The purchasing power of English workers from the 16th to the 19th century

The CSV of all data for the graph were downloaded from this link: https://raw.githubusercontent.com/vincentarelbundock/Rdatasets/master/csv/HistData/Wheat.csv

Introduction

In this analysis, we will reproduce a data vizualisation graphic with all the recoverable data made by William Playfair that tried to look at the evolution of wages for English workers and the cost of wheat between the 16th and 19th century. We will be using the data extracted from Playfair's original graph to make the visualisation as accurate as possible. Finally, we will draw a conclusion on our visual results to assess the validity of Playfair's original claim.

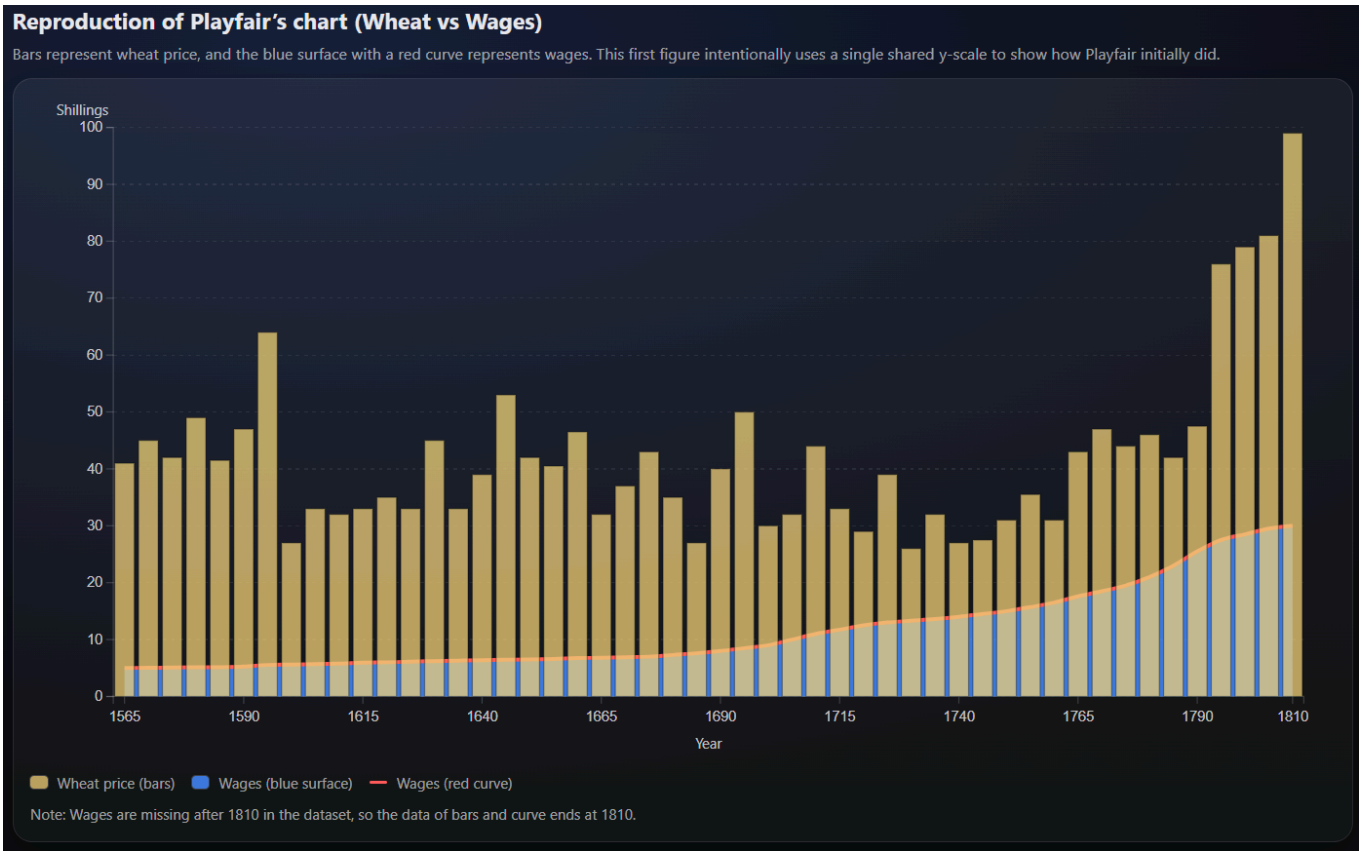
Playfair's claim :

Playfair believed that the purchasing power of English workers increased over time, despite the fluctuations in wheat prices.

Notes:

- Until 1971, the pound sterling was divided into 20 shillings, and a shilling into 12 pence.
- Wheat prices are expressed in shillings per quarter, where one quarter corresponds to 15 British pounds or approximately 6.8 kg.
- Wages are expressed in shillings per week.
- The period under study ranges from 1565 to 1810, as wage data are not available beyond this date.
- Data points are available at five-year intervals, resulting in observations only for years ending in 0 or 5.

Figure 1: Data Viz Graph as Playfair did

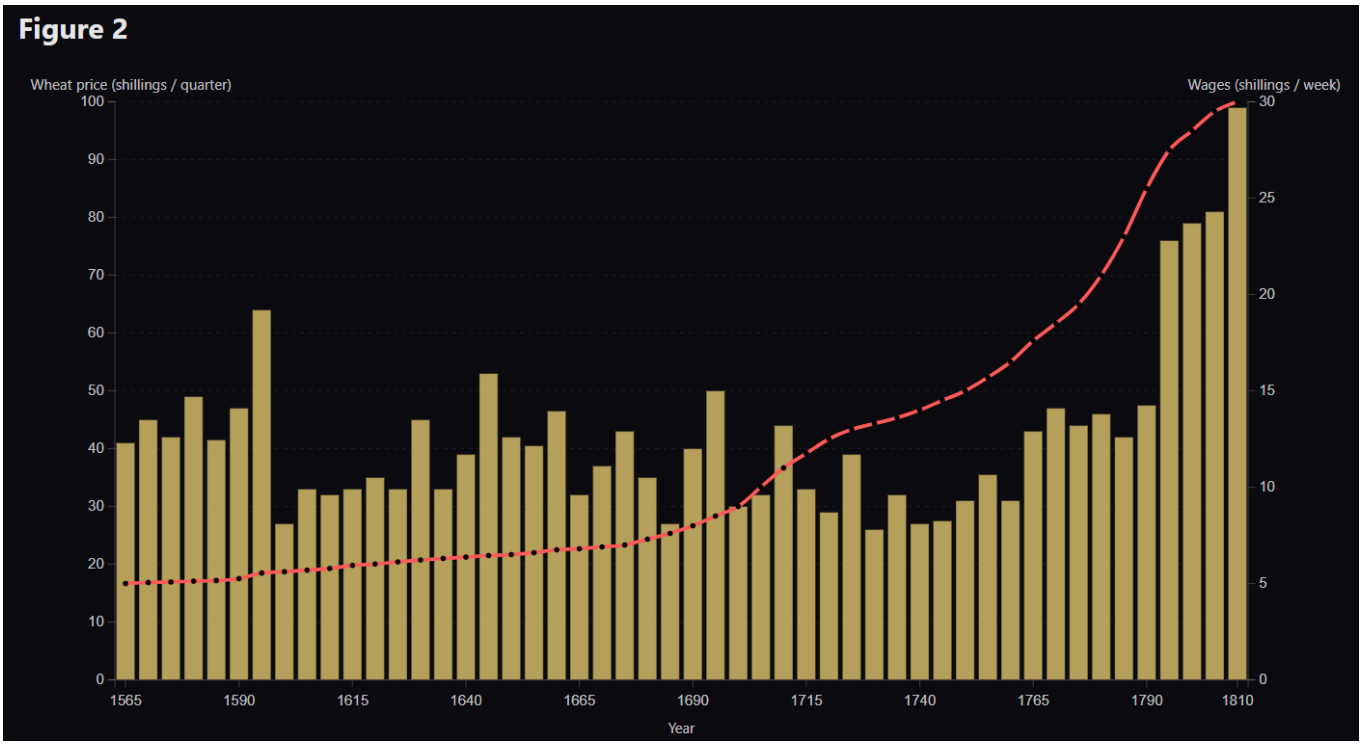


In Figure 1, we reproduced the original visual logic used by William Playfair to compare the evolution of wheat prices and wages over time.
The yellow bars show the price of wheat plotted in a way that expresses shillings per quarter of wheat. The blue curve with the red line represents the wages over time of the English workers expressed in shillings per week.

Visually, this representation does suggest a long-term increase in wages relative to the wheat prices. However, this impression relies on the superposition of incompatible units, which makes direct quantitative comparison ambiguous. Although the wage curve visually suggests an increase in purchasing power, this conclusion is inaccurate as the graph does not respect an explicit ratio between wages and prices.

We will now proceed to address these issues by generating a new D3.js graph that will be separating wheat prices and wages onto two distinct orrdinate axes while explicitly indicating their respective units.

Figure 2: Data Viz Graph as two unique Y-axis variables



Now that we fixed the first issue that was arisen by Playfair's, Figure 2 separates wheat prices and wages onto two distinct Y-axes, the bars used for the wheat price expressed as a difference of shillings/quarters and wages as a difference of shillings/weeks. In this representation, the relative sizes of the vertical positions of wheat price and wages are no longer comparable, as a result, the visual dominance observed in Figure 1 disappears. Variation in each quantity must be interpreted independently, thus this graph does not really help to figure out whether or not English workers truly gained or lost purchasing power explicitely over the decades.

An analysis based on the ratio between wages and wheat prices is now needed, thus what we will be doing in Figure 3.

Figure 3: Evolution of purchasing power (quarters of shillings per week)

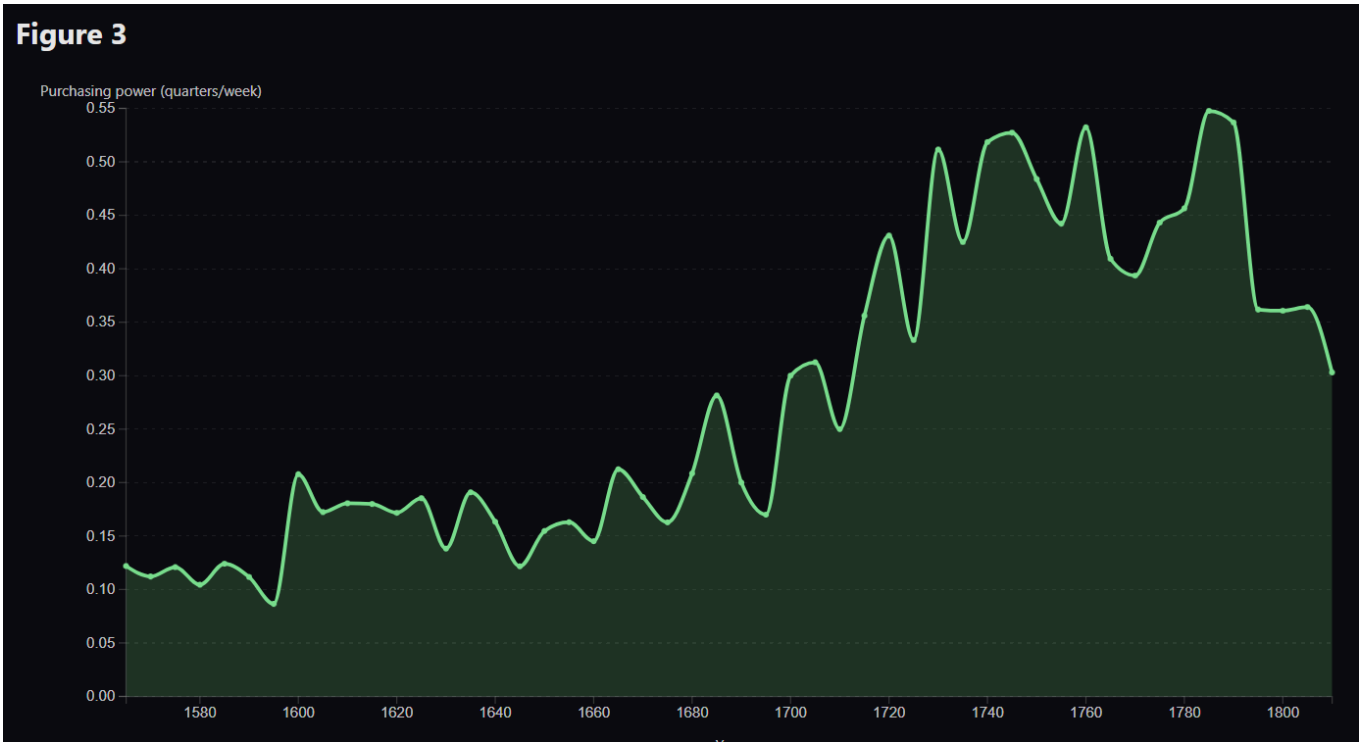


Figure 3 shows the evolution of the purchasing power of English workers over time. Purchasing power is defined here as the quantity of wheat that a worker can buy with one week of wages. It is computed explicitly as the ratio between weekly wages and the price of wheat and is expressed in quarters of wheat per week.

The formula used comes as follows:

Purchasing Power (time)=Wheat price(time) / Wages(time)

Where we look at the quarters of wheat purchasable per week of wages salary.

Unlike the previous figures, this representation directly measures what Playfair intended to demonstrate. The curve shows that the amount of wheat affordable with a weekly wage generally increased over the studied period. Short-term drops in purchasing power are visible during periods of high wheat prices, but the long-term trend clearly shows an increase in purchasing power.

This explicit calculation confirms that the improvement in economic conditions was not just a visual impression created by graphical choices, but corresponds to a real increase in purchasing power over time.

Conclusion

The results show that, despite the fluctuations in wheat prices, the purchasing power of English workers increased overall between the 16th and early 19th centuries. This confirms Playfair's original claim, while also showing that his graphical method overstated the conclusion by relying on visual biasness and inaccuracy rather than explicit calculation.

This study illustrates the importance of proper unit handling and explicit quantitative measures in data visualization, and shows how modern methodological standards can be used to reinterpret and clarify historical graphical studies.