Was There A Crisis? Living Standards in Lower Canada, 1760 to 1848 *

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Abstract

Lower Canada, now the Canadian province of Quebec, is believed to have faced an agricultural crisis in the early 1800s, leading to declining living standards, a debated topic due to lack of data. This paper uses new data on real wages, literacy, and infant mortality to quantitatively assess living standards from 1760 to 1850. The findings show no evidence of a crisis; instead, there are only indications of improvements during the period.

Keywords: Canadian economic history, agricultural crisis, economic growth, human development
Data Availability Statement: All our data is available here at ICPSR. Access to the BALSAC microdata used in this paper is restricted due to ethics regulations. They are available upon request from the BALSAC Project.
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1 Introduction

Did living standards fall in Lower Canada, the modern province of Quebec in Canada when it was a British colony, during the first half of the 19th century? This question is tied to the debated existence of an "agricultural crisis" with its origins in a persistent decline of wheat production. This, historians argue (Dorais, 2022), led to a generalized decline in living standards because of the importance of wheat to the agricultural sector and the economy in general (Russell, 2012; Rouillard, 2023).

The crisis is argued to be at the origins of the Rebellions of 1837–38 (Creighton, 1937; Goldring, 1980) which in turn led to the union of Upper Canada (i.e., Ontario) and Lower Canada in 1840 and a protracted period of political instability that ultimately led to the Canadian confederation in 1867.[1] Because it is argued that living standards fell in Quebec while they rose elsewhere, the crisis was an important motivator for the migration of French-Canadians to the higher-income states of New England (Paquet and Smith, 1983; Roby, 2004; Vermette, 2018).

In this paper, using and augmenting recently unveiled price and wage data (Geloso, 2019a; Geloso and Lindert, 2020), we show that there was no crisis. Real wages increased at a modest pace. This result is stronger when we use econometric strategies that control for seasonality of the wage observations and the heterogeneity of primary source materials. These findings also hold using different price deflators. Using demographic datasets, we also show that there were marked improvements in literacy rates and infant mortality rates. Literacy rates – proxied from signatures at marriage – were increasing throughout the period in a manner that is consistent with the findings regarding wages. A cross-section of literacy rates and infant mortality cross-walked with the wage data in the census of 1831 confirms that high-wage areas exhibit higher levels of human capital and lower rates of infant mortality. Combined, these results resolve multiple aspects of the debate over the "agricultural crisis".

Our article is divided as follows. Section 2 makes a short presentation of the debate on

[1] Others like Kelly (1997) and Bellavance (1992) emphasize the key role of French-Canadians political actors in the bargaining for confederation. In their telling, the consequences of the crisis shaped political behavior.

the agricultural crisis. Section 3 presents the wage evidence. Section 4 presents the literacy evidence. Section 5 presents the mortality evidence. Section 6 connects the results from the three previous sections to earlier works and confirms that any notion of falling living standards can be rejected. Section 6 concludes.

2 The Agricultural Crisis Debate

The opposing lines of the debate on the agricultural crisis in Lower Canada are drawn on two axes. The first relates to the theory that French-Canadian culture was holding back improvements in agricultural productivity. The second relates to whether the decline of wheat production – the argued root cause of the agricultural crisis – caused a decline in living standards (if there was a decline at all).[2] With regard to the first axis, proponents of a protracted crisis argue that the cultural conservatism of French-Canadians who clung to wheat farming and refused to adopt new and better farming practices precipitated the crisis (Jones, 1942, 1946; Séguin, 1970; Ouellet, 1966, 1972, 1980; Egnal, 1996). Combined with rapid population growth, the filling-up of the hinterland, and soil erosion (or low land quality in the telling of McCallum [1980]), this cultural conservatism resulted in falling living standards.[3]

Many cliometricians[4] pushed back strongly against the proponents of a protracted crisis and the emphasis on cultural conservatism (Lewis and McInnis, 1980; Armstrong, 1984b; Altman, 1998; Pronovost, 1998; Paquet and Wallot, 2007; Geloso et al., 2017; Geloso, 2022; Geloso et al., 2023b). Relying on agricultural productivity data, responses to price changes and farming techniques, they either showed that there were no statistically significant differences between

[2]No one debates whether there was a decline in wheat production. This is well-agreed upon by all parties involved (Lavertue, 1984; Russell, 2012; Rouillard, 2023).

[3]This explanation is often complemented with arguments regarding changes in foreign demand. However, most of those who emphasize foreign demand for agricultural output from Quebec tend to eschew the cultural conservatism hypothesis (Chatillon, 1976; McInnis, 1982; Geloso et al., 2023b).

[4]We say cliometricians because the near-totality of this group is composed of economists with the notable exceptions of Jean-Pierre Wallot and Claude Pronovost. The common denominator within that group is that econometric methods and economic modelling are frequently used to arrive at conclusions. Also, it should be noted that there are some historians who believe there was no crisis but accept the cultural conservatism hypothesis (i.e., they argue that French-Canadians had pre-capitalist mentalities — see for example Bouchard [1996]).

French-Canadian and English-Canadian farmers in Quebec or that culture played no role in the decline of wheat output.

Alongside rejecting the cultural conservatism hypothesis, they also systematically reject the idea of falling living standards. Paquet and Wallot (2007)[5] and McInnis (1982) were the first to seriously criticize the claims of an agricultural crisis by disputing relevance of the decline of wheat crop to living standards. The rational peasants of Quebec simply shifted away from wheat and into other types of farm outputs or non-farm outputs that were more remunerative.[6] A decline of wheat production could be the result of smooth changes in industrial activity as Quebec specialized increasingly in timber and potash production which it traded for cheaper wheat from the United States and Ontario (McInnis, 1982; Pronovost, 1998). On that basis, some reject the claim of a crisis (McInnis, 1982; Geloso et al., 2023b). Others are willing to accept the idea of a difficult evolution in the form of difficult structural changes in the economy but they do not speak of a crisis (Armstrong, 1984a, 1984b).

No one in that group, however, accepts the notion of declining living standards during the period associated with the crisis. Instead, they highlight a wealth of empirical evidence indicating actual increases. For example, using probate records, Paquet and Wallot (2007) found modest growth in per household financial wealth from 1792 to 1835 (between 18% and 51% in real terms). Later, using wheat prices and vital statistics, Geloso and Kufenko (2015) tested whether there were any signs of population pressures under the hypothesis that such signs would confirm the presence of a Malthusian equilibrium. They found no signs of such an equilibrium. As a Malthusian equilibrium is typically associated with stagnant productivity at a stable population, the presence of rapid population growth suggests productivity growth. Geloso and Bédard (2018) went further and used the logic of the equation of exchange, which

[5]This volume refers to a compendium of their articles since 1969 on the matter of Quebec's economic history.

[6]Multiple economic historians then complemented the earlier works of Paquet, Wallot and McInnis in arguing that there was a rational shift out of wheat that was welfare enhancing. Particularly illustrative of this viewpoint is the work of Geloso et al. (2023b) who looked at changes in wheat production following rapid reductions in intra-colonial transport costs and the unilateral liberalization of agricultural trade with the United States. They found that exposure to these shocks caused a shift out of wheat (which could be imported more cheaply from elsewhere) in favor of other activities (farm and non-farm) that led to net income gains. Thus, the shift out of wheat was rational and led to improvements in living standards.

states that the velocity of money times the money supply should equal the nominal value of all outputs being traded. Relying on price indices and monetary aggregates, they found that only under impossible assumptions regarding the velocity of money could there have been falling living standards. They argue that per capita income growth rates must have been somewhere between 0.17% and 0.53% per year from 1822 to 1851. Therefore, while some may debate whether structural changes occurred, such as the declining significance of agricultural activities, those who argue there was no crisis consistently agree that living standards improved at least modestly.

There is another group of scholars who argue that there was no crisis. However, they argue that there was modernisation in the sense that the structures of the economy were changing by becoming less agrarian. This modernization, they argue, was accompanied by near-stagnant living standards. Improvements were either modest or so unevenly distributed that large shares of the population actually suffered declines in living standards (Courville, 2008; Harris, 2012; Russell, 2012; Sweeny, 2015; Dessureault, 2021). The modernization process began because of the same agricultural problems that proponents of the crisis cite: overpopulation, soil erosion, and recurrent exogenous shocks (Russell, 2012, pp. 36-81). Modernization was an obligation rather than a choice, which explains the general emphasis on rising inequality during the period.[7]

The limitations of previous criticisms of the crisis are that they are either roundabout or rely on problematic data sources. Evidence based on economic theory or indirect observations is often deemed to be a roundabout solution that does not meet the empirical challenge of directly documenting living standards (Le Goff, 1974).[8] This is in addition to the scorn raised by some

[7]For example, Courville (1980) argues that while gross farm income increased or remained stable, farm income net of seigneurial dues fell. Seigneurial lords (i.e., feudal owners of large land estates created during the era of French rule) raised dues enough to offset any other gains in the farm sector. Turning to alternative sources of income like lumbering or leaving agriculture altogether was thus an obligation. As such, even though they dispute the idea of a crisis, they reject the idea of widespread improvements in living standards. Altman (1998) makes a similar claim regarding how seigneurial tenure increased poverty.

[8]This is the case with the work of Courville (1980) mentioned in the previous footnote. It relied heavily on wheat yields per unit of land (p. 202). This assumes that all farming productivity changes come from land productivity. Changes in transportation or transformation technologies that change marginal costs or shifts in demand changing marginal revenues cannot be captured by this type of data. It also focuses heavily on cereals and eschews the importance of pastoral production. One should consult Grantham (1989) for an illustration of this point applied to the case of France pre-1789.

scholars for the use of econometric methods by skeptics of the agricultural crisis (Dechêne, 1986).[9] When direct measurements of living standards are attempted, important criticisms are levelled. For instance, the probate data used by Paquet and Wallot (2007) have been attacked for not being representative (Russell, 2012). Moreover, the existing evidence does not allow to clearly distinguish who is correct between those who reject the claim of a crisis but debate whether living standards rose. Indeed, Harris (2012, p. 237) points out that there is a heavy reliance of localized case studies — mostly around Montréal — to study modernization. This makes it hard to generalize to the entire colony. There are also contradictions between the different case studies.[10]

Breaking the deadlock in this debate requires using direct measures of living standards. Given arguments that modernization was painful with minimal benefits for lower-income individuals, it is also essential to find indicators representing the majority of the colony's population. By utilizing data on wages for unskilled workers, literacy, and infant mortality, we aim to provide such indicators, thereby resolving the debate.

3 Wage Evidence

The claims of an agricultural crisis are tied to falling productivity in farming. A fall in the marginal product of labor should, normally, entail a reduction in real wages and real farm incomes (all else being equal). It is only fitting that we employ such wage data. Most importantly, the focus should be on unskilled workers because this group is likely to speak to the majority of workers and workers in the agricultural sector.

Currently, Geloso and Lindert (2020) provide the only continuous dataset of wages for Quebec from 1775 to 1859. It contains wage data collected from the account books from two

[9] Similar dismissals have been applied to other periods of Quebec's economic history (see Desbarats [1992] for an example).

[10] Sometimes, the contradictions are produced by the same author. For example, Dessureault (2018, pp. 199-229) argued that the Saint-Hyacinthe area near Montreal enjoyed universal improvements in living standards but that there was greater social differentiation (i.e., greater inequality). Yet, he later uses the same data to create an index of living standards for different periods from 1740 to 1834 and reports the coefficients of variation (i.e., a rough proxy for inequality) for each period (Dessureault, 2018, pp. 246-47). That coefficient falls over time.

important religious congregations near Quebec City – the Ursulines de Québec and the Séminaire de Québec. Both had large farm estates and numerous small industrial establishments.[11] After 1790, these sources are complemented with wage rates reported in government publications. Overall, they were able to collect 326 different wage rates for unskilled workers over the period. There was at least one wage rate for 93% of the years from 1776 to 1859. More than 75% of years offered more than two wage quotations for unskilled work.[12] Combined with the earlier work of Geloso (2019b) for the period from 1760 to 1774, we arrive at a combined 369 wage quotations over the period from 1760 to 1850.[13] To express the wages in real terms, there are two available indices. The first is provided by Geloso (2019a) in the form of a consumer price index (henceforth CPI). The second is produced by Geloso and Lindert (2020) and it measures the cost of living of people in the lowest deciles of the income distribution (henceforth poor-CPI). Both indexes behave similarly, but there are some notable differences after 1815. For the sake of robustness, we deflate nominal wages by both indexes. In Figure 1, these real wage series are depicted in the top two graphs with the solid lines (see more below on the dashed line). As can be seen, the wage series provided by Geloso and Lindert (2020) suggests that living standards rose to a higher plateau during the first half of the 19th century with no signs of a persistent decline. This is strong evidence against the claim of the decline in living standards argued for by proponents of the agricultural crisis.

INSERT FIGURE 1 HERE

That being said, there are multiple potential issues with these wage data that should be addressed in order to fully convince anyone of the implications they may produce with regards to the agricultural crisis. First, the resulting wage series is an average of annual wage rates.

[11] Geloso (2019b) describes the geographical distribution of this data. The relevant maps are replicated in the supplementary materials to this paper.

[12] They compared their wage rates with other secondary source quotations for wage rates and found great similarities across sources (Geloso and Lindert, 2020, Supplementary Materials). It is also worth pointing out that secondary sources rarely provided wage data for long continuous periods. The one exception is (Paquet and Wallot, 1972, p. 233) who provide wage estimates for unskilled between 1794 and 1812. The evolution during that period is similar to that of Geloso and Lindert (2020).

[13] The choice of ending at 1850 is because everyone seems to agree that, by 1850, the crisis was over.

This is problematic because there is an uneven number of observations per year which means that years with more observations are more reliable than years with fewer observations.[14] This problem is particularly problematic for the pre-1815 period where the data by Geloso and Lindert (2020) has fewer observations per year. As such, each annual average in that period comes with a greater confidence interval than after 1815.[15] Second, the wages come from multiple different sources. One could reasonably argue that heterogeneous sources have different characteristics that may influence wage levels.[16] If one source is more important during one sub-period than the other, this may in turn induce an incorrect assessment of real wages. Moreover, one could also argue that religious congregations and government sources might be unrepresentative. Finally, and probably most importantly, there is the issue of seasonality. Wages fluctuated considerably within any given year. This was evident in the *Quebec Mercury* in an article from August 21, 1832, which contained wage data for laborers, carpenters, blacksmiths, bricklayers, mechanics, and masons on a monthly basis during 1831. For unskilled workers, wages in July, August, and September were between 34% and 54% higher than in January. Such seasonality could potentially bias the information depicted in the top left panel of Figure 1.

Fortunately, we have multiple solutions to these three problems. First, Geloso and Lindert (2020) only presented the evidence for unskilled male workers paid on a daily basis. However, they collected more than 1,400 wage quotations of all sorts from 1760 to 1850. These included wage rates for unskilled women paid on a daily basis to clean and do laundry on the estates of the two religious congregations. They also included numerous daily wages for skilled workers, with carpenters and masons providing the greatest numbers. These can be used to determine if other types of workers experienced real wage gains. In Figure 1, the bottom left panel shows the wage estimates (using the same averaging method as Geloso and Lindert) for unskilled women doing housework in the religious congregations. The bottom right panels shows the same for carpenters and masons. In our supplementary materials, we provide greater details

[14] For example, there were three wage observations for 1803 while there were 35 for 1831.

[15] In our supplementary materials, we present the number of observations per year in their original series.

[16] This could include geographical factors since the estates of each congregation were not in different regions of the colony (see supplementary materials for maps).

about each series. However, it is clear from Figure 1 that they corroborate the story told using the unskilled wage rates for male workers. The depiction of a higher plateau reached by the 1820s is confirmed and none of the estimates show a continued decline in living standards.

Second, we complemented the sources with extra materials from newspaper and contemporary secondary sources (such as guides to immigrants). We also added other governmental sources as Geloso and Lindert (2020) had considered only the appendixes to the journals of the legislative assembly.[17] Over the period from 1775 to 1850, this grows the sample of wage quotations to 510. In addition to the benefit of a greater number of observations, we also have two new different types of source material. This allows us to see if the different types of sources produce systematically different wage results. In the top left panel of Figure 1 (see dashed lines), we produce the new wage series using the same averaging technique as Geloso and Lindert (2020). As can be seen, there are no noticeable differences between the series. If anything, the new additions push wage levels up after 1800.

Third, we also coded the months associated with each wage quotation in order to assess whether seasonality biases the result. This allows us to engage in regression analysis with the following ordinary least square (OLS) specification

$$ln(wage_{i,t}) = Source_{i,t}^{'}\alpha + Q_{i,t}^{'}\beta + Time_{t}^{'}\delta + \epsilon_i \tag{1}$$

where the natural log of $wage$ is each individual observation (i) by year (t) deflated by either of the two price indexes mentioned above. We add dummy variables for each quarter of the year in order to control for seasonality. There is an extra dummy variable for when we could

[17] This includes government reports, papers from the House of Commons and the *Colonization Circulars*. In the online supplementary materials, we provide more details on these additional sources. In the newspaper, the *Quebec Mercury* (English) and the *Gazette de Québec* (French and English) provided the lion's share of the wage observations. These were some of the most important newspaper in the colony. The rest was provided from a handful of smaller newspaper such as *Écho du Pays*, *The Vindicator and Canadian Advertiser* and *La Minerve*. The contemporary secondary sources are statistical compilers such as Martin (1836) (see Middleton (2021) more on Martin's numerous works and their importance) and Bouchette (1831), agricultural treatises such as Evans (1836) and guides to emigrants (Evans, 1833). All these sources provide wage rates for agricultural laborers or "mechanics" (skilled workers).

not ascertain the quarter or where the reported wage for an annualized figure. This step should account for the effect of seasonality in wages. We also control for the different sources (i.e., the Séminaire de Québec, the Ursulines, newspapers, contemporary secondary sources, and government publications) to apture the potential effect of heterogeneous source materials. We also include a time trend which is meant to see whether there is a sustained increase in living standards over time. The coefficient on the time trend should confirm whether there is the same pattern as in the top panel of Figure 1. We will also replicate this specification using decade dummies rather than a running time variable. The sample is restricted to unskilled male workers. However, we also replicate these results with unskilled female workers, carpenters and masons (i.e., the other series in Figure 1) in our supplementary materials. The descriptive statistics for this regression are available in Table 1 below.

INSERT TABLE 1 HERE

Table 2 shows the results of the different regression specifications. Each odd-numbered column uses the CPI from Geloso (2019a) to deflate nominal wages while the even-numbered ones use the poor-person CPI from Geloso and Lindert (2020). The first four rows show the results of the different dummies for the sources of the data. The reference category is quotations that come from government publications. As can be seen, the account books for the Ursulines and Séminaire provided lower wage rates than government publications, newspaper and contemporary secondary sources. As the wage series produced by Geloso and Lindert (2020) relied heavily on the account books of the Séminaire and Ursulines congregations, this confirms the usefulness of controlling for the heterogeneity of source materials. The next four rows depict the effects of seasonality using the first quarter of the year (i.e., January, February, March) as the reference category.[18] In line with evidence such as the aforementioned data tables from the *Quebec Mercury* (August 21st 1832), wages are higher in summer (Q3) than in winter.

The last rows depict different specifications of the time variable. The first two columns take the year as a running variable which provides a time trend. These suggests that real wages

[18] QNA is the dummy variable for when we were unable to ascertain the month or quarter of the wage quotation.

increased on average by between 0.4% and 0.7% per year.[19] This is relatively slow growth when compared with the United States, where economic growth between 1800 and 1860 ran well closer to 1.4% per year (Lindert and Williamson, 2016, p. 102). However, it is positive and thus contradicts the claim that there was an agricultural crisis that produced falling living standards. Using decadal dummies (in the last two columns), where the 1760s are the reference category, we confirm this depiction as wages levels in the 1810s–1840s appear to reach a noticeably higher plateau than in the 1760s to 1800s.[20]

INSERT TABLE 2 HERE

Fourth, we can employ binned scatter plots using all observations to fit a time trend. This has the advantage of allowing all observations to be used rather than the average of any given year. Instead of showing every single data point as individual dots, data points are grouped into bins or intervals along both the x-axis (here, this axis is represented by the years). The number of data points that fall within each bin is counted and then used to generate a fit of the dependent variable on the independent variable. This simplifies visualization of the results. It can also be used to present the binned relationship while controlling for other factors such as those included in Table 2 above (Stepner, 2013; Cattaneo et al., 2024). In Figure 2, four different binscatter plots are shown. The top panels use real wages deflated by the normal CPI. The bottom panels use real wages deflated by the poor-CPI. The leftmost panels are the binscatter plots without any controls. The rightmost panels are the binscatter plots with controls for seasonality and heterogeneity of source materials. In all cases, there is a clear pattern of improvements in real wages.

Overall, the wage data suggests that living standards for unskilled worker (i.e., a representative of the vast majority of the colony's population) did not fall. They actually increased.[21] As

[19] This overlaps with the range of growth rate simulations (0.17% to 0.53%) produced by Geloso and Bédard (2018) from 1822 to 1851 using inflation and estimates of the money supply.

[20] In our supplementary materials, we replicate these results with the wage rates for unskilled female workers, carpenters and masons. The results provide the same pattern of improvements over time. Those improvements are particularly pronounced for women.

[21] We should also point out that this is still probably downplaying improvements. As Courville (2008) points, the rise of rural villages and rural industries meant that farm households could offer more days of work during

such, the question now becomes whether other indicators of living standards were evolving in a similar manner.

INSERT FIGURE 2 HERE

4 Literacy

Our second measure of the evolution of living standards is literacy rates as measured by whether an individual was able to sign their name at the time of their first marriage. Six reasons motivate the use of the variable.

First, signatures have often been used as a measure of literacy in historical populations. As such, the proper treatment of the data is well defined and discussed in the literature (Stone, 1969; Schofield, 1973; Clark, 2007).[22] Second, literacy reflects the stock of human capital. Since the flow of human capital typically increases when the net returns to education increase, we should expect any upward trend in wage rates (i.e., the returns to education) to be followed by an upward trend in human capital stock (Goldin, 2016). As such, it should complement the findings from the previous section.

Third, literacy is an indicator of development in its own right. It reflects the ability to acquire skills, discover information about potential opportunities for gainful employment, and facilitate the acquisition of productive knowledge. Moreover, it enables the easier exercise of

the year. By using daily wage rates, we are capturing income gains from a higher marginal product of labor. We cannot capture income gains from workers choosing to work longer. Courville's work suggests that workers did exploit that extensive margin even though we cannot estimate the change in labor supplied per worker during any given year. This leads us to believe that our findings regarding real wages are still downplaying improvements. An important direction for future research would be to imitate what Humphries and Weisdorf (2019) did for England by using annual wages. This should capture the combined effect of changes in labor supplied and the marginal product of labor.

[22] While it is a commonly used proxy, it comes with a well-known caveat: it is a crude measure of literacy (Graff, 1987). Before modern mass education, there would be both those who could read but not write and those who could write their name but not handle full sentences (Reis, 2005). Nevertheless, across a broad range preindustrial and 19th century European societies, signature rates strongly correlated with other measure of human capital such as numeracy (A'Hearn et al., 2009). For this paper, we are more concerned with changes in literacy over time, not the precise level of literacy. Thus, the size of any potential bias matters less than if it changed over time. Fortunately, education reforms were limited during this period (Magnuson, 1992). In the 1840s, schooling had only just been introduced in Lower Canada and it still faced massive political and fiscal challenges (Meilleur, 1852; Nelson, 2000).

legal and political rights (Sen, 1988; Nussbaum, 2011). Fourth, literacy rates, as proxied by marriage contracts, are among the most continuous indicators of human capital we can find. Fifth, literacy rates are unlikely to suffer from issues related to inequality. If wealthier households were already literate, improvements in the literacy rate would have to come from lower-income strata.

Finally, literacy rates may appear to be weakly related to the topic of the agricultural crisis. However, proponents of the crisis' existence emphasize that farm households were non-responsive to market conditions in part because they were ignorant and could not access written information about new farming techniques (Ouellet, 1966). Moreover, if the crisis was driven by soil exhaustion or falling wheat yields and households had no other options but to continue farming, it is reasonable to expect that they would have shifted household members from schooling to farming (Shah and Steinberg, 2017). As such, the claim of an agricultural crisis leads us to expect a fall in the literacy rate. Any increase thus undermines the thesis of the agricultural crisis while also being consistent with the wage evidence.

To derive literacy rates, we use signatures in marriage records from an extensive database of linked vital records, the BALSAC database (Project Balsac, 2020). The records contain close to the complete French Canadian population and are linked together to reconstruct entire families (Vézina et al., 2018; Dillon et al., 2018). Most people married, and the Catholic Church had long required both the bride and the groom to sign their marriage records if able and the priest to record if not (Gagnon et al. 2011). However, the rate at which the inability to sign was reported in the data varies over time, with some records missing before 1770, many during 1770–1799, and a few afterwards. Therefore, in order to construct a series that is consistent over time, we consider only those who definitely signed their first marriage record as literate.[23] Thus, we underestimate the level of literacy.

The data, which are representative of the Catholic population, include some Protestants as

[23]The individuals with a definite signature or lack of signature are not the concern. The issue is the individuals for whom we do not know if they signed or not. However, as shown in the supplementary materials, this does not matter for measuring trends in literacy.

well. As Protestants tended to be richer and more literate than Catholics,[24] their slowly growing share of the population might create a form of composition bias that alters the trend in literacy. To avoid this problem, we also create a measure of literacy rates that focuses exclusively on Catholics.[25] For good measure, we will also break down the literacy rates by gender.

INSERT FIGURE 3 HERE

As can be seen from Figure 3, literacy rates show continuous decline until around the 1780s, stabilization to 1800, and a steady growth afterwards. The solid line in the top left panel of Figure 3 depicts the aggregate literacy rate (i.e., all genders, all religions). The dashed line shows the literacy rate within Catholic parishes only. The top right panel of Figure 3 shows our results by gender with the solid line for men and the dashed line for women. All of these different ways to cut the BALSAC data yields the same pattern of increasing literacy.

These results echo earlier works on literacy rates (as proxied from signature in marriage acts) that focused on individual parishes in the colony rather than the entire colony (Greer, 1978; Veilleux, 1981; Verrette, 2002). In the bottom left panel of Figure 3, we show the decadal literacy estimates of Verrette (2002) which are the most continuous with the largest sample of areas (43 parishes). As can be seen, the trends are similar.

The increase in literacy rates is consistent with the portrait of real wages from the previous section. Adult literacy at the time of marriage reflects human capital investment decisions made some years before.[26] As such, the rising levels starting *circa* 1800 imply that increased human capital formation began in the 1780s. In other words, literacy in year t should be explained in part by wages in years $t-15$ or $t-10$ (assuming schooling started at 5 and went on until 15).

[24] In the appendix, we confirm that this is the case, as there is a modest negative correlation between Protestantism and agricultural occupation. For the 389,721 marriages between 1800 and 1849 with a known occupation and denomination, Protestants are on average 0.11 percentage points less likely to have an agricultural occupation. In the appendix, we also show that when censuses reported literacy rates (after 1861), the estimates matched those from our dataset.

[25] Catholics are the group within Quebec believed to have suffered from the agricultural crisis. Protestants were wealthier and not affected. This also has the upside that for Catholics, literacy was more related to their socioeconomic situation; Protestants placed a much stronger emphasis on reading the Bible.

[26] The age at first marriage in Quebec during the first half of the 19th century was between 21 and 25 (Gossage, 1991; Hamilton, 1999).

This coincides with the increase in real wages discussed in the previous section.

One potential rebuttal to the purported connection between literacy rates and real wages is that the former is built from a colony-wide dataset whereas the latter is built on more geographically concentrated data. To assuage concerns, we employ the cross-sectional data from the 1831 census of Lower Canada which has been heavily used — notably to estimate farming productivity (Geloso et al., 2017; Geloso and Makovi, 2022; Geloso et al., 2023b; Geloso, 2022). One particular strength of the census is that it also reports local wages (daily and monthly) and wheat prices (Geloso et al., 2023a). As such, there exists a rich cross-section of wages.[27] Moreover, the local prices for wheat permit the computation of "grain wages," which, by dividing the wage rate by the price of a unit of wheat, essentially yields an estimate of wages at purchasing power parities. These cross-sections can be combined with the literacy data from the BALSAC database at the parish level to support the connection between the wage data we employed in the previous section and the literacy data.[28] If the census-based wages in 1831 show that parishes with higher wages are associated with higher literacy levels, then we can feel reassured about the logical connection we have tied between both. As such, we run the following OLS specification

$$Literacy_{i,t_1} = Y_{i,t_0}^{'}\alpha + X_{i,t_0}^{'}\beta + \epsilon_i \tag{2}$$

where $Literacy$ is the number of signatures as a share of all marriages in the ten-year period from 1838 to 1848 for each census sub-district i in the 1831 census. This explains the presence

[27] Geloso et al. (2023a) used that cross-section of wages to test the causal effect of land tenure institutions on living standards. Their work contains a 12 page appendix describing the 1831 census data and numerous checks they conducted to validate the reliability of the wage data. We used their dataset to crosswalk with the BALSAC parishes. Some errors were manually corrected (for example, the parish of Milton in Shefford country was too close to Saint-Damase and was incorrectly assigned to it).

[28] All of the aforementioned data is available on public data repository. The census and the BALSAC database have different geographical definitions. To merge the datasets, initially, we used the longitude and latitude of each area and matched them based on proximity under the condition that there be only match (i.e., there could not be more than two census sub-districts by parish in the BALSAC database) and that the distance between the two points did not excede 20 kilometers. The problem is that the matches were highly imperfect. This is because the census sub-districts often included multiple areas in close proximity. Using the centroids created from the census generated strange pairs. As such, we shifted to a manual crosswalk where we matched all the parishes one by one.

of two indexes for time, t_0 and t_1. The former refers to variables at the time of the 1831 census while the latter refers to the literacy rate over the 1838 to 1848 period. Since the flow of human capital increases when the net returns to education rise, we should expect any upward trend in wage rates (i.e., the returns to education) to be followed by a corresponding upward trend in the human capital stock. As such, people getting married from 1838 to 1848 would have been making their human capital investment decisions in years around 1831. Higher wages at the time of decision should motivate more investments because this would reflect greater expected returns. As such, the literacy rate is explained by either of four different Y: i) daily nominal wages; ii) monthly nominal wages; iii) daily grain-deflated wages; iv) monthly grain-deflated wages. The vectors of control variables X includes i) the geographical proximity to major urban centres (i.e., Montréal, Trois-Rivères, Québec City); ii) the road density within a 25km radius of the central point of each sub-district; iii) the share of the infant population that is going to school; iv) the ruggedness of the terrain within a 25km radius of the central point of each sub-district; v) the length of the growing season in a sub-district; vi) the land tenure regime in a given area and; vii) the lagged values (i.e., in 1821-31) of the literacy rate.[29] In Table 3, we report the descriptive statistics. Also included in Table 3 are the infant mortality rate, the urbanization rate, and a village dummy variable which we employ in the next section.

INSERT TABLE 3 HERE

In Table 4 below, we show the results from the regression. Only the main coefficients of interest are shown for the sake of brevity.[30] The top panel shows the bivariate regression with no control variables included. All the wage variables have the right sign but only the daily wage rates (nominal and adjusted for grain prices) are statistically significant. As we gradually add control variables, the results remain consistent and the pattern of statistical significance improves. Overall, we believe that Table 4 shows that it is reasonable to connect wages to literacy rates.

[29] All of these variables, except the lagged value of the literacy rate, have been employed in prior published works (Geloso et al., 2023b) and are publicly available online.

[30] Full results are available in our supplementary materials.

INSERT TABLE 4 HERE

Finally, we can also compare literacy rates with other measures of human capital to see if they behave in a manner consistent with other less continuous measures of human capital. The best available estimate are the primary school enrollments as reported by Dufour (1994) for the period 1829 to 1859 (with an important gap from 1836 to 1842). We divide the number of pupils by the population aged below 14 or 15 to obtain enrollment rates.[31] The enrollment rates, depicted in the bottom right panel of Figure 3, were increasing as well during the period from. As such, we believe the literacy rates act as a reliable proxy of human capital.

5 Infant Mortality

Infant mortality is intimately tied to the claims of the agricultural crisis. Indeed, the very idea of an agricultural crisis evokes food insecurity which has implications for mortality in general and infant mortality in particular (given the vulnerability of that subgroup to nutritional shocks).

In the work of Ouellet (1966, pp. 271, 278, 345), there is a Malthusian backdrop as unchecked population growth combined with falling land productivity caused the agricultural crisis. In a Malthusian framework, population growth must eventually be checked by a combination of falling birth rates and rising mortality rates (thus returning population levels to a long-run equilibrium). We would expect that infants, the most vulnerable group, would be the most sensitive to the strain of population pressures, which would likely result in rising infant mortality. Moreover, in the mid-18th century, the colony had relatively low mortality overall (i.e., crude mortality rates) compared to its European peers but no relative advantage when it came to infant mortality (Greer, 1997; Geloso, 2016). Yearly mortality rates in general, and infant mortality in particular, were very volatile due to periodic outbreaks of infectious diseases (Gagnon

[31] We used the censuses of 1825, 1831, 1844, 1851, and 1861 to create the age categories. We interpolated using the compounded rate of growth between each census. The censuses provided the age breakdowns of the population but the categories were frequently changed. Earlier censuses (e.g., 1825 and 1831) gave population below 14 as the categories with. The later censuses (e.g., 1844, 1851, 1861) used population up to 15. As such, the estimates we derive before the 1844 census are upwardly biased relative to the census of 1844 and the later ones. This means, that the trend we depict in the bottom right panel of Figure 3 is understating the extent of the improvements.

and Mazan, 2009; Amorevieta-Gentil, 2010; Bruckner et al., 2018). Cholera and smallpox were particularly lethal diseases for children (Bilson, 1977; Greer, 1985). With Quebec's growing integration into the North Atlantic economy and the rapidly increasing shipping volumes entering the ports of Quebec and Montreal, there were more infectious disease outbreaks, which would have pushed up mortality rates. In other words, the disease environment worsened during the period of the agricultural crisis.[32] This worsening would impact mortality alongside the Malthusian mechanisms described by Ouellet. Consequently, of all the indicators employed, we believe infant mortality is the most likely to support the claim of falling living standards during the period of the agricultural crisis. Finally, we also expect infant mortality rates to reflect the living standards of the vast majority of the population. Any improvements in infant mortality for the very rich would have minimal effects on the aggregate mortality rate.[33]

We use the same linked vital records to measure mortality as we use to measure literacy: the BALSAC database (Project Balsac, 2020). For our measure of life expectancy, we focus on infant mortality rates (deaths over births) as the death records for the entire province are only available through 1849. As infant mortality is defined as deaths before age one, we can thus compute it through 1848.

Many individuals in the data only have their birth, not their death, recorded. Here, we assume all children with missing death record survived to at least age one. This is reasonable, as most of the missing deaths likely occurred after 1849 and thus are not captured by the dataset.[34] However, this likely slightly underestimates infant mortality. Gagnon and Mazan (2009) used the spacing between births to estimate that around 10–20% of children with missing death records died in infancy from 1680 through the mid 18th century.[35] However, they find the percentage trending downwards over time. While the overall level might be underestimated,

[32]By the 1840s, more than 1,000 ships would enter the ports of Québec and Montréal each year – this is close to twenty times more than in the 1760s, 1770s, and 1780s (Ouellet, 1984, pp. 91-93).

[33]In order to see large improvements in infant mortality, the improvements must be widely shared across the population.

[34]In appendix, we show that the share of missing records is not correlated with socio-economic factors (e.g. agriculture's share of reported occupations in marriage records in an area).

[35]Infant mortality reduces spacing by ending breastfeeding early.

the bias will be decreasing over time. This is reassuring as we estimate a downwards trend in infant mortality (figure 1). Thus, if anything, we are underestimating the improvements in infant health.

Given that recent scholarship has overturned assumption that "missing girls" were absent in European populations, one might wonder if we also underestimate mortality due to infants being entirely missing from parish records (Szołtysek et al., 2022).[36] There are qualitative and quantitative reasons, however, to assume that the mortality rates are only underestimated by a very small margin. In Quebec, parish clergy paid close attention while recording infant births and deaths due to serious theological concerns regarding the souls of unbaptised children. A 17th century bishop went so far as to threaten delinquent parents with excommunication (Dillon et al., 2018). Gagnon and Mazan (2009) estimate that, from 1680 through the mid 18th century, only 2–3% of children died before baptism and left no records. We thus likely only very slightly underestimate mortality due to entirely missing children.

Our results are depicted in Figure 4 below. The solid line left panel shows infant mortality for the entire colony. As can be seen, there is a sizable reduction in infant mortality rates (per 1,000 births) during the first half of the 19th century.[37] This is also true if we look only at Catholics only (the dashed line in the left panel of Figure 4) in order to deal with the same concerns as with literacy rates. On the right panel of Figure 4, we show that crude death rates (per 1,000 inhabitants) for the entire population were also falling — thus echoing our main

[36] Our preliminary research suggests that, when it came to mortality, female children in Quebec were advantaged by nature but were disadvantaged (perhaps unintentionally) by family behavior.

[37] We should note that there is evidence from Arsenault-Morin et al. (2017) regarding the heights of French-Canadians convicts from 1780. Heights matter because they speak to socio-economic (including nutrition) in early childhood. Heights were falling to the 1820s but stabilized thereafter to the 1850s. This stabilization is consistent with rising living standards. The pre-1820 period, however, is something that requires further study. This is because it invites the possibility of the antebellum puzzle being present in Canada while infant mortality rates were falling. The empirical literature on the American antebellum puzzle suggests that we should expect higher infant mortality to be tied with shorter stature (Zehetmayer, 2011). The puzzle is reinforced by the fact that there are no signs of falling nutritional intake during the 1780-1820 period. Indeed, even the proponents of the agricultural crisis argue that falling nutrition in Quebec was more of a thing between 1820 and 1850 while the 1780 to 1820 was a period of higher living standards. As such, the stabilization of heights after 1820 invalidates the argument of a crisis (we should expect a fall in stature after 1820) but the pre-1820 trend also invites further research with regards to stature in Quebec.

result.[38] The five-year moving average is also depicted on the solid line to make the decline more visually clear.[39] Overall, the mortality data confirms an improvement in living standards.[40]

INSERT FIGURE 4 HERE

To further assess the validity of this conclusion, we replicate the effort in the previous section with literacy rates and determine whether there is an association between wage rates and infant mortality. If the decline in infant mortality was driven by rising material living standards, we would expect a negative association. To do this, we run the following OLS specification using the cross-section of wages from the 1831 census in combination with the BALSAC database:

$$IMR_i = Y_i^{'}\alpha + X_i^{'}\beta + \epsilon_i \tag{3}$$

where IMR is the number of infant deaths per 1,000 births in the ten-year period before the census of 1831 (i.e. 1821 to 1831) for each census sub-district i.[41] The infant mortality rate is explained by either of four different $Y's$: i) daily nominal wages; ii) monthly nominal wages; iii) daily grain-deflated wages; iv) monthly grain-deflated wages. We include the same control variables as with the literacy rates regressions with two differences. First, we do not use pupils as a share of the school age population. We see no meaningful relation between this variable and infant mortality. Second, we include either of two different measures of the disease environment, which we expect to have a meaningful relation with infant mortality. During the first decades of

[38]The data is taken from the work of Geloso and Kufenko (2015) who employed the estimates of Langlois (1935) to calculate death rates. The rates from Geloso and Kufenko (2015) differ from the rates reported by Ouellet (1966, p. 600) or Henripin (1973) but only by decimal points. The trend is the same across all sources.

[39]The crude death rates are far more volatile that they truly were. This is because the deaths were reported annually, but the population denominator is based on decadal interpolations made by Geloso and Kufenko (2015) using the work of demographers. The infant mortality rates, constructed from annual births and annual deaths, do not suffer from this issue.

[40]We note that there are life tables for generations born between 1801 and 1851 produced by Bourbeau et al. (1997). These tables yield simulated life expectancy expectancy by birth cohort from 1801 to 1851 (with a spacing of ten years between each) based on the experience of other countries for some key parameters such as the probability of dying at each age range. As such, these figures can confirm whether the direction of our infant mortality rates is consistent. For women, life expectancy at birth rose from 39.56 years for the 1801 cohort to 43.34 for the 1851 cohort. For men, the increase was from 37.79 years to 40.87 (Bourbeau et al., 1997, p. 26).

[41]Same crosswalk procedure as explained in footnote 28.

the 19th century, the population share of the older cities (Montréal, Trois-Rivières, Québec City) did not significantly increase. However, after 1815, some of the older settlements in the colony began to turn into rural villages and small towns with some light industries (Courville, 1990, 2008). When these emerging villages and towns are included, Quebec was undergoing a mild urbanization — especially after 1815. This could have contributed to the disease environment by facilitating the spread of infectious diseases. As such, we create a dummy variable for whether a village existed in the area the time of the census and an estimate of the share of a census sub-district's population was living in these villages and small towns. The dummy variable is created using the work of Courville (1990, App. B) that inventories all the villages and towns of Quebec in 1831. The urbanization rate is also created the work of Courville (1990, App. C) which provides the population of each village and small towns in 1831.[42] However, the data from Courville concerns only areas under the French land tenure regime (i.e., seigneurial tenure). As such, we cannot control for the type of land tenure institution in regressions that also attempt to control for the disease environment. Finally, we should note that the variable capturing distance to the large urban centres takes a different meaning here than with literacy rates. Greater distance to these areas should be associated with lower mortality rates because diseases may be unable to spread too far from of the ports they entered into.[43] All of these variables are described in Table 3.

INSERT TABLE *5* HERE

In Table 5, we report the results of the regression. Only the main coefficients of interest (i.e., wage measures) are shown for the sake of brevity.[44] The top panel shows the bivariate regression with no control variables included. All coefficients have the expected sign and are significant at the 5% level. However, when controls for road density, seigneurial tenure, and distance from large urban centers are included, there remains a significant relationship for both

[42] With some information missing for a handful of areas – most of which are on the island of Montréal.

[43] Wages were also higher in port cities. This is also why we need to control for proximity to large urban areas. Otherwise there is a spurious correlation between wages and mortality due to the health conditions in the cities.

[44] Full results are available in our supplementary materials.

daily grain wages and monthly grain wages. When the seigneurial tenure variable is dropped to consider the role of the disease environment in the form of urbanization, this pattern remains unchanged. Shifting to the village dummy (which assumes that being at least a village matters and that the size of the urban agglomeration is irrelevant) yields the same result. Finally, adding land quality makes the monthly wages not significant but renders the daily wages (in nominal terms) significant.

Overall, we believe that Table 5 shows that there is a connection between infant mortality and material living standards. For brevity, we did not report the coefficients on the control variables but it is worth mentioning that the urban rate or the village dummy rarely exhibit any signs of being statistically significant. The distance to large urban centres is frequently significant and negative – i.e., greater distance means lower infant mortality rates.

6 Implications for the Agricultural Crisis

Our findings above suggest that real wages did increase noticeably during the first half of the 19th century — a result that is strengthened when controlling for the heterogeneity of primary source materials and issues regarding the seasonality of wage observations. We also found that literacy rates were increasing and argued that the increase could be tied to that of real wages. The increase in literacy rates was also echoed in rising rates of schooling enrollments. Finally, we also found that infant mortality fell considerably (in line with crude death rates for the entire population). We also argued that this had a modest association with the increase in real wages. Finally, we argued that the measures used here are not heavily affected by distributional issues. Indeed, the wage rates were for unskilled workers (i.e., representative of the vast majority of the colonists) while the large improvements in infant mortality rates and literacy rates cannot be driven by improvements for the very rich only.

In the present section, we attempt to connect these findings with other stylized facts of Quebec's economic history in order to show that we can not only reject any claim of falling

living standards but that there is strong evidence to reject the idea of an agricultural crisis.

6.1 Consistency with Other Evidentiary Materials

First, we must point out that our evidence is broadly consistent with two other sets of evidence ruling out falling living standards in favor of modest increases.

The first of those sets is composed of studies relying on economic theory to rule out certain scenarios. For example, Geloso and Bédard (2018) used estimates of the money supply and price indexes to simulate – under different possible rates of monetary velocity – a range of growth estimates. For the period from 1822 to 1851, they argue that per capita must have grown between 0.17% and 0.53%.[45] Another example is that of Geloso and Kufenko (2015) who used time series econometrics to determine whether Quebec was an economy operating inside a Malthusian equilibrium. In other words, they formally tested the overpopulation mechanism that Ouellet (1966) proposed to explain the falling living standards he thought he observed. If an economy is Malthusian, any positive and permanent technological shock causes wages to increase. The increased wages induce greater fertility and lower mortality, demographic responses known as the preventive and positive checks. However, because of the constraint imposed by a fixed supply of land, this cannot be sustained (unless there are new technological improvements). Because of decreasing marginal returns to labor, rising population levels eventually cause wages to fall and the preventive and positive checks to work in reverse until population growth stops. At that point, wages return to their previous level albeit with a greater population level. Detecting the preventive and positive checks following shocks to wages is indicative of a Malthusian equilibrium. If there are no signs of the checks, this means that the economy is transitioning away from the Malthusian equilibrium through sustained technological progress (Galor, 2011; Pfister and Fertig, 2020; Pedersen et al., 2021; Jensen et al., 2021) or through the settlement of more land (Kufenko et al., 2022)). Geloso and Kufenko (2015) found no signs of the Malthusian checks post-1767. All the signs of checks applied to the pre-1767 era. From this, they concluded

[45] They used a conservative estimate of the money supply and monetary growth. More liberal estimates pushed up growth in the 0.66% to 1.02% range (Geloso and Bédard, 2018, p. 11).

the economy could not be deemed Malthusian. This result logically implies positive economic growth.[46]

The second set is composed of empirical evidence collected from different types of sources such as probates and consumption data. For example, Paquet and Wallot (2007) used 425 probate records for multiple regions around the main cities with their own price index from 1792 to 1835. They reported growth in financial wealth per probate of between 0.40% and 0.96% depending on the region. Unfortunately, they did not try to approximate the net value of probates because they had no land prices for the different regions. As such, they only reported the monetary values of debts and all assets except land. Fortunately, they did report the size of plots reported in probates. Using the data from Lafleur et al. (2003) who collected more than 1300 notarized deeds of land sale for the parishes in the region of L'Assomption (north of Montreal) from 1792–1796 to 1820–1825, we can estimate the value of land assets in probates. We use the average prices of uncleared land as a rough approximation of the value of real estate. Combined with the price indexes we used above to arrive at real values, we find that net wealth per probate increased by between 0.21% and 0.57% per annum.[47]

Arguing that probated wealth had problematic limitations, Dessureault (2018) borrowed the methodology of Carr and Walsh (1980) which consisted in assessing the prevalence of key consumption items in probates for American colonies before the Revolution. This is meant to capture the diffusion of new consumption habits and whether these habits were those previously adopted by richer households. Selecting 86 goods broken into five categories from probates around Montreal only, Dessureault (2018, p. 245) creates an index number based on their prevalence between 1770 and 1834. The annualized growth rate of that index is 0.34% per annum during the period.

Import data from and Ouellet (1984), Vallières and Desloges (2008) can also be used to complement this finding of rising consumption levels. The idea is that import data act as proxies for the expansion of the overall economy as it reflects trade expansion (Gwyn, 1998,

[46]This could either be intensive growth or extensive growth in per-capita inputs.

[47]If we use the price of land with improvements, the rates exceed 1% per annum

p. 164). This is depicted in Figure 5 below where consumption per capita in 1830–1832 is normalized to 1. As can be seen, consumption of sugar, metalwares, cotton, coffee and tea were increasing whereas the consumption of rum, spirits and wine remained stable.[48] Rising consumption levels as proxied by imports echo the results discussed above.[49]

INSERT FIGURE 5 HERE

All these earlier estimates had their own separate limitations: debated theoretical deductions, probated wealth with uncertainty regarding valuations of probated items, and second-best measures such as imports or the prevalence of goods (rather than incomes or wage rates). Yet, they all consistently suggested positive growth in the same range as what we found when using wages (i.e., growth rates of between 0.4% to 0.7% per annum). The added advantage of the wage data we employed is that they pertained to unskilled workers – a category representing the marginal productivity of labor for the vast majority of Quebec's population.

We should add that our proposed rates of improvements in wages (and other indicators) place Quebec well behind the United States and Britain. However, compared to most other areas in the world at the time, this pace is quite fast (Broadberry et al., 2015, pp. 371–401). In other words, Quebec was a poor performer amongst the star performers.

6.2 Consistency with Recent Literature

Second, our finding of rising living standards is also consistent with a recent empirical finding made by Geloso et al. (2023b) that rejects the idea of an agricultural crisis stemming from the decline of wheat crops. Until the early 1830s, Quebec was consistently a net exporter of wheat (McCallum, 1980, p. 28). However, by the 1850s, its net imports rose to more than 2.2

[48] Some might be tempted to argue that some of the growth could be due to rising imports destined for Upper Canada (i.e., Ontario) transiting through Lower Canada. However, this has been accounted for by using the method of Geloso and Foucher-Paquin (2023), which relies on data regarding transits through Lower Canada to Upper Canada.

[49] We should note that this figure probably understates things. In many regions of the colony, the government had no customs house even though ships did unload wares there. No customs house meant no records of trade (Geloso and Foucher-Paquin, 2023). Moreover, the summation of all quantities imported into Quebec means collecting data from all ports. However, 19th century imports at some ports (e.g., Saint-Jean, Nouvelle Beauce, Sherbrooke, Stanstead, Coteau du Lac) were not regularly reported in government publications (Aubry, 1970, p. 184).

million bushels (more than 2 bushels per person).

Geloso et al. (2023b) argue that this was due to two complementary forces: falling transportation costs on riverways and the unexpected unilateral liberalization of agricultural imports from the United States in 1831. Quebeckers shifted out of wheat production by virtue of comparative advantage and into other crops and sectors. They found that exposure to trade liberalization and falling transportation costs caused *net* agricultural income gains ranging from 1.42% and 7.44% between 1831 and 1851.[50] In the end, wheat *consumed* (from production and net imports) per capita increased 22% from 1831 to 1851 while pre-1831 levels were more or less stable.[51]

The productivity-enhancing trade shocks described by Geloso et al. (2023b) are consistent with rising wage levels. They suggest that agriculture's relative decline resulted from rising productivity elsewhere in the economy. Within the agricultural sector, non-wheat output began to be prioritized – not due to soil exhaustion or overpopulation, but rather because of a revealed comparative advantage in other outputs. Across the broader economy, new sectors such as timber, shipbuilding, shipping, and potash began to emerge, attracting workers and capital. This entire process hinges on productivity enhancements that lead to rising living standards.

This hurts the claims of those who reject the idea of falling living standards but argue that there was a painful modernisation process initiated by the difficulties of agriculture itself. In their telling, structural changes were forced onto the population which is why stagnating (or highly uneven increases) in living standards are emphasized. The complementarity of our findings with those of Geloso et al. (2023b) suggests that this was not the case. Rising living standards across all indicators point to a more benign process of structural change where the decline of agriculture is driven by productivity growth in the rest of the economy.

[50] They argued that this was a conservative estimates because they could not evaluate pastoral production and non-farm output. The effect was merely changes in crop production. However, looking at shipbuilding, shipping earnings, timber exports, potash exports and exports of animal products, they found strong signs of rising exports earnings that should boost these reported proportions up.

[51] McCallum (1980 p. 30) showed that per capita wheat consumption increased 39% between 1831 and 1851 (and argued it was stable before). However, Geloso et al. (2023b) pointed out that McCallum failed to deal with metrological issues in wheat production measurements that were not well-known at the time of McCallum's writing. The corrections reduced the proportion from 39% to 22%.

It is also worth pointing out that are our results are consistent with the findings of Geloso and Kufenko (2015) regarding a marked transition away from the Malthusian equilibrium system. Exits the Malthusian systems hinge heavily on human capital accumulation to break away (Galor, 2011). Our results regarding rising literacy rates are consistent with the idea of a transition *and* rising living standards. Such a transition also hinders the idea of a painful modernisation process.

7 Conclusion

The goal of this article was to employ new evidence to settle an old and lasting debate in Canadian economic history: was there an agricultural crisis in Quebec in the first half of the 19th century that led to falling living standards? Using mortality, literacy and wage data from 1760 to 1848, we find that there are no grounds to speak of falling living standards. Across all indicators, we find that Quebec's inhabitants were enjoying noticeable gains in living standards. We argue that this is consistent with recent empirical findings arguing that the relative decline of the agricultural sector was not something Quebeckers were forced into, but that it was instead welfare-enhancing.[52]

Some extra efforts should be taken to better ascertain how painful was the transition away from agriculture. Our work suggests that claims of a highly painful transition cannot be sustained. However, there could still have been short-term pains in the transition process. One potentially effective avenue to assess these would be to evaluate productivity growth in other sectors of the economy such as the potash, timber, shipping, shipbuilding, textile, and construction industries following standard methods of productivity analysis (Coelli et al., 2005). If the decline of agriculture in Quebec was the result of the rise of new industries, then we should

[52]To be sure, our work does not attempt a comparison of the trends with the rest of North America. It also does not state anything about living standards in Quebec relative to the rest of North America as it is well known that it was poorer than Ontario and the United States (McInnis, 1992; Geloso and Macera, 2020). It also does not attempt to explain the causes Quebec's relative poverty. Other works should deal with these questions. We plan to do it.

observe high rates of TFP growth in those industries.[53] This approach would — in combination with the all the aforementioned work and the evidence raised here — bring a definite conclusion to the question of the agricultural crisis. For now, our results suggest we can clearly rule out any claims of falling or stagnating living standards — which is the most common belief in the current historiography.

[53]Some efforts have already been developed in that direction. A working paper by Eloranta et al. (2017) produced an estimation of total factor productivity in Quebec's shipping industry from 1764 to 1861. While the result is preliminary, it suggests a per annum growth rate of 1.48% during the period.

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Figure 1: Real Wages in *Livres* per Day (1900 *Livres*) in Quebec, 1760 to 1850

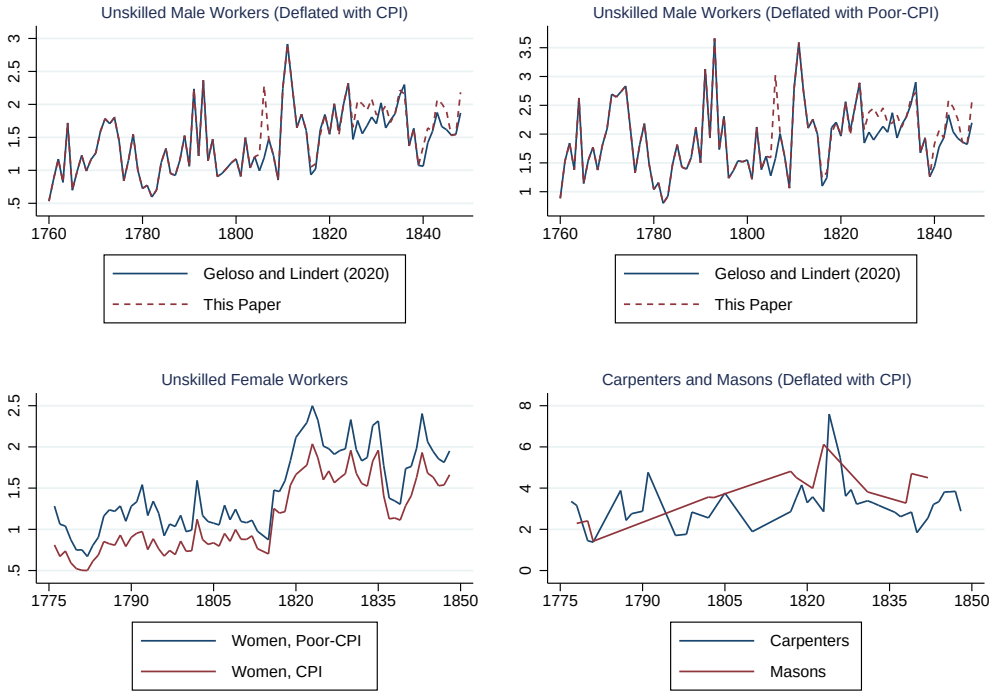


Figure 2: Binned Scatter Plots of the Wages of Unskilled Male Workers, 1760 to 1850

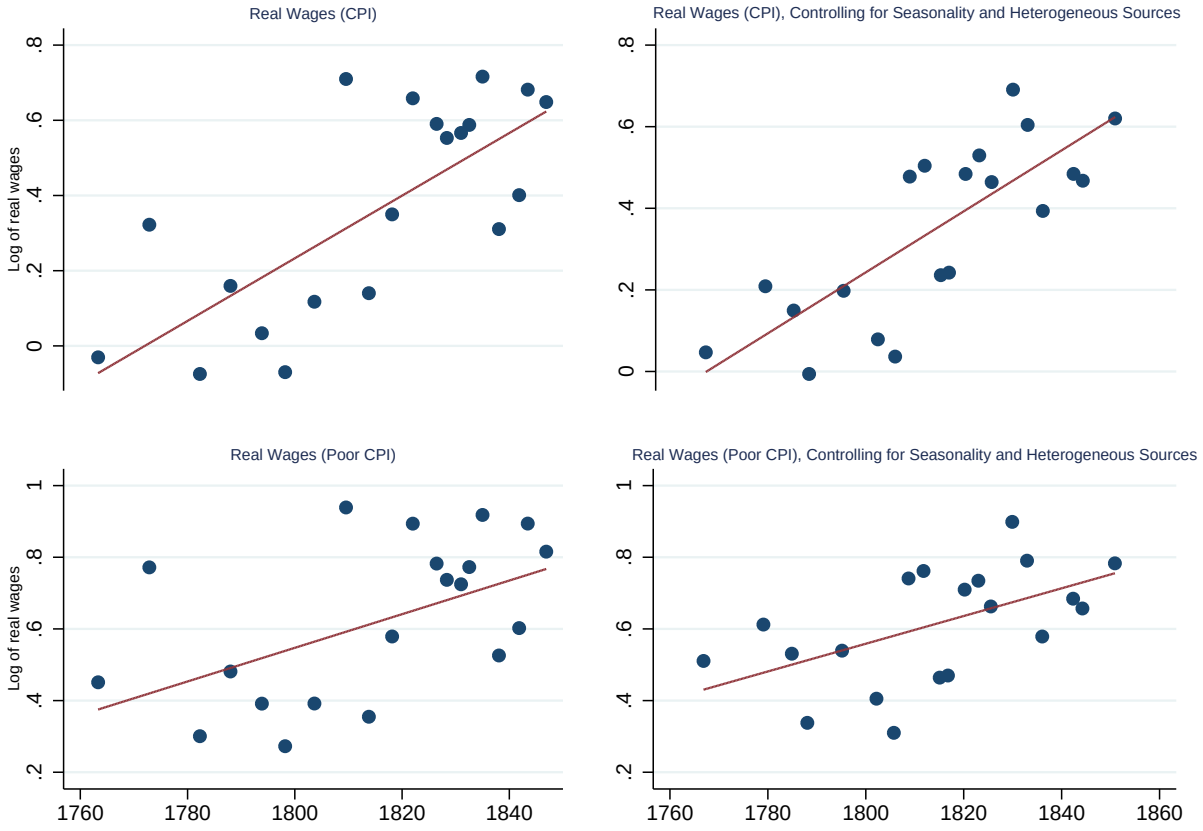


Figure 3: Literacy Rates in Quebec, 1760 to 1848

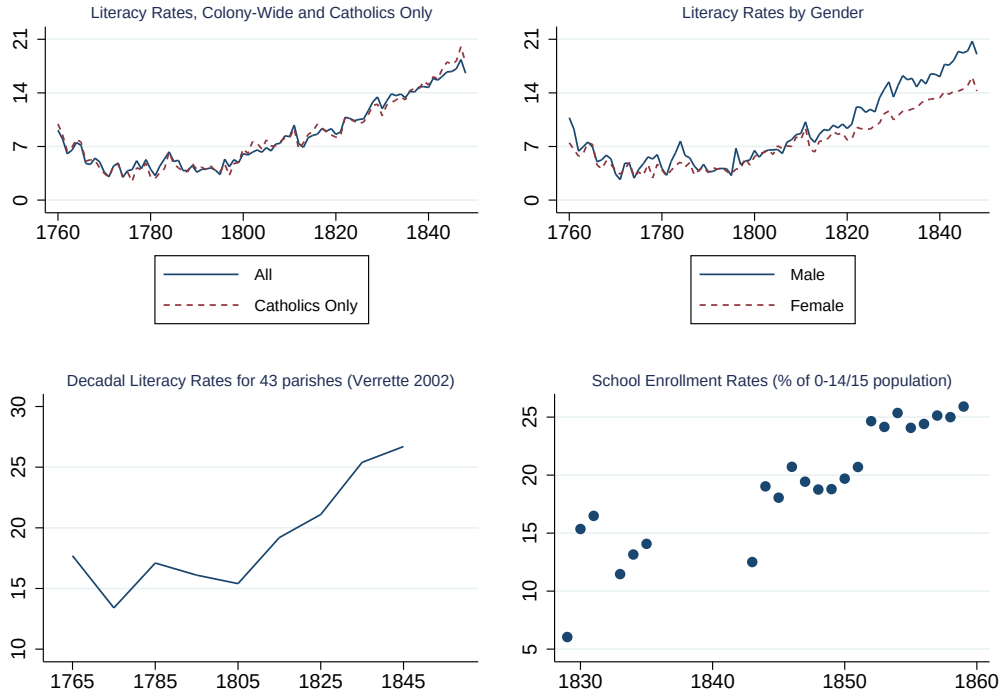
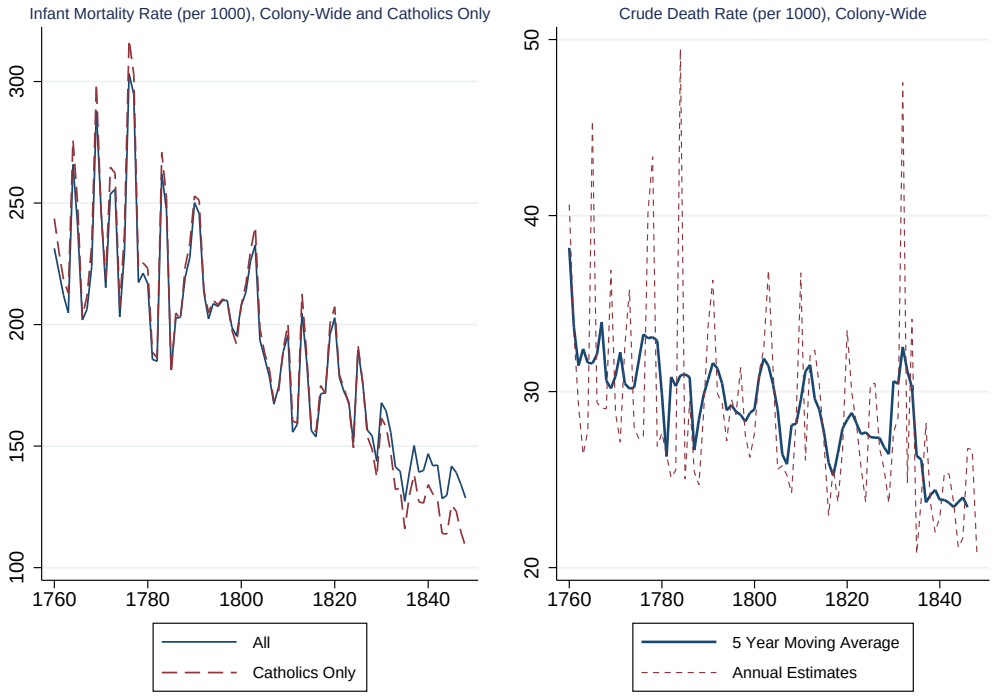


Figure 4: Infant Mortality Rates and Crude Mortality Rates, 1760 to 1848



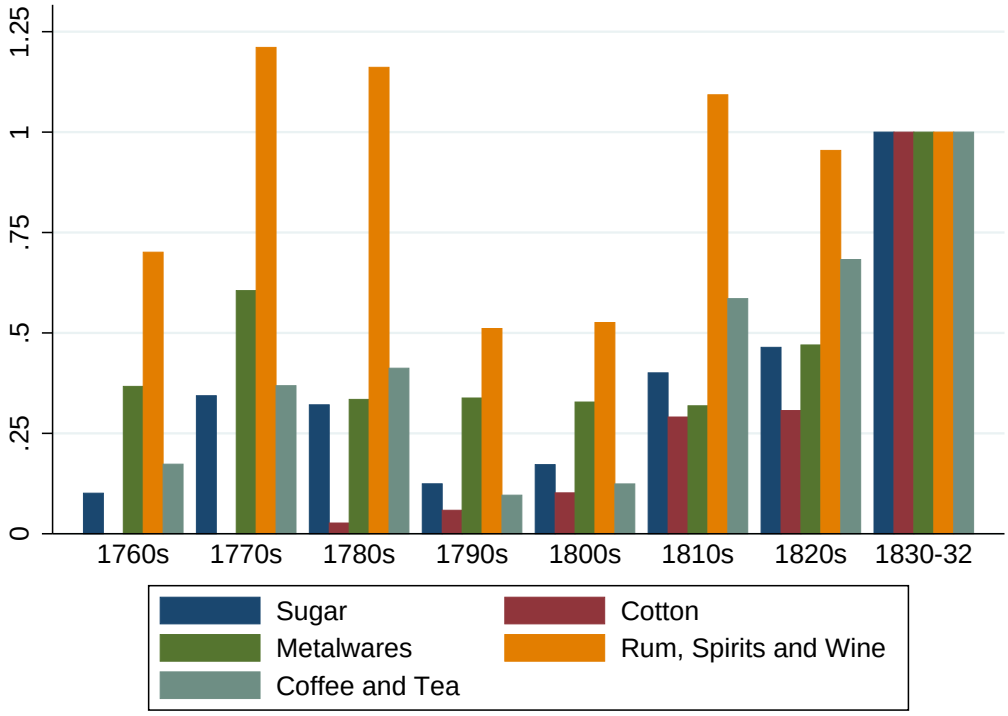


Figure 5: Quebec's imports per capita (proxy for consumption) of key goods from the 1760 to 1832

Table 1: Descriptive Statistics for Wage Regressions of Unskilled Male Workers

VARIABLES	(1) N	(2) Mean	(3) SD	(4) Min	(5) Max
Ln(Wage/CPI)	510	0.35	0.41	-0.73	1.56
Ln(Wage/Poor-CPI)	510	0.61	0.38	-0.42	1.81
Government Sources		Reference Category			
Newspaper	510	0.05	0.22	0.00	1.00
Contemporary Secondary Sources	510	0.07	0.25	0.00	1.00
Seminaire	510	0.54	0.50	0.00	1.00
Ursulines	510	0.11	0.32	0.00	1.00
Q1		Reference Category			
Q2	510	0.18	0.38	0.00	1.00
Q3	510	0.29	0.45	0.00	1.00
Q4	510	0.19	0.39	0.00	1.00
QNA	510	0.24	0.42	0.00	1.00
1760s		Reference Category			
1770s	510	0.05	0.22	0.00	1.00
1780s	510	0.09	0.29	0.00	1.00
1790s	510	0.10	0.31	0.00	1.00
1800s	510	0.07	0.25	0.00	1.00
1810s	510	0.11	0.32	0.00	1.00
1820s	510	0.16	0.36	0.00	1.00
1830s	510	0.20	0.40	0.00	1.00
1840s	510	0.15	0.36	0.00	1.00
Year	510	1813.77	24.18	1761	1848

Table 2: OLS Regression Results with Wage Rates to Control for Seasonality and Heterogeneity of Source Materials, Unskilled Male Workers Only

VARIABLES	(1) Model 1 ln(Wages/CPI)	(2) Model 1 ln(Wages/Poor-CPI)	(3) Model 1 ln(Wages/CPI)	(4) Model 1 ln(Wages/Poor-CPI)
Newspaper	0.0167	0.0265	-0.0225	0.000593
	(0.0725)	(0.0726)	(0.0723)	(0.0725)
Contemporary Secondary Sources	0.0645	0.0391	-0.00799	-0.00876
	(0.0538)	(0.0546)	(0.0550)	(0.0555)
Séminaire	-0.129***	-0.111***	-0.212***	-0.200***
	(0.0359)	(0.0349)	(0.0419)	(0.0414)
Ursulines	-0.121**	-0.0923*	-0.141**	-0.113*
	(0.0583)	(0.0559)	(0.0642)	(0.0628)
Q2	0.187***	0.193***	0.187***	0.179***
	(0.0662)	(0.0647)	(0.0643)	(0.0637)
Q3	0.225***	0.234***	0.196***	0.195***
	(0.0612)	(0.0608)	(0.0573)	(0.0570)
Q4	0.173***	0.171***	0.212***	0.205***
	(0.0650)	(0.0648)	(0.0619)	(0.0616)
QNA	0.201***	0.223***	0.136**	0.130**
	(0.0617)	(0.0609)	(0.0628)	(0.0623)
1770s			0.277***	0.236***
			(0.0912)	(0.0910)
1780s			-0.103	-0.211***
			(0.0780)	(0.0737)
1790s			-0.0682	-0.188***
			(0.0735)	(0.0712)
1800s			0.182*	-0.0193
			(0.0927)	(0.0904)
1810s			0.360***	0.105
			(0.0875)	(0.0843)
1820s			0.500***	0.242***
			(0.0699)	(0.0658)
1830s			0.443***	0.156**
			(0.0715)	(0.0672)
1840s			0.450***	0.190***
			(0.0712)	(0.0662)
Year Trend	0.00744***	0.00387***		
	(0.000679)	(0.000670)		
Constant	-13.24***	-6.522***	0.0317	0.494***
	(1.242)	(1.225)	(0.0898)	(0.0860)
Observations	510	510	510	510
R-squared	0.291	0.152	0.381	0.251

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 3: Descriptive Statistics for Regressions on Literacy Rates and Infant Mortality

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Infant Mortality Rate	153	14.86	6.84	0.00	43.75
Literacy Rate (1838-1848)	168	16.94	12.17	0.00	81.67
Literacy Rate Lagged (1821-1831)	157	10.00	11.35	0.00	79.71
Monthly Wage (s/month)	168	25.05	7.88	10.00	50.00
Daily Wage (s/day)	168	1.81	0.45	1.25	3.00
Daily Grain Wage (bu/day)	165	0.29	0.07	0.20	0.55
Monthly Grain Wage (bu/month)	165	4.05	1.26	1.82	7.74
Length of Growing Season (Days)	168	198.97	11.40	171.77	212.00
School Age Population in School (Percentage)	168	57.77	51.17	0.00	414.29
Village Dummy	154	0.81	0.40	0.00	1.00
Urbanization Rate	152	0.12	0.12	0.00	0.78
Distance from Nearest Urban Centre (km)	168	50.13	43.21	0.00	362.00
Ruggedness (25km radius)	168	66.26	48.40	18.21	230.08
Road Density (km within a 25km radius)	168	585971.80	258714.20	0.00	1021136.00
Indicator for Land Tenure (Non-Seigneurial)	168	0.08	0.28	0.00	1.00

Table 4: OLS Regression Results for Literacy Rates from 1838 to 1848 with Wages in the 1831 Census

	Daily Wage	Daily Grain Wage	Monthly Wage	Monthly Grain Wage
Specification 1	5.274*	30.74*	0.245	1.613
	(3.144)	(17.48)	(0.187)	(1.066)
Controls			*No controls included*	
Observations	168	165	169	166
R-squared	0.037	0.033	0.025	0.027
Specification 2	4.983*	29.17*	0.200	1.335
	(2.956)	(16.82)	(0.166)	(0.963)
Controls		*Road Density, Distance, School Population Share*		
Observations	168	165	169	166
R-squared	0.068	0.066	0.053	0.056
Specification 3	4.973*	28.75*	0.201	1.343
	(2.614)	(15.12)	(0.146)	(0.836)
Controls		*Road Density, Distance, School Population Share, Seigneurial Tenure*		
Observations	168	165	169	166
R-squared	0.068	0.066	0.053	0.056
Specification 4	5.257**	29.17**	0.247*	1.668**
	(2.632)	(13.85)	(0.101)	(0.750)
Controls		*Road Density, Distance, School Population Share, Land Quality, Seigneurial Tenure*		
Observations	168	165	169	166
R-squared	0.108	0.108	0.096	0.104
Specification 5	3.839*	15.11	0.248**	1.101*
	(2.142)	(11.37)	(0.11)	(0.641)
Controls		*Road Density, Distance, School Population Share, Land Quality, Seigneurial Tenure, Lagged Literacy Rate (1821-31)*		
Observations	157	155	158	156
R-squared	0.59	0.549	0.561	0.552

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 5: OLS Regression Results for Infant Mortality Rates with Wages in the 1831 Census

	Daily Wage	Daily Grain Wage	Monthly Wage	Monthly Grain Wage
Specification 1	-2.416**	-16.71**	-0.216**	-1.268**
	(1.141)	(7.078)	(0.0858)	(0.509)
Controls		*No controls included*		
Observations	154	152	155	153
R-squared	0.022	0.029	0.052	0.048
Specification 2	-1.494	-15.10**	-0.102	-0.811*
	(1.009)	(6.141)	(0.0772)	(0.443)
Controls		*Road density, Distance, Seigneurial Tenure*		
Observations	154	152	155	153
R-squared	0.234	0.252	0.235	0.246
Specification 3	-1.680	-15.46**	-0.121	-0.900*
	(1.024)	(6.342)	(0.0780)	(0.459)
Controls		*Road density, Distance, Urban Rate*		
Observations	145	143	146	144
R-squared	0.12	0.137	0.125	0.135
Specification 4	-1.285	-13.68**	-0.113	-0.848*
	(1.217)	(7.370)	(0.0850)	(0.515)
Controls		*Road density, Distance, Village Dummy*		
Observations	147	145	148	146
R-squared	0.112	0.129	0.119	0.13
Specification 5	-2.097**	-15.21**	-0.0849	-0.625
	(0.972)	(5.856)	(0.0700)	(0.400)
Controls		*Road density, Distance, Urban Rate, Land Quality*		
Observations	145	143	146	144
R-squared	0.168	0.176	0.16	0.162

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$