Data Analysis for Division of Labor from 17-19$^{\text{th}}$ Century

Ian Zimmermann

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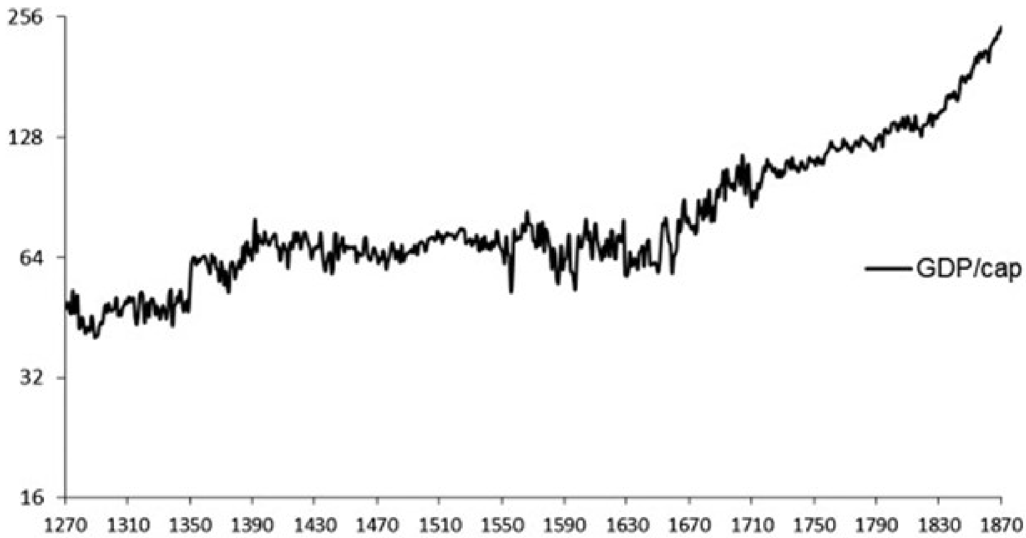
1 Introduction

Adam Smith's *Wealth of Nations* highlights the critical role of a country's division of labor in fostering prosperity. The book identifies two key factors to consider when analyzing workforce demographics: "the skill, dexterity, and judgment" (Smith 33) of the workforce and "the number of those who are employed in useful labor" (Smith 33). Smith then discusses two primary categories of work—agriculture and industry—placing greater emphasis on the latter. He asserts that prosperous nations are distinguished more by their superiority in industry than in agriculture (Smith 38). However, during his time, he lacked access to the data and calculations available today. By analyzing historical data, we can evaluate the accuracy of his statements and explore the role of unproductive labor compared to his two emphasized categories.

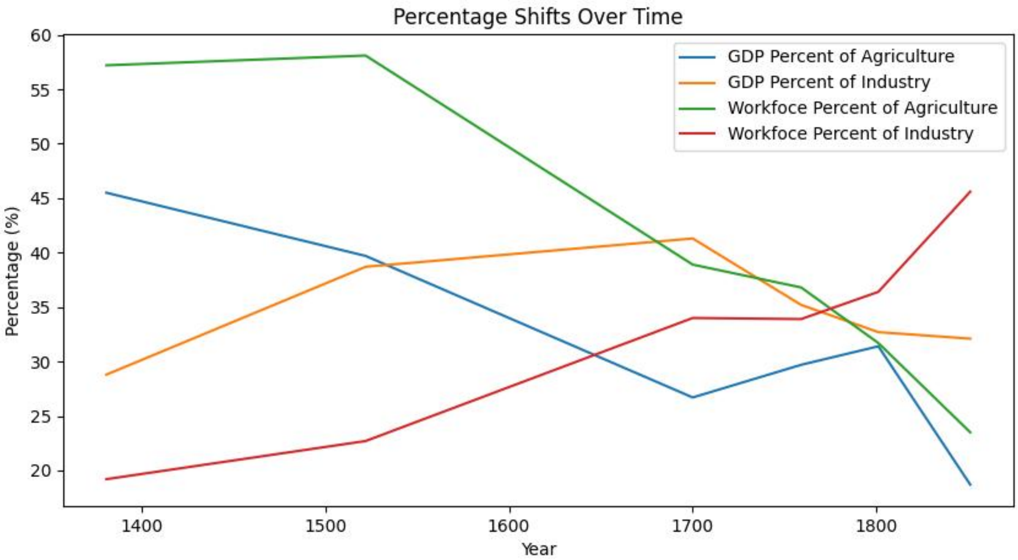
2 Data Analysis

One significant way to quantitatively measure a country's growth and prosperity is by examining its GDP over time. A graph from the *Oxford Journal* illustrates that during Smith's era, Britain was a prosperous and growing nation. From the late 1600s to the early 1800s, Britain's GDP showed consistent and steady growth.

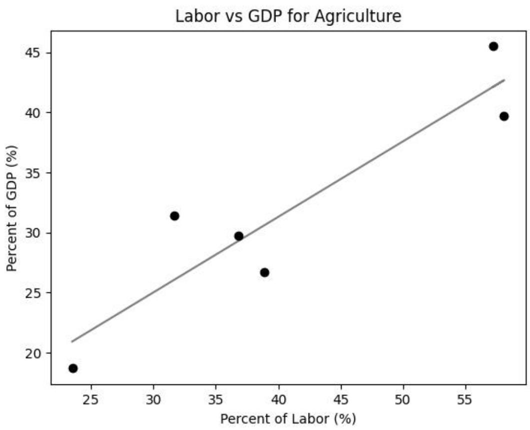


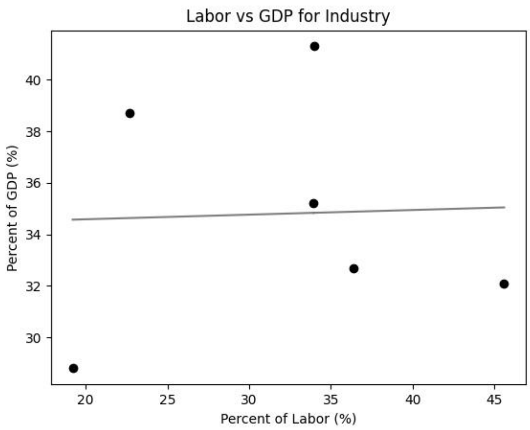
Source: Broadberry *et al.* (2011).

Based on Smith's idea of a superior nation, industry plays a more critical role in the success and growth of a country than agriculture. *The Wealth of Nations*, published in 1776, did not heavily rely on quantitative data. Instead, Smith based his arguments on observations and firsthand accounts rather than comprehensive nationwide statistics. Today, data from Smith's era and earlier can be analyzed to test his theories. A dataset from Broadberry includes workforce composition and value-added share from the 1400s to the 1800s for Britain. While consistent censuses from this period are rare, certain government regimes conducted censuses for specific purposes. These sporadic population snapshots provide sufficient information to understand the workforce during Smith's time. This data includes workforce population breakdowns and the percentage of GDP contributed by each industry segment. Plotting this data on a timeline reveals shifts over time.



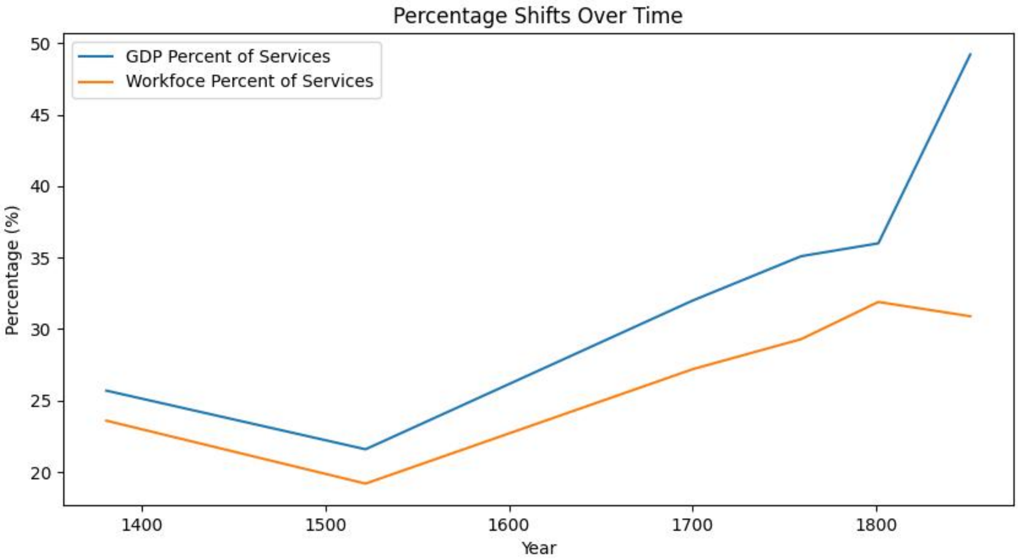
During the eighteenth century and beyond, the percentage of the workforce engaged in agriculture significantly declined, while the percentage in industry increased. However, despite this increase in industrial workforce, the value added by the sector to GDP simultaneously decreased. This trend appears contradictory to Smith's argument that industrial emphasis is essential for a nation's prosperity. Examining the correlation between workforce distribution and GDP contribution can provide insights into which sector has a greater impact on economic growth when more labor is allocated to it.





According to the graphs above, the workforce percentage in agriculture correlates significantly more strongly with GDP contribution than the industrial sector. Statistically, the agricultural sector's workforce exhibits a robust correlation with its economic contribution. A potential counterargument could suggest diminishing returns as more people enter agriculture—due to the finite need for food—but this does not appear to be the case, as the correlation remains steady even at higher workforce percentages. In contrast, the industrial sector's GDP contribution remains relatively stable, around one-third of the economy, regardless of workforce size.

A third workforce category, the service industry, is not mentioned as much in Smith's analysis of a prosperous nation. In *The Wealth of Nations*, Smith focuses on "the number of those who are employed in useful labor" (Smith 33), dismissing the service sector as unproductive labor since it does not involve the creation of tangible goods. Examples of what Smith deems unproductive labor include soldiers, doctors, musicians, and domestic servants. However, historical census data suggests that the service sector played a vital role in the economy, contrary to Smith's perspective. He sees unproductive labor as having a smaller amount of total value since it does not accumulate and produce goods over time.



During the period of *The Wealth of Nations*, the workforce engaged in the service sector steadily increased, and its contribution to GDP grew concurrently. Statistical analysis reveals a strong correlation between the service sector's workforce percentage and its GDP share. Furthermore, linear regression shows that the service sector's GDP contribution increases at double the rate of agriculture. This finding indicates that, with equivalent workforce increases, the service sector drives GDP growth more rapidly than agriculture.

Sector	Slope	Correlation
Agriculture	0.62	0.92
Industry	0.02	0.04
Service	1.67	0.85

The table above shows the correlation and slope between the percentage of the workforce and the GDP contribution for each sector of labor. While this is a preliminary, high-level data analysis, it clearly demonstrates that the service industry has a much higher slope. This indicates that as more workers join the service sector, its contribution to GDP increases significantly more than that of either industry or agriculture.

These findings suggest that the service sector is far more important than Smith initially proposed in his assessment of the industries that define a prosperous nation. The data challenges Smith's original perspective, emphasizing the pivotal role of the service sector in economic growth and development.

3 Smith's View

In *Wealth of Nations*, Book 2, Smith states that unproductive labor "seldom leave any trace or value behind them for which an equal quantity of service could afterwards be procured." Smith argues that this category of labor does not significantly contribute to the creation of lasting value and suggests that resources should only be directed toward this sector after all necessities have been paid for and addressed. He elaborates on the distribution and expenditure of society's wealth, emphasizing that the sustenance of unproductive labor relies on the surplus generated by productive labor. This perspective underscores broader economic and social dynamics surrounding wealth allocation and the distinction between creating and consuming wealth.

In reading *Wealth of Nations*, it becomes evident that Smith does not regard unproductive labor as a critical contributor to a nation's prosperity. His analysis largely excludes a significant portion of the workforce. During the 18th century, at least a quarter of the workforce—and an increasingly significant segment—was employed in the service industry. Despite this, Smith devotes little attention to the sector, focusing instead on the tangible outputs of agriculture and industry. However, modern data suggests that the service sector plays a vital role in economic growth and national prosperity. The strong correlation between GDP growth and workforce engagement in the service sector highlights its importance, even if its contributions are less tangible than those of other industries.

Although the service industry does not generate physical goods or concrete assets, it creates value in ways that Smith may not have fully appreciated. Services enhance quality of life, foster social cohesion, and fuel innovation, all of which can significantly advance a nation's prosperity. By enriching human experiences and addressing diverse societal needs, the service sector contributes to the broader progress of a nation, underscoring its indispensable role in a thriving economy. Smith's omission of this perspective, while perhaps understandable given the context of his era, suggests that his framework could benefit from a more holistic view of economic contributions, encompassing both tangible and intangible forms of labor.

References

[1] S. Broadberry, B. M. Campbell, and B. van Leeuwen. When did britain industrialise? the sectoral distribution of the labour force and labour productivity in britain, 1381–1851. *Explorations in Economic History*, 50(1):16–27, 2013.

[2] A. Smith. Wealth of nations. 1776.

[3] H.-J. Voth. The longest years: New estimates of labor input in england, 1760–1830. *The Journal of Economic History*, 61(4), 2001.

Note: Chat-GPT was used for proofreading paper