

# Was There A Crisis? A Human Development Index for Lower Canada, 1760 to 1848 \*

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October 3, 2022

## Abstract

The colony of Lower Canada, now the modern-day province of Quebec in Canada, is presented as having experienced a prolonged agricultural crisis (marked by the shift away from wheat-farming) during the first decades of the nineteenth century. During this crisis, living standards supposedly fell, but this is subject to a debate which persists to this day because of the absence of convincing data. In this paper, we use new data (real wages, literacy, and infant mortality) to provide quantitative evidence of living standards in the form of a Human Development Index (HDI) to study whether there was a crisis between 1760 and 1850 (and we extend the index to 1688 and 1911 in appendix). Across multiple specifications of the HDI to account for non-linearity, we find no signs of a crisis. We find only signs of improvements during the period — driven largely by falling infant mortality rate and rising literacy rates. This new evidence should finally put to rest the claim that there was a crisis.

**Keywords:** Canadian economic history, agricultural crisis, economic growth, human development

**JEL Codes:** N11, E50

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\*Acknowledgements go to Leandro Prados de la Escosura, Gilles Paquet, Alexandra Foucher and Germain Belzile. Thanks to Jean-Sébastien Bournival and Lisa Dillon for help with the IMPQ data. Geloso also thanks Belle Isle Premium Moonshine from the great state of Virginia.

# 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” following a decline in wheat production and declining farm productivity.

This crisis may have played a key role in Canadian history (Russell, 2012). 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.<sup>1</sup> The crisis also marked a trend in living standards that contrasted with the rest of the North America. This was an important force behind Quebec immigrants heading to higher-income New England states (Paquet and Smith, 1983; Roby, 2004; Vermette, 2018).

The debating lines 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 the existence of the crisis. With regard to the first axis, many 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.<sup>2</sup>

Many economists and cliometricians pushed back against this explanation and its variants (Lewis and McInnis, 1980; Armstrong, 1984; Altman, 1998; Paquet and Wallot, 2007; Geloso et al., 2017; Geloso, 2022).<sup>3</sup> Relying on agricultural productivity data, responses to price changes

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<sup>1</sup>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.

<sup>2</sup>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; Lavertue, 1984; McInnis, 1982; Geloso et al., 2022).

<sup>3</sup>See Geloso for a discussion of the multiple variants of the cultural conservatism hypothesis (Geloso, 2022, fn2, p.2).

and farming techniques, they showed that there were no statistically significant differences between French-Canadians and English-Canadians farmers in Quebec.

These economic historians who are skeptical of the claims of cultural conservatism also tend to question whether there was a crisis.<sup>4</sup> Paquet and Wallot (2007)<sup>5</sup> and McInnis (1982) were the first to seriously raise doubts the crisis' existence. They criticized the relevance of the decline of wheat crop as a sign of an agricultural crisis since little was known about total output and market value of other crops. Moreover, the decline of wheat production could be the result of 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). Moreover, Paquet and Wallot (2007) found using probate inventories that there was modest growth in per household wealth from 1792 to 1835 (between 18% and 51% in real terms). Later, 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 which is typically associated with stagnant productivity at a stable population level. They found no signs of such an equilibrium. Given rapid population growth, this suggests the presence of productivity growth. Geloso and Bédard (2018) went further and used the logic of the equation of exchange which states that the velocity of money times the money supply should be 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 was negative output per capita growth possible. Courville (1990, 2008) also marshalled indirect evidence against the claim of a crisis by pointing to the emergence of numerous rural villages between 1764 and 1851 . This suggested faster urbanization than previously appreciated. He also found signs of proto-industry and greater pluriactivity. Combined, his findings suggest a fall in the agricultural sector's share of employment and output even though total output was probably increasing.<sup>6</sup>

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<sup>4</sup>Some historians who believe there were no crisis do not reject the cultural conservatism hypothesis (i.e., they argue that French-Canadians had pre-capitalist mentalities – see for example Bouchard [1996]).

<sup>5</sup>This volume refers to a compendium of their articles since 1969 on the matter of Quebec's economic history.

<sup>6</sup>Courville (2008) prefers to speak of a short *malaise* contained to the 1830s. A claim which echoes that of

The problem with these criticisms is that they are either roundabout or that they rely on problematic data sources. For instance, the probate data used by Paquet and Wallot (2007) have been criticized for not being representative (Russell, 2012).<sup>7</sup> The evidence based on economic theory or indirect observations (such as Courville’s urbanization trends) are often deemed to be roundabout solutions that do not rise to the empirical challenge of documenting living standards directly (Le Goff, 1974).<sup>8</sup> This is in addition to the scorn raised by some scholars for the use of econometric methods by skeptics of the agricultural crisis (Dechêne, 1986).<sup>9</sup>

This short article takes on the challenge of providing *direct* evidence as to whether there was a crisis. Using recently unveiled price and wage data (Geloso, 2019a; Geloso and Lindert, 2020) alongside infant mortality data, and literacy data, we construct a human development index (HDI) for Quebec. While the index spans from 1688 to 1911, we focus on the period from 1760 to 1848 to deal with claims regarding the existence of a crisis.

We find *no* signs of a crisis during the first half of the 19th century. Real wages were either stagnant or rising modestly while mortality was falling and literacy rates were rising. Shifting between linear and non-linear components for literacy and mortality (as both indicators have lower and upper bounds while wages have no upward bounds) (Kakwani, 1993; Prados de la Escosura, 2015, 2021, 2022.) does not alter our results. We find that there was a decline in human development prior to 1790 and that the rebound was clearly underway by 1800. Moreover, the HDI improvements are accompanied by lower volatility in year-to-year changes. This reduction in volatility is itself an improvement in quality of life (Fogel, 2004). Simply put,

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Greer (1993) regarding the economic factors behind the timing of the rebellions of 1837–38.

<sup>7</sup>Russell discusses the debates over the probates used by Paquet and Wallot but he does not take any issue with the price index used to deflate them. Yet, the price index itself is also problematic. The index used was an equal-weight index of 20 goods — mostly agricultural ones (see Paquet and Wallot (1998)). This weighting scheme overstates price levels given that there was an important change in relative price of non-agricultural goods. Price indices that rely on expenditure weights and a greater number of non-agricultural goods suggest that prices fell more rapidly between circa 1800 and 1850 (Geloso, 2019a).

<sup>8</sup>Moreover, some of the indirect empirical evidence is contradictory. For example, Arsenault-Morin et al. (2017) find that the stature of French-Canadians fell between 1780 and 1820. As stature is tied to nutrition, this can be taken as a possible sign of falling living standards. This is quite an important rebuttal of the indirect evidence as the authors have elsewhere criticized the claim of the agricultural crisis. Such contradictory evidence suggests the limited ability of indirect methods to convince involved parties.

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

there was no crisis.

To be sure, our evidence does not suggest that Quebec grew as fast or faster than the rest of British North America. We do not take a stance on this for lack of comparable data needed to estimate HDI for the United States and the rest of the Canadian colonies pre-1850. However, our results do suggest that it is safe to bury the claim of an agricultural crisis once and for all – a significant contribution for Canadian historians and economists.

Our article is divided as follows. Section 2 highlights the data and method we used to construct the human development index from 1688 to 1911. In Section 3, we present and discuss the results from 1760 to 1848. The full HDI, covering 1688 to 1911, is depicted in appendix and made available for everyone to use even if we focus on the 1760 to 1848 period for this article. Section 4 concludes.

## **2 Data and Methods**

### **2.1 The Data**

To measure living standards in Quebec, we assembled three indicators. The criteria we used for using them is that they be highly continuous on an annual basis (i.e., limited need for interpolation) for the period for 1760 to 1848. The three measures that qualify are infant mortality rates, literacy rates and real wages.

All our measures were available for 1688 to 1848 but some become unusable on an annual basis after 1848. We were able to extend some of these measures to 1911 on a decadal basis by using census data. These are reported in appendix.

#### **2.1.1 Mortality**

We are able to reconstruct mortality rates from a new extensive database of linked vital records, the IMPQ (Infrastructure Intégrée Des Microdonnées Historiques de la Population du Québec,

IMPQ (2020)).<sup>10</sup> The records are close to the complete Catholic population (and many Protestants) and are linked together to reconstruct entire families (Vézina et al., 2013; Dillon et al., 2018). For our measure of life expectancy, we focus on infant mortality rates 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.

Religious incentives for prompt and universal baptism suggest the data are of high quality. Parish clergy paid close attention to recording infant births and deaths due to serious theological concerns about the souls of unbaptised children. A 17th century bishop went so far as to threaten delinquent parents with excommunication (Dillon et al., 2018). As records included the dates of both births and baptisms, Gagnon and Mazan (2009) estimated (with some assumptions) that from 1680 through the mid 17th century, a stable 2–3% of children died before baptism and were not recorded.<sup>11</sup>

However, some children still are missing death records. Gagnon and Mazan (2009) used the spacing between births<sup>12</sup> to estimate that around 10–20% of children with missing death records died in infancy from 1680 through the mid 18th century, with the rate trending downwards over time. Here, we assume all children with missing death record survived to at least age one. We do so for two reasons. First, as mentioned above, because the death records only cover through 1849. Second, as we find decreasing rates of mortality, the decreasing rate of error would introduce bias against our findings. While we underestimate overall levels of infant mortality, we likely underestimate the improvement as well.

In the mid 18th century, while the province had relatively low mortality overall compared to its European peers, it had no 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

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<sup>10</sup>This dataset is a combination of two previous datasets, the BALSAC database and the RPQA (Project Balsac, 2020; PRDH, 2020).

<sup>11</sup>Given that recent scholarship has overturned assumption that “missing girls” were absent in European populations (Szoltysek et al., 2022) and a handful of women were accused of infanticide during this period, it is likely too that some infants’ deaths were concealed (Cliche, 2008). Both the laws surrounding infanticide and the enforcement thereof became more sympathetic to women in the early 19th century, so again this is biased against our findings (Pilarczyk, 2012).

<sup>12</sup>Infant mortality reduces spacing by ending breastfeeding early.

to periodic outbreaks of infectious diseases (Gagnon and Mazan, 2009; Amorevieta-Gentil, 2010; Bruckner et al., 2018). Smallpox was a particularly lethal disease for children, especially when food had been recently in short supply and during times of warfare (Greer, 1985). However, as can be seen from the top left panel of figure 1, we find that by the mid-19th century the situation had improved substantially.

### 2.1.2 Literacy

The main measure of literacy used in this paper is the ability of an individual to sign their name. Signatures have often been used as a proxy for literacy in historical populations.<sup>13</sup> The marriage records from the IMPQ provide a useful source of data on signatures. 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, before 1800 the rate at which individuals were reported as definitely not signing varied dramatically. 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. Thus, we likely underestimate literacy overall.

This measure of literacy shows a continuous decline until around 1800 and a steady growth afterwards (see top right panel of figure 1). While perhaps surprising, this decline in literacy is well documented.<sup>14</sup> The initial settlers were overwhelmingly from urban areas, and the men were usually poor craftsmen, not farmers (Greer, 1997). They thus were drawn from a population with moderate levels of literacy. However, their descendants rapidly settled into a life of farming. Initial settlement patterns were low density, impeding the establishment of schools, and other skills besides formal education were in demand (Magnuson, 1992). The continuous decline through 1800 is probably driven by new settlement. Older and longer settled parishes stop declining earlier than new parishes. For example, Portneuf (near Quebec City) reached 10%

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<sup>13</sup>c.f. A'Hearn et al. (2009).

<sup>14</sup>Moreover, this pattern was not unique to Quebec. Acadians (the French settlers of Atlantic Canada) had a very similar trend of literacy over time (Dugas, 1993).

circa 1680 and stayed there until 1800, at which point literacy rates continually rise (Veilleux, 1981). Its only after 1800 that all local studies suggest a rise in literacy across all parishes (Verrette, 2002). This is confirmed in the top right panel of figure 1.

### 2.1.3 Wages

The wage data employed was created by Geloso and Lindert (2020). Extracted from the account books of religious congregations operating large estates around Quebec City and from multiple reports contained in the *Journals* of the legislative assembly, these wage rates apply to unskilled workers who contract work on a daily basis.<sup>15</sup> 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. 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).<sup>16</sup>

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 (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 different specifications of the real wage component of the HDI. The bottom panel of figure 1 illustrates the real wage series.

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<sup>15</sup>They extended the work of Geloso (2019b) who studied the 1688 to 1775 period by using the same source to go as far as 1859. After that year, they shift to other conventionally-used sources in Canadian economic history to plot nominal wages to 1913 for Quebec.

<sup>16</sup>We combine this data with the similar wage rate data for the period from 1688 to 1775 to help us cover the period from 1760 to 1775 and from 1688 to 1911 (in appendix).



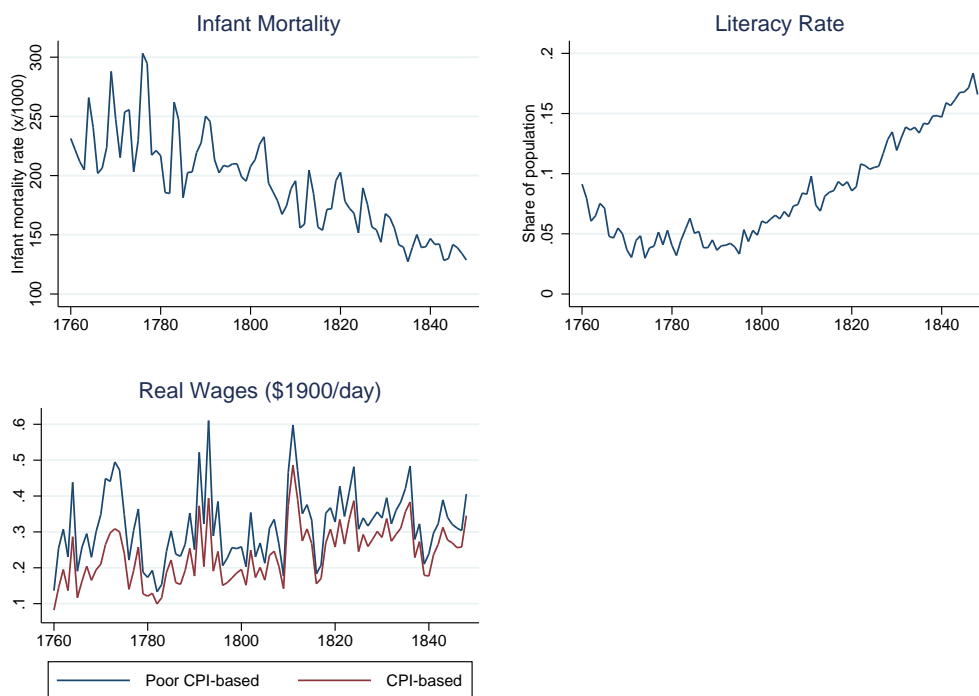


Figure 1: Data Components of the HDI for Quebec 1760–1848

## 2.2 The Index

The usual method of constructing a HDI consists in estimating:

$$HDI = \left( \prod_{i=1}^n I_i \right)^{1/n} \quad (1)$$

where each component  $I$  is a dimension of the index. The most well-known versions of the HDI (notably the United Nations Development Program) use mean years of schooling, life expectancy at birth and income per capita (in log) as the  $I$  dimensions. However, many indices switch variables (e.g., infant mortality instead of life expectancy at birth) depending on availability. Others add additional dimensions (e.g., political liberty – see Prados de la Escosura (2021)). The changes are generally accepted if they remain loyal to the underlying philosophy of the HDI – which is to measure the standard of living in terms of the ability to exercise agency. Hence why the literature emphasizes “capabilities” (Sen, 1988). A healthy and literate person

with high income has more capabilities to exercise agency (and show volitional abilities) than an unhealthy and illiterate person with high income. As such, as long as a chosen proxy variable speaks philosophically to what the HDI is meant to capture, it can act as a substitute (Kakwani, 1993; Gasper, 2002). For our purposes, literacy rates and mortality rates transformed as infant survival rates<sup>17</sup> qualify as substitutes.

A more debated issue than the choice of measure is the manner in which each of the components are constructed. Normally, each  $I$  is transformed into an index using the following linear form:

$$I = \frac{(x - m_0)}{(m - m_0)} \quad (2)$$

where  $m_0$  and  $m$  are the minimum and maximum values of each component and  $x$  is a polity's observed value on this dimension at a given time.<sup>18</sup> While income is a variable that is unbounded upwards, education and health have both lower and upper boundaries. This is problematic because of the linear formulation in equation 2.<sup>19</sup> For example, a reduction in infant mortality in country with a low infant mortality rate is far more impressive in terms of human capabilities than the same reduction in a country with a high rate. A linear formulation fails to capture this. Moreover, the choice of proxy variable can heighten the problem of linearity (Hay et al., 2017; Prados de la Escosura, 2022). For example, as life expectancy rose in the 20th century there was a decline in disability. This means an increase in the healthy life expectancy at birth (HALE or DALY). However, these improvements have been most pronounced in countries with already high levels of life expectancy. The boundedness of using the non-adjusted measure of life expectancy thus amplifies problems associated with the quality of the proxy. This is why

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<sup>17</sup>See next footnote.

<sup>18</sup>It should be noted that variables that improve as their values fall (such as infant mortality) require an additional transformation. The country value for  $x$  must be transformed by  $b - x$  where  $b$  is the maximum rate. For example, if the mortality rate is on 1,000,  $b - x$  becomes  $1000 - x$ . This essentially converts the mortality rate into a survival rate whose use is more straightforward in indexed form. This adjustment must be carried on to  $m$  and  $m_0$ .

<sup>19</sup>There are other issues, namely that the index assigns a strong penalty to poor performers (Herrero et al., 2012).

non-linear transformations (Kakwani, 1993) of the following shape have been proposed:

$$I = \frac{\log(m - m_o) - \log(m - x)}{\log(m - m_o)} \quad (3)$$

This formulation creates values  $> 0$  and  $< 1$  in a convex form. If a country's value  $x$  is either at the maximum  $m$  or the minimum  $m_o$ , it is assigned the value of 0 or 1.<sup>20</sup> In this paper, we take no stand on which measure is superior but note that the linear form in equation 2 would overstate any improvement in Quebec during our period of study as any improvement took place from a low level. As such, we present one HDI using all  $I$  as specified in equation 2 and another HDI where the  $I$  for education and health are computed in the non-linear transformation of equation 3.

Setting up the the maximum  $m$  or the minimum  $m_o$  for literacy rates and infant mortality rates transformed as infant survival rates is relatively easy because of the boundaries. For the purposes of this paper we set them at 100% and 0.1% for literacy and at 999.99 and 300 for the infant survival rates.<sup>21</sup>

Setting up the minimum and maximum from wages is less straightforward. Generally, the literature relies on empirical findings from the happiness and life satisfaction literature (Prados de la Escosura, 2022, fn5, p. 15) which tends to find some form of satiation point in the relation of income to emotional well-being. That satiation point is set as the maximum which is why Prados de la Escosura (2022) used the figure of \$75,000 (in 2011 purchasing-power-parity adjusted dollars). The minimum point is fixed using the fact that GDP per capita cannot permanently go below a certain floor — that of subsistence — without some form of equilibrium mechanism kicking in (e.g., population decline in a Malthusian growth regime) (Pritchett, 1997). Hence why the floor is set at \$100 by Prados de la Escosura (2022) in his recent work on measuring international HDI since 1870. The problem is that our wage data is a daily wage

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<sup>20</sup>We thank Leandro Prados de la Escosura for pointing us to Kakwani (1993) and his axiomatic approach to human development which includes the form in equation 3.

<sup>21</sup>This transformation meant to simplify the index's analysis implies that the worse value is an infant mortality of 700 per 1,000 and the best value is a mortality rate of 0.01 per 1,000.

estimate which is hard to convert into income terms. To convert the wage estimate into a real income figure adjusted for purchasing-power-parity, we rely on the Maddison Project Database income estimate for Canada in 1840 and the intra-Canada wages differences found by Geloso and Macera (2020) from the 1842 census. Finding a 42% difference in wages between Quebec and Ontario and assuming equal income in Ontario and the rest of Canada (except Quebec), they used Quebec’s demographic weight to isolate what the per capita income would have been. We use the same approach and find that real income per capita in Quebec in 1840 stood at \$1456 (again in 2011 purchasing-power-parity adjusted dollars).<sup>22</sup> That level is then indexed to the wage movements in order to assign the values discussed above (i.e., \$100 for the minimum and \$75,000 for the maximum).<sup>23</sup>

## 3 Results

### 3.1 Levels and Changes

In figure 2 below, the resulting HDI is displayed. The left-side panel shows the index with non-linear components for literacy and infant mortality while the right-side panel shows the index with linear components. There are some small year-to-year differences in the movements and differences in the level. However, the overall trend is the same: a decline until 1790 and a sustained increased thereon.<sup>24</sup>

The starting levels in the first decades of the index appear to be low. This is unsurprising given the role of recurrent warfare. Under French rule, Quebec had been at war nearly one year out of two. There were multiple invasions (in 1692, in 1711, and in 1759) as well as important

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<sup>22</sup>We have to redo their calculation because they used an earlier version the Maddison Project Database. There have since been some revisions to the Canadian numbers.

<sup>23</sup>This is an imperfect solution, but it is biased unfavourably against our findings. Indeed, by using the wage rate under the assumption that it reflects the changes in the marginal product of labor, we are essentially stating that all income growth came from productivity growth. This omits the possibility of an increase in income by longer work year. However, if there were longer work years during the period studied, the trends would only be stronger. As such, our HDI is downplaying improvements.

<sup>24</sup>In appendix, we show the series covering 1688 to 1911. In that extended series, there is a strong decline from 1688 to 1790. This is expected given the behavior of the infant mortality and literacy rates (which are deteriorating continuously to 1760). See footnote 25.

disruptions to the colony's international trade. The invasion that culminated with the cession of Quebec to the British was particularly damaging. The British destroyed numerous farms around Quebec City (Frégault, 1955; Deschênes, 1988) in addition to the burden of the militia requirements imposed by the French regime (Dechêne, 2008). The American Revolutionary War (1775–1783), which was marked by the invasion and occupation of part of Quebec (notably Montreal), also seems to be associated with reductions in the level of the HDI. Alongside invasions came sieges and disease, increasing mortality. Notably, smallpox broke out during the 1775 Siege of Quebec (Amorevieta-Gentil, 2010). With the exception of the war of 1812–1815, the colony was mostly free of international wars and invasions after the American Revolutionary War, suggesting that wars imposed large costs on living standards on the colonists.<sup>25</sup>

From the 1790s onward, the index improves at a relatively steady pace. Both formulations of the HDI suggest that the level doubled in the six decades after 1790. Looking at figure 1 suggests that the gains are in large part driven by the rise in literacy and the fall in mortality. Rising real wages appear to play a more modest role, although they managed to stay ahead of a rapidly growing population (from less than 80,000 to close to 900,000). This seems plausible given that there are no strong trends in the wage rates until the 1850s even though there is level change post-1815 with wages being at a higher plateau from 1815 to 1848 than in prior years.

These developments rule out the possibility of claiming that there was an agricultural crisis that translated itself in falling living standards. This is consistent with the indirect evidence advanced by skeptics of the crisis. For example, Geloso and Bédard (2018) and Paquet and Wallot (2007) pointed to evidence from rising per capita imports as a proxy for rising living standards. New evidence by Vallières and Desloges (2008) regarding trade with Great Britain shows that most of the increase in imports from 1760 to 1851 was from British manufactured goods such as cotton clothing, metals, alcohols, salt, coffee, tea, and tobacco.<sup>26</sup> This suggests rising consumption levels of non-food items and luxury (imported) food items. Simultaneously,

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<sup>25</sup>Breaking down the data in appendix by period from 1688 to 1790 suggests that the level was stable for most of the era of French rule to 1740 and that it then declined strongly during the war years of 1740-1748, 1754-1763, 1775-1783. This reinforces our statement that wars had strong adverse effects on living standards.

<sup>26</sup>This evidence is conservative as it omits trade with the United States.

McCallum (1980 p. 30) showed that per capita wheat consumption increased 39% between 1831 and 1851 (and that pre-1831 levels had been somewhat stable).<sup>27</sup> Recomputing McCallum's estimates to deal with metrological problems in the censuses of 1831 and 1851, Geloso et al. (2022) found a more modest increase of 22% between 1831 and 1851. Moreover, it is worth pointing out that Geloso (2019a) found that components of the price level behaved differently as the price of manufactured (domestic and non-domestic) goods fell relative to the price of agricultural goods.<sup>28</sup> As such, the finding of rising consumption levels of wheat and imported items is consistent with our findings with the HDI that living standards were rising.<sup>29</sup> It also confirms that the indirect evidence used previously to argue against the claim of a crisis was correct.

### 3.2 Volatility

More importantly, the rising consumption levels of wheat and manufactured goods mentioned above is consistent with another finding unlocked by our HDI: the fall in the volatility of the components of the index. There are two reasons to be interested in volatility in addition to our concern over trends. First, volatility in prices is generally perceived as a drag on economic growth (Judson and Orphanides, 1999) as documented for the American colonies prior to the Revolution by Lindert and Williamson (2016). Second, volatility in indicators such as infant mortality can speak to recurrent “mortality crises” which accounted for “a large part of total mortality during the early modern era” (Fogel, 2004, p. 5).<sup>30</sup> Mortality crises need not be visible

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<sup>27</sup>McCallum (1980) producing this number is relevant here as he is one of the proponents of the crisis' existence. He argued that the rising consumption levels was due to the import of cheap American and Ontarian wheat. However, in his story, the shift to these new sources was due to the crisis (i.e., falling wheat output in Quebec due to outdated farming techniques and poor lands) rather than a simple unveiling of a lack of comparative advantage in wheat production (Geloso et al., 2022).

<sup>28</sup>Clothing items and metalwares fell the fastest. Real cotton goods prices fell 53% from the 1790s to the 1840s whereas prices for linens and flannels fell 18% and 11%. The real price of nails (the item used to represent metalwares) fell 52%.

<sup>29</sup>Moreover, its also consistent with price theory. Using a CES function where the utility function implies somewhat complementary goods, an easing of the budget constraint because of a single falling price (here, the price of non-agricultural goods such as clothing items) allows an increase in the consumption of all goods.

<sup>30</sup>Fogel adds that the elimination of these crises “explained largely” the decline in mortality rates between the mid-eighteenth and mid-nineteenth centuries (Fogel, 2004, p. 6).

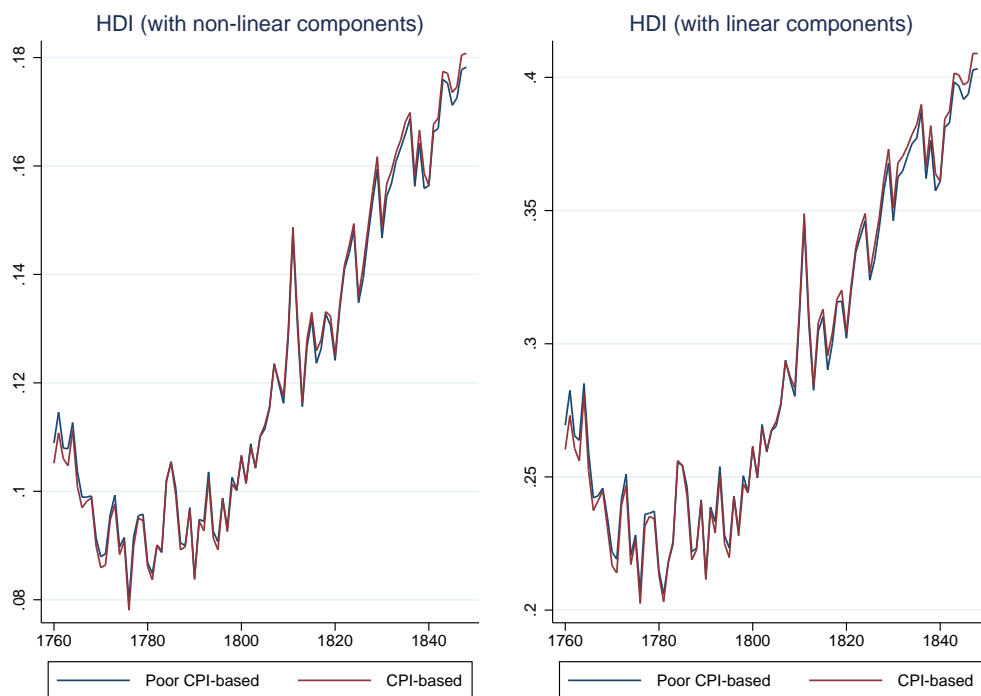


Figure 2: HDI for Quebec, 1760 to 1848

in national aggregates to be problematic. Recurrent localized shocks can leave important scars on local populations that last a lifetime (Komlos, 1988). Such costs are unlikely to be captured by the level of mortality. However, they can be captured indirectly by changes in the volatility of mortality. Lower volatility means fewer crises and thus fewer such scars. This is why economic historians tend to consider falling volatility as a sign of improvement in living standards (Flinn, 1974; Lagerlöf, 2003; Fogel, 2004; Andersson et al., 2010; Pfister and Fertig, 2020). In our case, falling volatility — especially in infant mortality — would be tied with better nutrition, which would also be consistent with the rising consumption levels of wheat documented by McCallum (1980) and Geloso et al. (2022) and of other goods as documented by Vallières and Desloges (2008).

To measure volatility, we copy the approach of Lindert and Williamson (2016) and Geloso (2020) who used the standard deviation of log changes of prices from year to year. However, they took the standard deviation over entire periods whereas we will take the standard deviation over

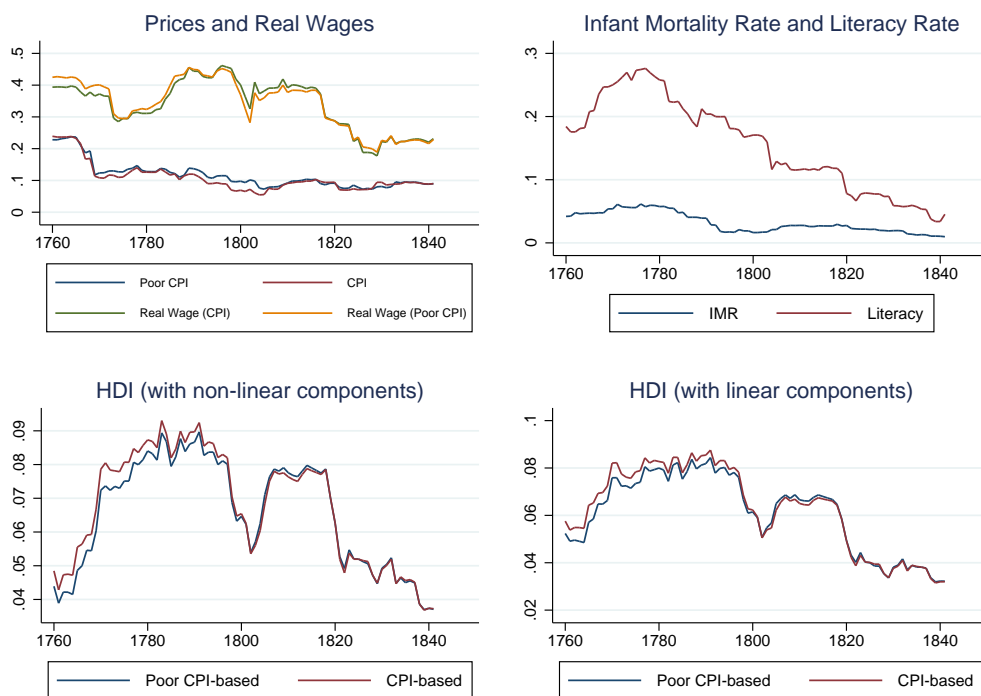


Figure 3: Rolling (15 years) Standard Deviation, 1760 to 1848

a rolling 15 year window from 1760 to 1841.<sup>31</sup> This rolling window allows us to capture changes in volatility over time. We apply this approach to all the data series used (prices, wages, mortality and literacy).

The results are depicted in the two panels of figure 3 below. The top left-side panel shows the rolling standard deviation for the price indexes and the real wages. As can be observed, there is falling volatility for all components with most of the fall concentrated in the post-1815 period. On the top right-side panel, the decline in volatility is more visible for literacy and mortality. In the two bottom panels, the volatility in HDI is also shown to fall for the period from 1800 to 1850.

Falling volatility is consistent with the indirect evidence brought forth by skeptics of the crisis. First, as we pointed out above, consumption levels of wheat per capita increased. This means a larger supply of calories. The fall in the volatility of prices, real wages and infant

<sup>31</sup>This means that the first observation centered at 1760 will include all years from 1753 to 1767 whereas the value centered at 1841 will include all years from 1834 to 1848.



mortality over time suggest that this larger supply was also more stable. This greater stability is a form of increased living standards. Second, the greater stability is consistent with the work of Geloso and Kufenko (2015) on whether the economy of Quebec could be qualified as being in a Malthusian equilibrium. 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). Rising population levels, because of decreasing marginal returns to labor, cause wages to eventually fall and the preventive and positive checks 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 (i.e., continued innovation allowing for growth in productivity) (Nicolini, 2007; Clark, 2008; Crafts and Mills, 2009; Galor, 2011; Murphy et al., 2010; Klemp, 2012; Møller and Sharp, 2014; Klemp and Møller, 2016; Pfister and Fertig, 2020; Pedersen et al., 2021; Jensen et al., 2021) or that the land constraint was weak (i.e., more lands could be settled) (Kufenko et al., 2022). In their work, 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 the economy could not be deemed Malthusian. Our volatility findings confirm their results. Mortality volatility dropping faster than wage volatility suggests that the positive check is becoming less relevant over time. As fertility rates remained high and relatively stable while wages increased modestly, it is only the level of deaths that is dropping. The fall in volatility suggests that this drop in the level of deaths is associated with fewer mortality crises. This essentially rules out the positive check.

## 4 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 to construct a human development index from 1760 to 1848, we find that there are no grounds to speak of a crisis: living standards rose continuously from 1790 to 1848 after falling modestly until 1790. Simply put, there was no crisis.

To be sure, our work does not attempt a comparison with the rest of North America. It does not attempt to document whether living standards improved faster or slower than elsewhere. We leave that to future work as creating human development indexes for other portions of North America prior to the 1850s would be a daunting task by itself. We also leave questions such as why there was an upturn circa 1790 to future research. Nevertheless, we believe that our results should lead to the final abandonment of the claim of an agricultural crisis in the literature — a valuable contribution to the discussion.

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