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ARTICLES – ARTÍCULOS

Wages, prices and living standards in a growing economy. The case of Boston, Massachusetts

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Abstract

This study analyzes the living standards of laborers in Boston, Massachusetts, in 1785–1900. Using a linear programming model, I determine the food basket that provided a balanced nutrition at the lowest possible cost. Then, I estimate the welfare ratio of laborers. The evidence shows that laborers in Boston earned enough to cover their basic needs, and that their real wages increased in the nineteenth century. The results also show that the welfare ratio of laborers in Boston was higher than the ratios in several European cities. Boston can be considered a high-wage economy in the late eighteenth and nineteenth centuries

Keywords: Living costs, prices, wages, Boston.

JEL codes: N31, I32, J31, C61.

1. Introduction

For a long time, economists and economic historians have analyzed living standards in New England. Some estimates suggest that living standards in colonial New England were relatively high. According to Robert Allen, Tommy Murphy and Eric Schneider, in the eighteenth century the welfare ratio in Massachusetts was already higher than the ratios in Continental Europe (Allen, Murphy and Schneider 2012).[1] Vincent Geloso also showed that laborers in colonial New England had relatively high living standards in the eighteenth century: the welfare ratio of unskilled workers in this region was higher than

1 The welfare ratio is calculated as the ratio between family income and the cost of subsistence.

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the ratios in England, Paris and Quebec (Geloso 2019).[2] In addition, according to Robert Allen, the welfare ratio in Massachusetts was even higher than the ratios in Northern Europe in the nineteenth century (Allen 2009; 2014).

For the estimation of welfare ratios, it is necessary to make assumptions about the subsistence basket. Some studies have used information on the historical habits of low-income families to make assumptions about the subsistence basket in New England. Allen (2009) and Allen et al. (2012) used a food basket that was supposed to resemble the consumption habits of poor people in Massachusetts,[3] and that provided the necessary quantities of calories and proteins for subsistence. Geloso (2019) used a similar food basket, but increased the quantity of fuel, to estimate welfare ratios in New England. Allen (2014) made some changes to the composition of the food basket in Massachusetts to reflect changing diets, and increased the quantity of calories.

There are several challenges when making assumptions about the subsistence basket. Information on consumption habits is useful to make assumptions about the subsistence basket if this basket is supposed to reflect diets in the past. However, it is important to be cautious when using historical diets to compute welfare ratios. First, since historical diets did not necessarily provide the exact quantity of nutrients associated to subsistence, an adjustment may be needed. Some adjustments may be arbitrary. Second, if consumption habits vary across countries and across time, the resulting welfare ratios may not be comparable. For example, if consumption habits are affected by real income, the differences in welfare ratios (computed using different diets) may not reflect differences in real income (Zegarra 2022; 2024b). Additional problems may emerge if diets changed over time in response to relative prices. Depending on the selection of the diet, the results may be very different (Zegarra 2022; 2024b). Considering the problems associated with the use of historical consumption habits, some doubts may arise regarding the validity of previous estimations of welfare ratios. Are previous estimations of welfare ratios in Massachusetts valid for understanding the standards of living in this state?

Some studies have used linear programming to find the subsistence basket, and estimate welfare ratios for several economies (Allen 2017; 2020; Zegarra 2021; 2022; 2024b; 2024a). Linear programming is useful to find the lowest-cost basket that provided several nutrients, using information on prices, and the chemical composition of foodstuffs. If the subsistence basket is defined as the basket that secured subsistence at the minimum cost, linear pro-

2 High living standards, however, were not exclusive to New Englanders in colonial times. In general, Americans had high living standards prior to 1800 (Lindert and Williamson 2016).

3 However, as I will show in this article, there were important differences between the average diet of families in Massachusetts and the baskets used by Allen (2009) and Allen et al. (2012).

gramming will be very useful to estimate the cost of subsistence and welfare ratios. This method has several advantages with respect to the use of historical diets. On one hand, the method does not rely on an arbitrary adjustment of historical diets. In addition, the resulting food basket is not affected by real income. Furthermore, unlike some studies that have assumed the same basket over long periods, linear programming may yield different food baskets in response to changes in relative prices. In 2017, Robert Allen used linear programming to estimate poverty lines in the twenty-first century (Allen 2017). Other studies used this optimization method to estimate welfare ratios prior to 1900 (Allen 2020; Zegarra 2021; 2022; 2024b). However, no study has used the same method to find the lowest-cost basket in Massachusetts prior to 1900.

In this article, I estimate welfare ratios of laborers in Boston in 1785–1900 using linear programming. I use this method to determine the lowest-cost food basket in Boston. As part of the model, some restrictions were made, in terms of a minimum intake of calories, proteins, fat, iron, and some basic vitamins. To estimate the cost of subsistence, the cost of fuel, clothing, housing, and other basic products was added. The welfare ratio was calculated using information on wages and the cost of subsistence.

In order to estimate welfare ratios in Massachusetts, Allen et al. (2012), Allen (2009; 2014) and Geloso (2019) relied on data on prices and wages reported by Carroll Wright in the nineteenth century (Wright 1885), in addition to some official sources. These studies assumed that the basket of Massachusetts was composed of a large quantity of cereals (corn or wheat flour) and a few kilograms of legumes, meat, and butter or oil. Compared to these studies, I use a different data set, and a different methodology. I use a variety of secondary sources to obtain information on prices and wages in Boston,[4] and a linear programming model to estimate the lowest-cost food basket.

According to my estimations, the welfare ratio of laborers in Boston was usually above 1.5, which implies that working families could cover their basic needs. In addition, real wages increased over time, especially in the late nineteenth century. After ranging around 2.0 in 1800–1860, the welfare ratio increased to 2.9 in the 1890s. My estimates are lower than the welfare ratios from Allen et al. (2012), Allen (2009) and Geloso (2019) for the late eighteenth and early nineteenth centuries. Compared to Allen (2014), the differences in levels and trends are smaller. The fact that my results are lower than those of Allen (2009), Allen et al. (2012) and Geloso (2019) and similar to those of Allen (2014) is not surprising. I assume far higher calorie requirements than the first three studies; the differences in calorie requirements with Allen (2014) are relatively small.

4 I use several sources, including Wright (1885). The appendix lists all data sources.

The article contributes to the debates on the Great Divergence. Some studies show that the welfare ratio in Massachusetts was higher than the ratios of several European cities in the late eighteenth and nineteenth centuries (Allen 2009; 2014; Allen et al. 2012; Geloso 2019). Since the baskets in these studies are supposed to reflect consumption patterns, some doubts may arise regarding their accurateness to measure the standards of living in Massachusetts. However, my results confirm that Boston was a high-wage economy. A comparison of my estimates and previous estimates shows that the finding that Bostonians had relatively high welfare ratios is robust to changes in the methodology. When comparing my results for Boston and welfare ratios in Europe, the present study reveals that families in Boston had higher living standards than those in important European cities in 1785–1900. Borrowing a phrase by James Lemon, America was the "best poor man's country" (Lemon 2002), or at least one of the best ones.

2. Economic growth and living standards in Boston

By the late eighteenth century, New England was a mainly agricultural region. Most people lived in rural areas. However, the region experienced important changes over time. In particular, the region witnessed a significant industrial revolution and a rapid process of urbanization; in the second half of the nineteenth century, most people in the region lived in cities.

The region experienced an important transformation in the nineteenth century from a rural agricultural economy into an urban industrialized economy. Urban population in New England increased from 76 thousand inhabitants in 1790 to 784 thousand in 1850, and 3.8 million in 1900, at an average rate of 3.6% per year.[5] Rural population also grew, but at an average rate of only 0.2% per year. Therefore, the urbanization rate in New England increased from 8% in 1790 to 29% in 1850, and 69% in 1900. In Massachusetts, the urban population grew at 3.6% per year in 1790–1900, and the urbanization rate increased from 13% in 1790 to 51% in 1850, and more than 86% in 1900. In the late eighteenth and early nineteenth century, most people lived in the countryside; in contrast, in the late nineteenth century, most people lived in cities. As New England became industrialized and highly urbanized, the city of Boston grew rapidly. After growing by 1.3% per year in 1700–1800, the population of Boston grew by 3.2% per year in 1800–1900. Boston

5 Population data comes from official sources (U.S. Department of Commerce 1975; U.S. Department of Commerce and Labor 1909; U.S. Department of Interior 1901). Urban population in Massachusetts and New England refers to the population in cities of more than 2,500 inhabitants.

was a city of 25 thousand inhabitants in 1800; a hundred years later, the city had more than half million people.

The urbanization of New England was associated with the expansion of manufacturing and commerce. Capital flew into the manufacturing sector in the nineteenth century. In constant dollars of 1840, capital invested in manufacturing in New England grew from 87 million dollars in 1840 to 1.6 billion in 1900 (U.S. Department of Interior 1902; U.S. Department of State 1841). In Massachusetts, capital in the manufacturing sector increased from 42 million dollars in 1840 to 823 million in 1900. On the other hand, the labor force in Massachusetts increased from 209 thousand in 1840 to 485 thousand in 1880, and 745 thousand in 1900; and the labor force in non-agricultural activities increased from 121 thousand in 1840 to 406 thousand in 1880, and 667 thousand in 1900 (Easterlin 1960). Due to the industrialization of Massachusetts, the labor force in non-agricultural sectors increased from 58% of the total labor force in 1840 to 84% in 1880, and 90% in 1900.[6]

Total income in the region increased in the nineteenth century. In particular, in 1840–1900 total income grew by 2.6% per year in New England and 2.9% per year in Massachusetts. The growth of total income can be explained by the growth of population and the growth of income per-capita. On one hand, the population in New England grew from 1.2 million in 1800 to 5.6 million in 1900, at an annual rate of 1.5%; in Massachusetts, population grew at 1.9% per year in 1800–1900. On the other hand, income per-capita in New England increased in the nineteenth century, after experiencing a decline in the eighteenth century. Peter Lindert and Jeffrey Williamson showed that income per-capita in New England declined by 0.3% per year in 1774–1800, and grew by 2.4% per year in 1800–1840 (Lindert and Williamson 2013). From 1840, income per-capita in New England maintained an upward trend. For example, Richard Easterlin showed that in 1840–1900 income per-capita increased by 1% per year in New England, and 0.6% per year in Massachusetts (Easterlin 1960).

Some scholars have computed welfare ratios to determine the evolution of living standards in Massachusetts (Table 1). According to Robert Allen, Tommy Murphy and Eric Schneider, the welfare ratio of unskilled workers in Massachusetts in the early seventeenth century was lower than the ratio in London, but similar to the Oxford ratio (Allen et al. 2012). Eventually, the welfare ratio in Massachusetts exceeded the London ratio. For the late eight-

6 In addition to experiencing a rapid process of industrialization and urbanization, New England enjoyed gains in productivity. In constant dollars of 1840, income per worker increased from 465 dollars in 1840 to 544 dollars in 1880 and 586 dollars in 1900. In Massachusetts, income per worker increased from 379 dollars in 1840 to 585 dollars in 1900. In 1840–1900, income per worker increased by 1% per year in New England and 0.7% in Massachusetts. Income per worker increased in agriculture and in non-agriculture.

eenth century, Robert Allen found that the welfare ratio in Massachusetts was higher than the ratios in London, Oxford, Amsterdam, Florence and Vienna (Allen 2009). In addition, the welfare ratio in Massachusetts increased by almost 100% between 1755–1775 and 1835, from around 3.0 to nearly 6.0.

In 2019, Vincent Geloso estimated the welfare ratios of Massachusetts, Canada, England and France in the seventeenth and eighteenth centuries (Geloso 2019). Geloso increased the quantity of fuel in the subsistence basket of Massachusetts. The welfare ratio in this state was around 3.5 in 1688–1700, 3.1 in 1701–1725, 3.4 in 1726–1750, and 3.2 in 1751–1775. These results confirm that Massachusetts was a high-wage economy. The welfare ratio in this state was above 3.0 during this period, which suggests that families in the region could satisfy their basic needs. Moreover, the region had relatively high ratios for international standards, even compared to Northern Europe. The welfare ratio in Massachusetts during this period was higher than the ratios in England, France, and Canada.

In 2014, Robert Allen estimated new welfare ratios in Massachusetts and London, using a food basket that provided more calories (Allen 2014).[7] Since the basket was more expensive, the new welfare ratio of Massachusetts was lower. However, the new findings of Allen still show that the welfare ratio in Massachusetts in the eighteenth and nineteenth centuries was far higher than 1.0. In addition, Allen showed that real wages increased rapidly in New England in the nineteenth century. The ratio increased from around 2.0 in 1800-1820 to more than 5.0 in the 1890s. In addition, the welfare ratio in Massachusetts was higher than the ratio in London in nineteenth century. For example, in 1800–1849, the welfare ratio was 2.2 in Massachusetts and 1.7 in London. Compared to London, the welfare ratio in Massachusetts grew more rapidly. In 1800–1849, the welfare ratio in Massachusetts was 29% higher than the ratio in London; in 1850–1899, it was 44% higher.

Therefore, New England experienced important economic transformation in the nineteenth century, as it became more urbanized and industrialized. However, from the late seventeenth century, New England was already a high-wage economy. Previous estimations of welfare ratios suggest people in the region could cover their basic needs, and living standards improved over time.

7 Allen et al. (2012) and Allen (2009) assumed a subsistence basket that provided around 1,940 calories per day for an adult male, and family expenses equivalent to three adult men. Meanwhile, Allen (2014) assumed a subsistence basket with around 2,100 calories per day for an average person, and family expenses equal to four times the expenses of an average person.

TABLE 1 ▪ *Welfare ratios, 1700–1899: previous studies*

	1700–1749	1750–1799	1800–1849	1850–1899
Estimates from Allen (2009) and Allen et al. (2012)				
Massachusetts	3.0	4.2	5.2	
London	4.2	3.5	3.8	
Amsterdam	4.2	3.8	2.9	
Antwerp	2.8	2.5	2.3	
Valencia	1.8	1.4		
Leipzig	1.4	1.0	0.7	
Milan	1.8	1.4		
Estimates from Allen (2014)				
Massachusetts		1.5	2.2	3.8
London		1.9	1.7	2.7
Estimates from Geloso (2019)				
Massachusetts	3.3	3.3		
Southern England	2.5	2.2		
Paris	2.0	1.7		

Notes: The table reports welfare ratios from Allen et al. (2012), Allen (2009; 2014), and Geloso (2019). Allen (2009) and Allen et al. (2012) used the same methodology to estimate welfare ratios. Allen et al. (2012) reported the welfare ratios of a variety of cities in 1700–1850. However, for 1800–1849, they did not report the welfare ratio of Massachusetts; in this case, I calculated the welfare ratio using wages and prices collected by Allen (2001) for 1805, 1815, 1825, 1835, and 1845, and the same assumptions as Allen et al. (2012). Allen (2014) depicted the welfare ratios of Massachusetts and London in his Figure 6, but did not provide the specific figures. In this case, I calculated the welfare ratios using wages and prices collected by Allen (2001), and the same assumptions as Allen (2014). Geloso (2019) depicted the welfare ratios in his Figure 1. The figures reported in this table are approximations from Geloso's Figure 1.

3. Challenges when estimating welfare ratios

Since the early 2000s, economists and historians have estimated welfare ratios for a large number of economies. Most studies have considered consumption patterns in order to make assumptions on the subsistence basket. Several studies have included a large amount of cereals, in addition to legumes and meat, among other items, in the food basket of poor people. The basket has been assumed to provide enough calories and proteins to ensure subsistence.

In 2001, Robert Allen relied on information on the diets in modern London in order to make assumptions about a respectability basket in pre-1800 Europe (Allen 2001). This basket included bread, legumes, meat, and other