273.

Bairoch, P. (1997). *Victoires et déboires: Histoire économique et sociale du monde du XVIe siècle à nos jours*. Paris: Editions Gallimard.

Bairoch, P., Batou, J. and Chevre, P. (1988). *La population des villes européennes: banque de données et analyse sommaire des résultats: 800–1850*. Paris: Droz.

Becuwe, S., Blancheton, B. and Onfroy, K. (2019). « Base Montesquieu » les données du commerce extérieur français de 1836 à 1938. *Revue de l'OFCE* **4**, pp. 87–109.

Bolt, J. and Van Zanden, J.L. (2014). The Maddison Project: collaborative research on historical national accounts. *Economic History Review* **67**, pp. 627–651.

Bolt, J. and Van Zanden, J.L. (2020). Maddison style estimates of the evolution of the world economy. A new 2020 update. Maddion Project Working Paper n. 15.

Bolt, J. and Van Zanden, J.L. (2021). Two concerns about the interpretation of the estimates of historical national accounts before 1850. *Journal of Global History*, forthcoming.

Braudel, F. (1984). *Civilization and Capitalism, 15th–18th Century, vol. III: The Perspective of the World*. London: Collins.

Broadberry, S. (2013). Accounting for the great divergence. LSE Economic History Working Papers 184/13.

Broadberry, S. (2021). The Industrial Revolution and the Great Divergence: Recent Findings from Historical National Accounting. In Bisin, A. and Federico, G. (eds.), *Handbook of Historical Economics*. London: Academic Press, pp. 749-771.

Broadberry, S., Campbell, B.M., Klein, A., Overton, M. and Van Leeuwen, B. (2015). *British Economic Growth*. Cambridge: Cambridge University Press, pp. 1270–1870.

Cameron, R. and Freedeman, C.E. (1983). French economic growth: a radical revision. *Social Science History* **7**, pp. 3–30.

Charles, L., Daudin, G., Plique, G. and Girard (2021). TOFLIT18 website. Retrieved at http://toflit18.medialab.sciences-po.fr.

Chaunu, P. (1964). Histoire quantitative ou histoire sérielle. *Cahiers Vilfredo Pareto* **2**, pp. 165–176.

Clapham, J.H. (1921). *The Economic Development of France and Germany*. Cambridge: Cambridge University Press, pp. 1815–1914.

Clark, G. (2010). The macroeconomic aggregates for England, 1209–2008. *Research in Economic History* **27**, pp. 51–140.

Crafts, N.F. (1984). Economic growth in France and Britain, 1830–1910: a review of the evidence. *Journal of Economic History* **44**, pp. 49–67.

Crouzet, F. (1966). Angleterre et France au XVIII e siècle: Essai d'analyse comparée de deux croissances économiques. *Annales. Histoire, Sciences Sociales* **21**, pp. 254–291.

Crouzet, F. (1985). *De la supériorité de l'Angleterre sur la France: l'économique et l'imaginaire, XVIIe–XXe siècles*. Paris: Libr. Académique Perrin.

Crouzet, F. (1996). The second hundred years war: some reflections. *French History* **10**, pp. 432–450.

Crouzet, F. (2003). The historiography of French economic growth in the nineteenth century. *Economic History Review* **56**, pp. 215–242.

David, P.A. (1967). The growth of real product in the United States before 1840: new evidence. *Journal of Economic History* **27**, pp. 151–197.

Davis, R. (1973). *The Rise of the Atlantic Economies*. London: Weidenfeld & Nicolson.

Deaton, A. and Muellbauer, J. (1980). *Economics and Consumer Behavior*. Cambridge: Cambridge University Press.

De la Fuente, M. (2014). A mixed splicing procedure for economic time-series. *Estadistica Espanola* **56**, pp. 107–121.

De Pleijt, A. and van Zanden, J.L. (2016). Accounting for the "little divergence": what drove economic growth in pre-industrial Europe? *European Review of Economic History* **20**, pp. 387–409.

De Rouvray, C. A. (2005). Economists writing history. American and French Experience in the mid-20th century. PhD Thesis, London School of Economics.

De Vries, J. and Van der Woude, A. (2011). *The First Modern Economy: Success, Failure, and Perseverance of the Dutch Economy, 1500–1815*. Cambridge: Cambridge University Press, pp. 1500–1815.

Dunham, A.L. (1951). Conditions in the early nineteenth century which retarded the development of French industry: a new perspective on the industrial revolution in France. *Michigan Alumnus Quarterly Review* **62**, pp. 148–158.

Dupâquier (1988). *Histoire de la population française (3)*, 4 vols. Paris: Presses Universitaires de France.

Findlay, R. and O'Rourke, K. (2007). *Power and Plenty: Trade, War, and the World Economy in the Second Millennium*. Princeton: Princeton University Press.

Fohlen, C. (1978). Entrepreneurship and management in France in the nineteenth century. In *The Cambridge Economic History of Europe VII: The Industrial Economies: Capital, Labour, and Enterprise*. Cambridge: Cambridge University Press, pp. 347–81.

Fouquet, R. and Broadberry, S. (2015). Seven centuries of European economic growth and decline. *Journal of Economic Perspectives* **29**, pp. 227–244.

Goldstone, J.A. (2021). Dating the Great Divergence. *Journal of Global History*, forthcoming.

Grantham, G. (1991). The growth of labour productivity in the production of wheat in the Cinq Grosses Fermes of France, 1750–1929. In J.M. Chevet (ed), *Land, Labour and Livestock: Historical Studies in European Agricultural Productivity*. Manchester and New York: Manchester University Press, pp. 340–363.

GRANTHAM, G. (1997). The French cliometric revolution: a survey of cliometric contributions to French economic history. *European Review of Economic History* **1**, pp. 353–405.

GRENIER, J.-Y. (1985). *Séries économiques françaises: XVIe–XVIIIe siècles*. Paris: EHESS.

HEYWOOD, C. (1992). *The Development of the French Economy, 1750–1914*. London: Palgrave Macmillan UK.

HOFFMAN, P.T. (1996). *Growth in a Traditional Society. Growth in a Traditional Society: The French Countryside, 1450–1815*. Princeton: Princeton University Press.

HOFFMAN, S. (1963). *In Search of France*. Cambridge: Cambridge University Press.

KOMLOS, J. (2003). An anthropometric history of early-modern France. *European Review of Economic History* **7**, pp. 159–189.

KRANTZ, O. (2017). Swedish GDP 1300–1560: A Tentative Estimate. Lund Papers in Economic History 152.

LABROUSSE, E. (1944). *La crise de l'économie française à la fin de l'ancien régime et au début de la Révolution*. Paris: Presses universitaires de France.

LANDES, D.S. (1949). French entrepreneurship and industrial growth in the nineteenth century. *Journal of Economic History* **9**, pp. 45–61.

LE ROY LADURIE, E. (1968). Les comptes fantastiques de Gregory King. *Annales. Histoire, Sciences Sociales* **23**, pp. 1086–1102.

LE ROY LADURIE, E. (1977). Motionless history. *Social Science History* **1**, pp. 115–136.

LE ROY LADURIE, E. (1982). *The Territory of the Historian*. Brighton: Edward Everett Root.

LÉVY-LEBOYER, M. (1968). La croissance économique en France au XIXe siècle. Résultats préliminaires. *Annales. ESC* **23**, pp. 788–807.

LÉVY-LEBOYER, M. and BOURGUIGNON, F. (1985). *Economie française au 19e siècle*. Paris: Economica.

MADDISON, A. (2001). *The World Economy: A Millennial Perspective*. Paris: OECD.

MADDISON, A. (2003). *The World Economy: Historical Statistics*. Paris: OECD.

MADDISON, A. (2007). *Contours of the World Economy, 1–2030 AD*. Oxford: Oxford University Press.

MALANIMA, P. (2009). *Pre-modern European Economy: One Thousand Years 10th–19th Centuries*. Leiden: Brill.

MALANIMA, P. (2011). The long decline of a leading economy: GDP in central and northern Italy, 1300–1913. *European Review of Economic History* **15**, pp. 169–219.

MALINOWSKI, M. and VAN ZANDEN, J.L. (2017). Income and its distribution in preindustrial Poland. *Cliometrica* **11**, pp. 375–404.

MARKOVITCH, T.J. (1965). *L'industrie française de 1789 à 1964*. Cahiers de l'ISEA Série AF, no. 4. Paris: Institut de Science Economique Appliquée.

MILANOVIC, B. (2015). The level and distribution of income in mid-eighteenth-century France. *Journal of the History of Economic Thought* **37**, pp. 17–37.

MORAZÉ, C. (1957). *Les bourgeois conquérants, XIXe siècle*. Paris: Colin.

MORRISSON, C. and SNYDER, W. (2000). The income inequality of France in historical perspective. *European Review of Economic History* **4**, pp. 59–83.

NUVOLARI, A. and RICCI, M. (2013). Economic growth in England 1250–1850: some new estimates using a demand side approach. *Rivista di Storia Economica* **29**, pp. 31–54.

O'BRIEN, P. and KEYDER, C. (1978). *Economic Growth in Britain and France 1780–1914: Two Paths to the Twentieth Century*. London: George Allen & Unwin.

PALMA, N. and REIS, J. (2019). From convergence to divergence: Portuguese economic growth, 1527–1850. *Journal of Economic History* **79**, pp. 477–506.

PFISTER (2011). Economic growth in Germany, 1500–1850, Paper presented at the Conference on Quantifying Long Run Economic Development, Venice 22–24 March, 2011.

PRADOS DE LA ESCOSURA, L. (2016). Mismeasuring long-run growth: the bias from splicing national accounts—the case of Spain. *Cliometrica* **10**, pp. 251–275.

PRADOS DE LA ESCOSURA, L., ÁLVAREZ-NOGAL, C. and SANTIAGO-CABALLERO, C. (2021). Growth Recurring in Preindustrial Spain? *Cliometrica*, forthcoming.

Ridolfi, L. (2016). The French Economy in the Longue Durée. A study on Real Wages, Working Days and Economic Performance from Louis IX to the Revolution (1250–1789). Ph.D. diss., IMT School for Advanced Studies Lucca, Italy.

Ridolfi, L. (2019). Six centuries of real wages in France from Louis IX to Napoleon III: 1250–1860. *Journal of Economic History* **79**, pp. 589–627.

Ridolfi, L. (2020). Gender inequality in a preindustrial rural economy. Evidence from Southwestern France, 1660–1850. Mimeo.

Riley, J. (1987). French finances, 1727-1768. *Journal of Modern History* **59**, pp. 209–243.

Sawyer, J.E. (1951). Strains in the social structure of modern France. In E.M. Earle (ed), *Modern France*. Princeton University Press: Princeton, pp. 293–312.

Schön, L. and Krantz, O. (2012). The Swedish economy in the early modern period: constructing historical national accounts. *European Review of Economic History* **16**, pp. 529–549.

Sharp, P., Strulik, H. and Weisdorf, J. (2012). The determinants of income in a Malthusian equilibrium. *Journal of Development Economics* **97**, pp. 112–117.

Simpson, J. (1995). *Spanish Agriculture: The Long Siesta, 1765–1965*. Cambridge: Cambridge University Press.

Spooner, F.C. (1972). *The International Economy and Monetary Movements in France, 1493–1725*. Cambridge: Harvard University Press.

Toutain, J.-C. (1961). *Le produit de l'agriculture française de 1700 à 1958. Cahiers de l'ISEA Série AF, nos. 1–2*. Paris: Institut de Science Economique Appliquée.

Toutain, J.-C. (1987). *Le produit intérieur brut de la France de 1789 à 1982. Economies et sociétés. 'Histoire quantitative de l'économie française', Série AF, no. 15*. Paris: Institut des Sciences Mathématiques Economiques Appliquées.

Trebilcock, C. (1981). *The Industrialisation of the Continental Powers 1780–1914*. New York: Routledge.

Van Zanden, J.L. and Van Leeuwen, B. (2012). Persistent but not consistent: the growth of national income in Holland 1347–1807. *Explorations in Economic History* **49**, pp. 119–130.

Vauchez, M. (2015). *1816 l'année sans été*. Editions Persée: Aix-en-Provence.

Voigtlander, N. and Voth, H.J. (2013). The three horsemen of riches: war, plague and urbanization in early modern Europe. *Review of Economic Studies* **80**, pp. 774–811.

Weir, D.R. (1991). Les crises économiques et les origines de la Révolution française. *Annales. Histoire, Sciences Sociales* **46**, pp. 917–947.

Wrigley, E.A. (1985). Urban growth and agricultural change: England and the continent in the early modern period. *Journal of Interdisciplinary History* **15**, pp. 683–728.

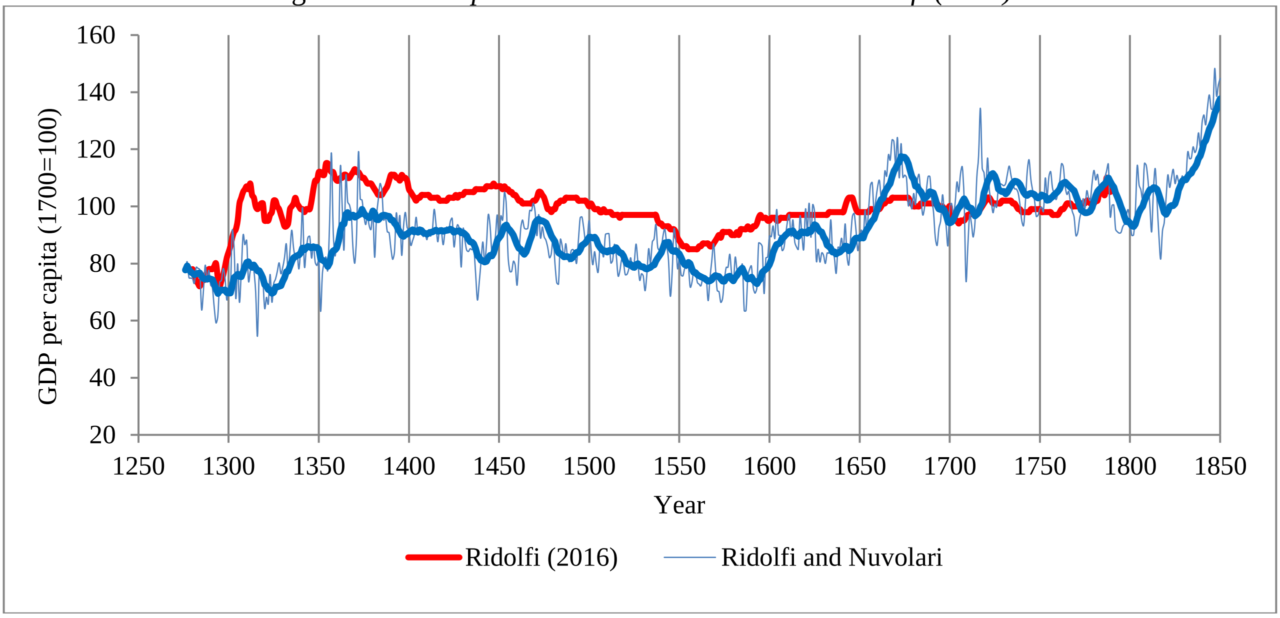
Online Appendix

Appendix 1: Comparison of our GDP per capita series with Ridolfi (2016)

Figure A1.1 compares our new series of French output per capita with that in Ridolfi's (2016). Both series have been constructed using the demand side approach. Figure A1.1 shows a number of significant differences in the evolution of output per capita from 1250 to 1850. In particular, the current series displays a lower level of income in the period 1300-1600 and steadier growth than Ridolfi (2016) between the late sixteenth century and the 1780s. These differences arise from two main factors.

First, the current version relies on a much broader set of wage and price data. The current dataset builds upon Ridolfi (2019) which is an updated version characterized by a significantly larger spatial and temporal coverage than Ridolfi (2016). For instance, based on new archival evidence, Ridolfi's (2019) dataset provides a greater coverage of Southern France (especially the Mediterranean and South-Western areas) and the Centre, while in terms of time, it increases the sample size for the late medieval period. Furthermore, the price and wage series in Ridolfi (2019) cover a longer time span allowing us to extend the GDP estimates to 1850.[1]

Figure A1.1 *Comparison between our series and Ridolfi (2016)*



Notes: the smoothed series is a 11-year moving average.

The second difference lies in the way the price and wage indices are constructed. In estimating the price and wage series, Ridolfi (2016) relies on piecewise regressions models while the current version applies Clark's (2005) regression framework which is best suited to capture short term fluctuations than the former.

Differences also lie in the weighting schemes used for obtaining the price indices of agricultural and manufacturing products. Following Allen (2000), in this study we use a Laspeyres-type weighting scheme while Ridolfi (2016) estimates geometric price indices using as weights the assumed output shares of each commodity. In both studies however, the differences in the formulae used for construction have little bearing on final results. Finally, the current version updates the population and trade figures based on the most recent releases.[2]

[1] For a detailed discussion of the sources, their coverage, and the construction of the series, see Ridolfi (2019; both the published paper and the online Appendix) and Ridolfi (2016).

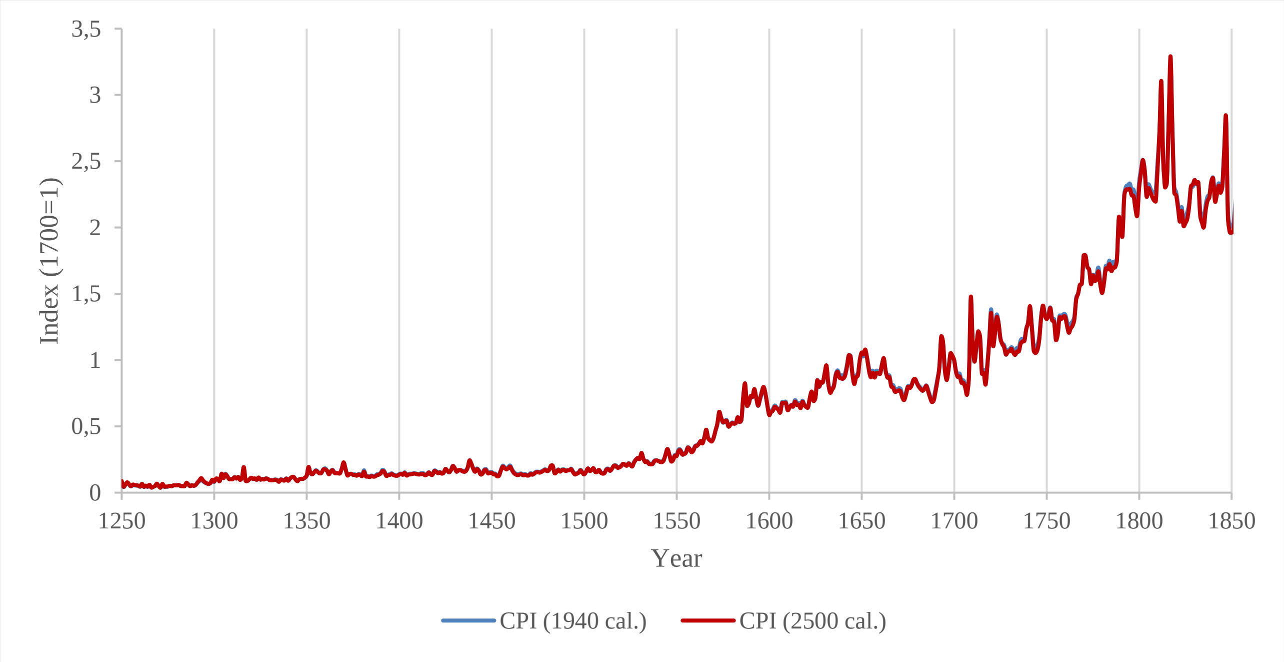
[2] For instance, the new estimates hinge upon the recent trade statistics released by the TOFLIT18 project (Charles et al., 2021) and the Montesquieu database (Becuwe, Blancheton, and Onfroy, 2019).

Appendix 2: The consumer price index

We deflate nominal wages by the consumer price index constructed by Ridolfi (2019). This is a Laspeyres price index whose weights reflect the quantities consumed per person per year as originally proposed by Allen (2001). Overall, the basket provides 1,940 calories per person per day (Table 1). In what follows we check the consistency of this benchmark against an alternative specification that differs in terms of total calorie intake. Specifically, following Humphries' (2013) concerns about the minimum calorie intake set by Allen (2001), we raise per capita consumption of bread to 265 kilograms per year so as to meet the minimum requirement of 2,500 calories per day for active workers.

Figure A2.1 compares the baseline with this alternative specification. The price series are almost indistinguishable in their evolution suggesting that results are not driven by the total calorie intake of the basket.[3]

Figure A2.1 *Comparison between different consumer price indices*



Sources: prices: Ridolfi (2019). *Notes*: following Allen (2001), our baseline consumer price index (CPI) is based on a consumption bundle of 1,940 calories per person per day. The second consumption bundle instead provides 2,500 calories per person per day. The structure of the bundle is the same as Allen (2001) except for bread whose per capita consumption is set to 265 kilograms per year.

[3] Note that for estimating output per capita, we are interested in price changes rather than price levels and this is why we compare the two consumer price indices in index form rather than in level.

Appendix 3: Sensitivity analysis

Given the uncertainties surrounding estimates of output per capita for the pre-industrial period, it is useful to perform some sensitivity analysis in order to check the overall reliability of our results.
First, we explore different sets of parameters and check how these changes affect the estimates of total output per capita. Second, we compute the days of work that are "implicit" in our estimates of GDP per capita (implied working year) and compare them with a series of the actual working year derived from a set of independent estimates.

We start from considering the parameter set involved in computations. In the baseline specification we assume that the ratio between agricultural production and domestic consumption of agricultural goods (r) was equal to one, namely that France was a closed economy in terms of trade of agricultural products. Here we relax this assumption for the period 1716–1850 when France rapidly developed its colonial trade, especially with America (Crouzet 1966). Specifically, we estimate the ratio between agricultural production and domestic consumption of agricultural goods (r) by applying the following expression:

$$(1)\ r = \frac{Y_{ad}}{C_a} = \frac{Y_{ad}}{Y_{ad}+S_{aI}I-S_{aE}E}$$

where Y_{ad} is domestic agricultural production; C_a is total consumption of agricultural products; I represents total imports and E total exports, while S_{aI} and S_{aE} are the shares of agriculture in total import and total export, respectively.
We have used three sources for estimating the ratio between agricultural production and domestic consumption of agricultural goods (r). The first is Arnould (1791) which reports significant pieces of information, recently re-proposed by Léon (1974) and Daudin (2012), about the sectoral distribution of foreign trade at the beginning of the eighteenth century. Arnould identifies four sectors, namely colonial consumption goods and slaves, raw materials, other agricultural goods, and industrial commodities including drinks. Adding up the contribution of raw materials and other agricultural goods one obtains an estimate of the share of agricultural products in total imports (S_{aI}) and exports (S_{aE}) for the year 1716. The resulting share of agricultural products in total exports is about 25 per cent while that in total imports accounts for about 60 per cent in 1716.

Second, for the years 1754-1821 we rely on the Toflit18 dataset which includes information on the quantities and values of imports and exports for hundreds of products.[4] Finally, for the period 1836-1860, we draw upon the Montesquieu dataset (Becuwe, Blancheton, and Onfroy, 2019) which collects annual series of French foreign trade from 1836 to 1938 based on a large set of products.[5] These are classified in three broad categories, primary, agricultural, and manufacturing products following the definition provided by the custom administration.

Initially we have used the classification used in the Montesquieu dataset to compute our trade statistics.[6] In order to provide a harmonized series of r we group the trade data contained in the Toflit 18 dataset using this classification. Nevertheless, we have also tested an alternative definition of agricultural products which broadens the definition used in the Montesquieu dataset by including also wood and raw textiles materials. This latter is our preferred classification because it fits better with the definition of agricultural products of our paper. Again, we re-group Toflit 18 data so as to match this classification. [7]

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[4] This dataset (Charles et al.) is available at http://toflit18.medialab.sciences-po.fr

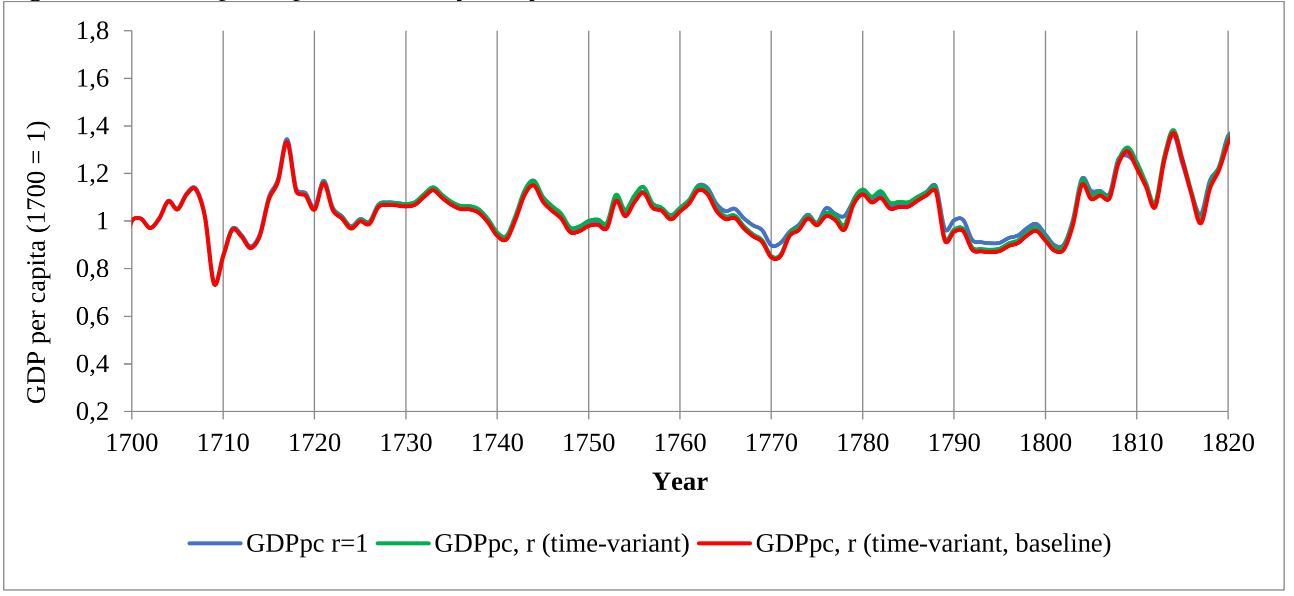
[5] The exchanged products are presented at several levels of disaggregation. The principal classification groups them in 107 categories for imports and 135 categories for exports (Becuwe, Blancheton, and Onfroy, 2019).

[6] See the Appendix section 2 and the supporting material presented in Becuwe, Blancheton, and Onfroy (2019) for a detailed description of the items included in the category of 'agricultural products'.

[7] We are indebted to Guillaume Daudin, Stéphane Becuwe, Bertrand Blancheton, and Karine Onfroy which kindly shared their data, thus, allowing us to harmonize the Toflit 18 and Montesquieu trade statistics.

Estimating *r* also requires information on nominal agricultural output which we draw from Toutain (1961).[8] His series has the advantage of allowing us to estimate the series of *r* back in time as far as possible.
Figure A3.1 compares the GDP per capita with *r* equal to one against two alternative specifications -based on the two definitions of agricultural product specified above- which allow *r* to vary over time. The results are reassuringly consistent with the baseline specification where *r* is set to one

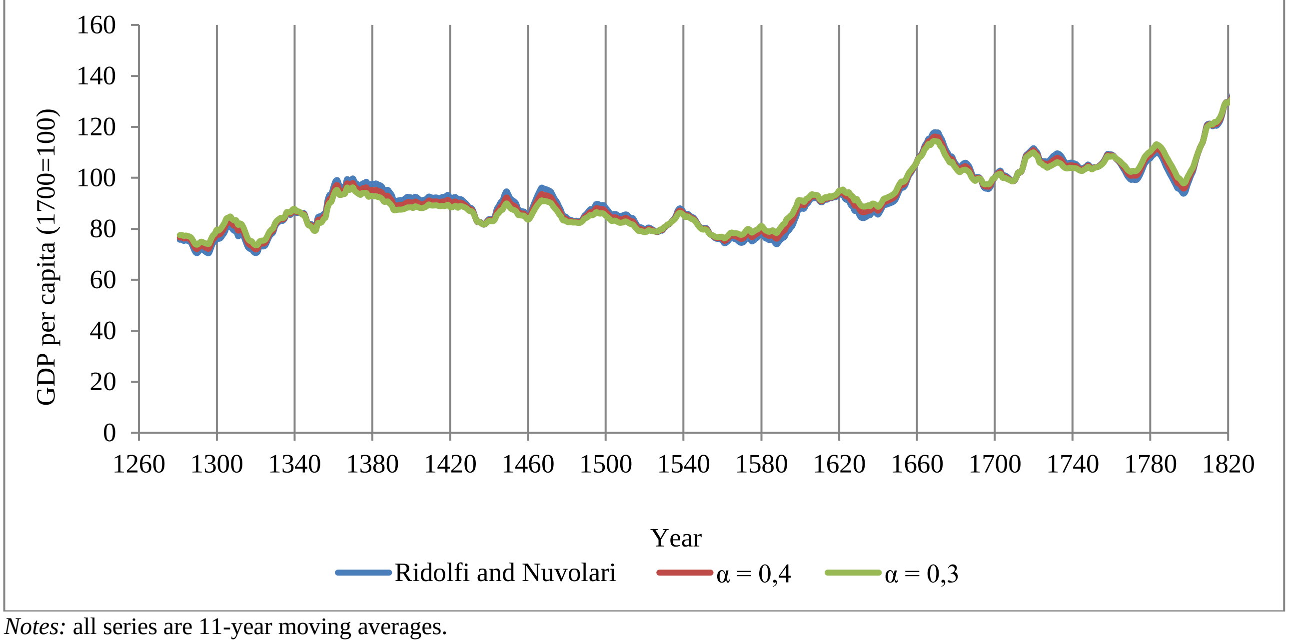
Figure A3.1 *GDP per capita, sensitivity analysis: r*



Sources: see the text. *Notes:* all series are 11-year moving averages.

Following Allen (2000), in the baseline specification, we set the own price, cross price, and income elasticities at -0.6, 0.1, and 0.5, respectively. Here, we use two different sets of parameters. The first implies that α =0.4; β = -0.5; while the second α = 0.3; β = -0.4. Figure A3.2 shows that the baseline specification is broadly consistent with these alternative specifications.

Figure A3.2 *French GDP per capita, Sensitivity analysis: elasticities*



Notes: all series are 11-year moving averages.

[8] We have also estimated *r* using two alternative series of total agricultural output, namely Toutain (1987) and Lévy-Leboyer and Bourgouignon (1985). However, these changes do not make any substantial difference.

Furthermore, to assess the reliability of our GDP per capita series, we compare the days of work that are "implicit" in our GDP per capita estimates (implied working days), with a series of the actual working days. The yearly number of working days implied in our output per capita series is computed as follows:

(1) $d = \frac{\alpha \cdot Y}{w \cdot L}$

where Y is the nominal GDP, α is the share of wages in total income, w is the nominal daily wage, and L the total number of workers. Equation (2) indicates the total number of working days necessary to obtain a yearly earning corresponding to a certain level of GDP per capita conditional on the prevailing income distribution and the wage structure. To estimate this formula, we proceed as follows. First, we construct an index of nominal GDP (Y) multiplying our series of real GDP per capita by the cost of living index constructed by Ridolfi (2019) and by total population from Dupâquier (1988, vols II and III).

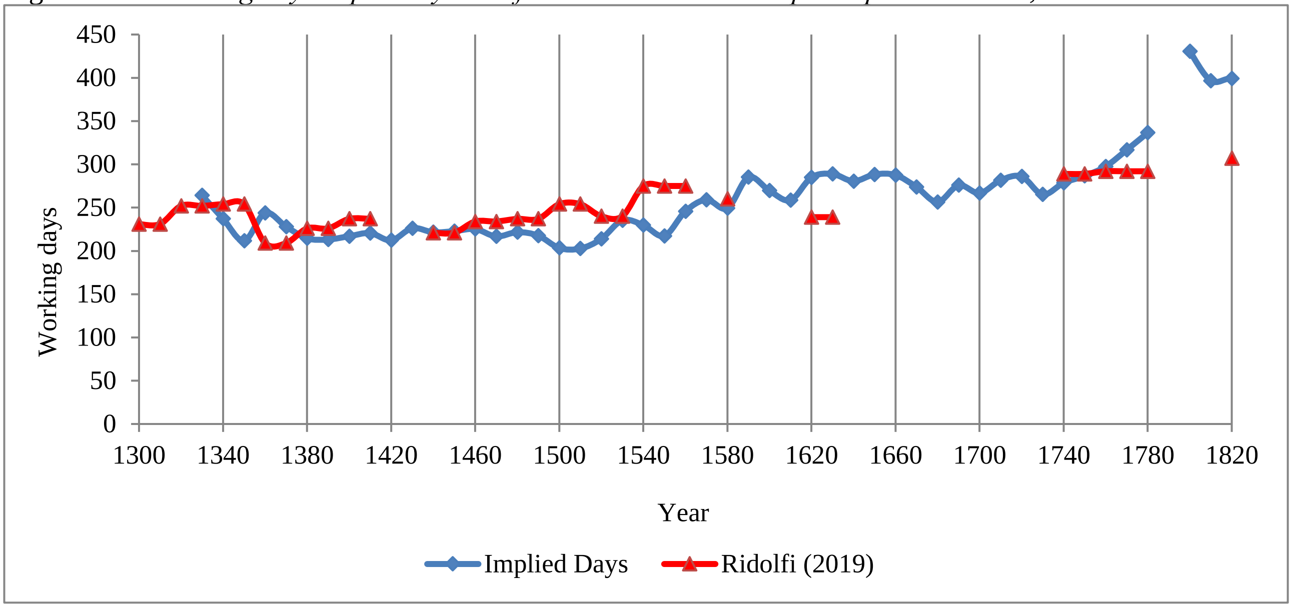
Consistent eighteenth and nineteenth evidence suggests that the labour share in total income α was about 0.55 (Milanovic 2015, Morrisson and Snyder 2000, Piketty 2014). In the absence of more precise information, we retained the same value for earlier periods. In this way, we can construct a time-series of the nominal value of labour income (the numerator of formula 2). We then estimate total working population L by multiplying total population by the average share of working population for the period 1806–1851 (0.45) provided by Marchand and Thélot (1991). We finally compute the denominator of formula (2) by multiplying the average daily wages (series taken from Ridolfi (2019)) by the total number of workers.

Figure A3.3 compares the implied working year derived from equation (2) with a series of the actual working year for French regular construction workers from 1300 to 1800. The series labeled "Ridolfi (2019)" is constructed using a fairly large sample of building projects across France that record the weekly number of days worked per person for the period 1320–1644 as well as a set of secondary sources (Ridolfi 2019, Appendix). It should be noticed that these data are consistent with what we know about other occupational categories for which consistent, although scattered information, is available. Specifically, the total number of days worked per year in industry averaged 286 according to the 1844 industrial survey and approached 280 days between 1843 and 1870 for workers employed in mining (Kuczinsky 1946).[9]

Overall, Figure A3.3 suggests that our estimates track rather closely the series of the actual working year before 1800. After 1800 there is a visible discrepancy between the two series. In this case, it is likely that the wide fluctuations in the cost of living index of the period 1810-182 make the estimates of the implied working days significantly less reliable. At all events, given the admittedly crude procedure adopted for the computation, we consider this overall result as an interesting corroboration of our estimate of output per capita. At the same time, as we have already noted, this finding suggests that we should consider our estimates of GDP per capita for the revolutionary and Napoleonic period with some caution.

[9] The 1844 survey is available at the Archives Nationales (F/20/715). The 1852 and 1862 agricultural surveys point to a lower working year. However, it is difficult to interpret these numbers as these concern time spent in agriculture while a substantive share of workers, ranging from 25 to 50 percent floated seasonally from agriculture to industry (Grantham 1993, Magnac and Postel-Vinay 1997) or integrated their earnings with other sources of income (Goubert 1960).

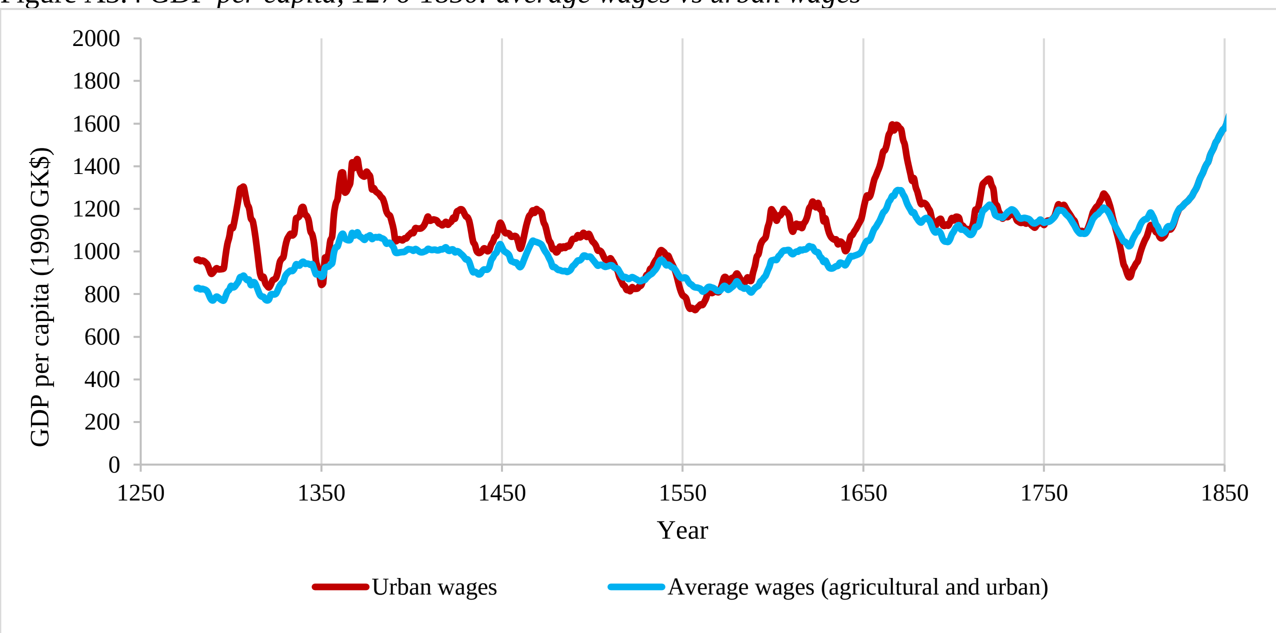
Figure A3.3 *Working days implied by Ridolfi and Nuvolari's GDP per capita estimates, 1276–1850*



Sources: see text.

Finally, we compare our series of GDP per capita with one obtained using only urban wages rather than the average of agricultural and urban wages in the demand function (Figure A3.4). This allows to assess potential differences that should be taken into account when comparing our estimates with that of other countries for which only urban wages have been used. Overall, we find that the use of urban wages results, in general, in a slightly higher level of GDP per capita and in a series that in several moments is characterized by some rather sharp fluctuations. The series obtained using the average of urban and agricultural wages has a significantly smoother behavior.

Figure A3.4 *GDP per capita, 1276-1850: average wages vs urban wages*



Sources: see text. *Notes:* all series are 11-year moving averages.

References

ALLEN, R. C. (2000). Economic structure and agricultural productivity in Europe, 1300–1800. *European Review of Economic History* **4**, pp. 1–25.

ALLEN, R. C. (2001). The great divergence in European wages and prices from the Middle Ages to the First World War. *Explorations in Economic History* **38**, pp. 411–447.

ARCHIVES NATIONALES. Prix des denrées et salaire en 1844. **F/20/715**.

ARNOULD, A. M. (1791). *De la balance du commerce et des relations commerciales extérieures de la France: dans toutes les parties du globe, particulièrement à la fin du régne de Louis XIV, et au moment de la révolution avec la valeur de ses importations et exportations progressives depuis 1716 jusqu'en 1788 inclusivement*, volume 1. Paris: Buisson.

BECUWE, S., BLANCHETON, B. and ONFROY, K. (2019). « Base Montesquieu » les données du commerce extérieur français de 1836 à 1938. *Revue de l'OFCE* **4**, pp. 87-109. https://doi.org/10.3917/reof.164.0087

CHARLES L., DAUDIN, G., PLIQUE, G. AND GIRARD, P. (2021), TOFLIT18 website. Retrieved at http://toflit18.medialab.sciences-po.fr

CLARK, G. (2005). The condition of the working class in England, 1209–2004. *Journal of Political Economy* **6**, pp. 1307–1340.

CROUZET, F. (1966). Angleterre et France au XVIII e siècle: essai d'analyse comparée de deux croissances économiques. *Annales. Histoire, Sciences Sociales* **21**, pp. 254–91.

DAUDIN, G. (2012). *Commerce et prospérité: La France au XVIIIe siècle.* 2e édition. Lulu. com.

DUPÂQUIER, J. (1988). *Histoire de la population française*. 4 vols. Paris: Presses Universitaires de France.

GOUBERT, P. (1986). *The French peasantry in the seventeenth century*. Cambridge: Cambridge University Press.

GRANTHAM, G. (1993). Divisions of labour: agricultural productivity and occupational specialization in pre-industrial France 1. *Economic History Review* **46**, pp. 478–502.

HUMPHRIES, J. (2013). The lure of aggregates and the pitfalls of the patriarchal perspective: a critique of the high wage economy interpretation of the British industrial revolution. *Economic History Review* **66**, pp. 693-714.

KUCZYNSKI, J. (1946). *A short history of labour conditions under industrial capitalism*. London: F. Muller.

LÉON, P. (1974). Structure du commerce extérieur et évolution industrielle de la France à la fin du XVIIIe siècle. In F. Braudel (eds), *Conjoncture économique, structure sociale. Hommage à Ernest Labrousse*. Paris: Mouton, pp 407–32.

LÉVY-LEBOYER, M. and BOURGUIGNON, F. (1985). *Economie française au 19e siècle*. Paris: Economica.

MAGNAC, T., and POSTEL-VINAY, G. (1997). Wage competition between agriculture and industry in mid-nineteenth century France. *Explorations in Economic history* **34**, pp. 1–26.

MARCHAND, O. and THELOT, C. (1991). *Deux siècles de travail en France*. Paris: Nathan.

MILANOVIC, B. (2015). The Level and Distribution of Income in Mid-Eighteenth-Century France, According to François Quesnay. *Journal of the History of Economic Thought* **37**, pp. 17–37.

MORRISSON, C. and SNYDER, W. (2000). The income inequality of France in historical perspective. *European Review of Economic History* **4**, pp. 59–83.

PIKETTY, T. (2014). *Capital in the twenty-first century*. (Technical appendix). Cambridge, MA: Harvard University Press.

RIDOLFI, L. (2016). The French Economy in the Longue Durée. A study on Real Wages, Working Days and Economic Performance from Louis IX to the Revolution (1250–1789). *Ph.D. diss., IMT School for Advanced Studies Lucca, Italy*.

RIDOLFI, L. (2019). Six Centuries of Real Wages in France from Louis IX to Napoleon III: 1250–1860. *Journal of Economic History* **79**, pp. 589–627.

TOUTAIN, J.-C. (1987). Le produit intérieur brut de la France de 1789 à 1982*. Economies et sociétés. 'Histoire quantitative de l'économie française',* Série AF, no. 15. Paris: Institut des Sciences Mathématiques Economiques Appliquées.