

The Contribution of Enslaved Workers to Output and Growth in the Antebellum United States

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Abstract: Estimating the contribution of enslaved workers to output and growth in the United States during the first half of the nineteenth century is a crucial building block to better understand the contours of nineteenth-century US economic history, and, more generally, the connection between slavery and capitalism. To date, no such estimates exist. In this paper, we use data on slave valuations to calculate the contribution made by enslaved workers to regional and national gross national product in 1839 and 1859 and to the growth in per capita output in the twenty years before the Civil War. We find that enslaved workers were responsible for somewhere between 11.72 and 16.87 percent of the increase in output per capita nationally between 1839 and 1859.

Keywords: slavery, capitalism, growth, antebellum America

JEL Codes: N1, N3, O4

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Introduction

Since 1619, when a group of more than 20 enslaved workers arrived in the port of Jamestown, Virginia, slavery has been an important feature of American history, structuring its economy politics and culture. By the nineteenth century, the presence of slavery on its national territory set the United States apart from European states who also trafficked in slaves and used their labor in overseas possessions, but kept the institution itself off their national territories. As noted by contemporaries and passionately discussed by scholars, the labor, politics, culture and ideas of millions of enslaved women, men and children left a deep imprint on American life: the legacies of their enslavement, exploitation, discrimination and political repression stamp the United States to the present day.

While there is almost universal agreement among scholars on the importance of slavery to the American experience, as well as on the terrible sufferings of the enslaved, there is still considerable debate about the economic impact of the labor of enslaved people. In recent years, historians' return to questions of economic change, coupled with powerful political mobilizations around issues of racial inequality, have brought increased attention to this question, with some scholars arguing that significant connections existed between slavery, economic development, the unfolding of capitalism and the Industrial Revolution in the United States (Johnson, 2013; Beckert, 2014; Baptist, 2014; Beckert and Rockman, 2016; Rosenthal, 2019; Stelzner, 2020, building on Du Bois, 1935 and Williams, 1944). However, other scholars have vehemently opposed the idea that slavery was important to early US economic development, making two distinct but interrelated arguments: that American capitalism would have developed around broadly similar lines without slavery and that slavery was relatively unimportant to U.S. economic growth (Hilt, 2017; Olmstead and Rhode, 2018; Burnard and Riello, 2020).

To address what has become one of the most contentious debates in historical research today, we focus on one central aspect of this question: estimating in quantitative terms the contributions enslaved workers made to gross national product in the United States in 1839 and 1859 respectively and then determining what percent of that growth in per capita gross national product derived from slave labor. We utilize data on slave prices and valuations to isolate the income generated by an enslaved person of a given age and gender in a given year. Linking that data to demographic information on enslaved people (by state) lets us estimate output and growth over the antebellum period. Our calculations show that the increased per capita output of

enslaved workers in the United States was a significant source of per capita GNP growth for both regional economies and the national economy in the two decades before the Civil War. Our calculations also underscore the increasingly precarious position of free non-slave-holding southerners over that same period and the growing income inequality between enslaved southerners, free non-slave-holding southerners, and slaveowners—that is, we shed new light on the distributional effects of antebellum slavery. This more precise estimation of the contribution of enslaved men, women and children to the output and growth of the US economy helps to contextualize current scholarly debates, enables us to enter into a conversation with European scholars' new estimates on the importance of slavery to that continent's economic development, helps us better understand United States economic history and provides new data to inform current debates on deeply entrenched racial inequalities, including on the possibility of reparations to the descendants of enslaved Americans.

Literature Review

Economists, historians and other scholars have long been interested in determining slavery's economic importance. In fact, the debate started long before slavery in the United States ended. Regardless of whether they supported or critiqued slavery, nineteenth-century Americans frequently commented on the connections between slavery and US economic development, and notions of the mutual dependence of planters, merchants and manufacturers, as well as of slave-owning regions and non-slave-owning regions, were common. For newspaper editor Hezekiah Niles, for example, that connection was obvious when he observed in 1827 that “[o]n the White Mountains of New Hampshire we find the sugar of Louisiana, and in the plains beyond the Mississippi the cotton cloths of Rhode Island are domesticated... All these working together, constitute the prosperity and power of the United States.”² A Savannah correspondent of the *Southern Cultivator* essentially agreed, when he argued that to slavery “does this country largely—very largely—owe its greatness in commerce, manufactures, and its general prosperity.”³ The North, abolitionist William Lloyd Garrison stated succinctly, was “a partner in iniquity.” Enslaved people saw these connections as well, for example when in 1867 a group of freedpeople in Virginia

² *General Convention, of Agriculturalists and Manufacturers, and Others Friendly to the Encouragement and Support of the Domestic Industry of the United States* (Baltimore: n.p., 1827), 15.

³ *Southern Cultivator*, February 26, 1868: 61.

justified their claims to land by arguing that “[o]ur wives, our children, our husbands, has been sold over and over again to purchase the lands we now locates upon ... didn’t we clear the land, and raise the crops of corn, of tobacco, of rice, of sugar, of everything... didn’t them large cities in the North grow up on de cotton and de sugars and de rice that we made?”⁴

Many later-day scholars have agreed with these assessments: Callender (1902), Du Bois (1935), Schmidt (1939), and North (1961), for example, argue that cotton, grown mostly by enslaved workers, were an important—even prime—mover of growth in the United States throughout much of the antebellum period. Du Bois (p. 5) asserts that “[b]lack labor became the foundation stone not only of the Southern social structure, but of Northern manufacturing and commerce.” North (p. 68) contends that cotton “was the commodity for which foreign demand was significantly increasing... [and that] accounted for over half the value of exports... cotton was the most important proximate cause of expansion” between 1815 and 1843 and continued to be a central driver of national growth up to the Civil War. Income created by cotton via exports and from domestic textile production created demand for other product, thus stimulating growth in other parts of the country. Likewise, historians have argued that cotton, and slavery more generally, was central to economic growth in antebellum America because of its contribution to economic output, importance in international trade, institutional innovations and capital accumulation (Johnson, 2013; Beckert, 2014; Baptist, 2014; Beckert and Rockman, 2016; and Rosenthal 2019). For example, Beckert (2014) argues that at a particular but crucial moment in the history of capitalism, the disposessions of indigenous lands and the enslavement of people of African descent—alongside a market economy—were central to reorienting significant swaths of the global countryside to commodity production and providing raw materials for nascent industries.

This line of argument has met considerable resistance. Kravis (1972), for example, shows that exports represented less than one-tenth of total income in the United States before the Civil War. Olmstead and Rhodes (2018, p. 12) explain that “cotton exports were a very small share of national product—less than 5 percent over much of the antebellum period.” And Easterlin (1961), Gallman (1970), and Fishlow (1964) demonstrate that southern farms and plantations were largely food sufficient, and that grain sent from the Midwest down the Mississippi river

⁴ A Freedman’s Speech,” *The Pennsylvania Freedmen’s Bulletin* (January 1867): 16.

was destined for New Orleans, northeastern states, and abroad, which lets them argue that southern plantations did not drive demand for food produced in the Midwest.

While these are important points in qualifying the economic significance of slavery in general and cotton in particular, they are also slightly misleading. Some, at times seem to conflate slavery with cotton and argue that slavery was relatively unimportant in terms of national output and growth because of (what they consider) cotton production's small share in national output. Yet as is implied by Easterlin (1961), Gallman (1970), and Fishlow (1964), enslaved persons were involved in the production of much more than cotton. Indeed, Olmstead and Rhodes (2018; p. 13) themselves explain that "corn, not cotton, was the South's leading crop in terms of value in 1839 and 1849!" Furthermore, Wright (2006) shows that a significant number of enslaved workers in Kentucky, Missouri, and Virginia were employed in wheat production— despite that commodity being typically associated with free family farmers. Because corn, wheat, and other foodstuffs produced in the South were often not exported, trade statistics offer only an incomplete picture of enslaved workers' contribution to output and growth in antebellum America.

Second, it is misleading to conclude that cotton was economically insignificant because cotton exports represented only five percent of the nation's output. This argument is akin to arguing that the automobile industry is unimportant to the contemporary German economy because it only contributed 7.7 percent to that nation's GNP in 2018, or that the information technology industry is of little consequence to the United States today because it only contributed 6.8 percent to American GNP, assertions that are obviously problematic (Beckert, 2021; Darity, 1990, pp. 120-6; Solow, 1995, pp. 105-6). Moreover, the total value of cotton textile output in the United States in 1859 represented only a little more than four percent of total commodity output. Few scholars would argue that the textile industry was inconsequential at the very moment in which it represented the cusp of US industrialization.⁵

Third, while it is true that the income from cotton production was not spent on Midwestern crops, it did stimulate demand for crops and livestock production in the South (many times on plantations). Furthermore, scholars have shown that cotton production, and slavery

⁵ This estimate includes the value of inputs, like cotton, used in textile production and the value added from textile production itself. It is derived using data on the value of cotton textile production from Harley (1992) and data on total commodity output from Gallman (1960).

more generally, generated demand for Northern-produced goods and services, including coarse textiles as well as financial and trade services (Beckert and Rockman, 2016; Rockman, 2023). As economists have indeed pointed out, “[t]he slave trade and slavery extended their tendrils into every fissure of the American economy, producing a hothouse effect that created vast national wealth. America’s economic success was built by the unrelenting enslavement of black people. One can hypothesize a counterfactual chain of events where American economic growth took place without slavery, *but this is the actual way in which it all began*” (Darity Jr. and Mullen, 2020; p. 55). We can never know what US economic development would have looked like without slavery, but we *can* specify its actual role in the development of the American economy. The idea that capitalism and freedom unfolded hand in hand and are almost interchangeable is appealing, but it should be subject to scrutiny so that these questions are settled by the historical record, not a theoretical or wistful construct of what could or should have been.

Fortunately, there is much work we can draw on in this project. Earlier scholars have contributed to this discussion, for example, by creating estimates of slaves’ contribution to output. Gunderson (1974) used data on per capita output by state from Gallman (1966) and Easterlin (1961) and data on net yearly earnings from holding an enslaved worker from Evans (1962), adjusted by demographic profiles using data from Fogel and Engerman (1974ab), to calculate the percent of income the free population in a given state derived from the labor of enslaved workers.⁶ He found that in 1860 income expropriated from these women, men and children represented 42 percent of per capita income of free citizens in Alabama, 29 percent in Mississippi, 24 percent in Texas, and 17 percent in Virginia. Gunderson (p. 992) concludes that “[a]ll of the states in the South had enough of their income dependent on slavery that they could certainly be expected to protest, agonize, resist, and organize against any threats to its existence”—as, of course, they did.

Lindert and Williamson (2016) calculate the total value of food, shelter, and clothing provided to enslaved workers in 1800, 1850, and 1860. These estimates combined with other estimates for total income and the methods used for creating them imply values for the contribution of enslaved workers in the same years. In Figure 1, we display the implied contribution of enslaved workers to total income in different regions and for the country as a

⁶ Gunderson (1974) also uses rental price data for 1845 through 1860 from Evans (1962) to translate Fogel and Engerman’s (1974ab) values for 1850 to 1860.

whole in 1800, 1850, and 1860. These are potentially the most comprehensive estimates to date – covering the entire antebellum period. As can be seen in Table 1, Lindert and Williamson’s implied estimates of the contribution of enslaved workers to total income paint a picture of the decreasing and relative unimportance of the economic activity of enslaved workers in the late antebellum period. Indeed, according to their estimates, the income created by enslaved workers – including both the production that was used to keep them alive and that which slaveowners retained – only amounted to 6.5 percent of total income on the eve of the Civil War.

Table 1 – Lindert and Williamson’s Implied Estimates of the Contribution of Enslaved Workers to Total Income

	1800	1850	1860
<i>New England</i>	0.2%	0.0%	0.0%
<i>Middle Atlantic</i>	3.3%	0.0%	0.0%
<i>East North Central</i>	--	0.0%	0.0%
<i>West North Central</i>	--	5.1%	3.3%
<i>South Atlantic</i>	35.9%	18.5%	17.2%
<i>East South Central</i>	--	19.8%	23.2%
<i>West South Central</i>	--	26.8%	24.6%
<i>United States</i>	18.7%	6.5%	6.5%

Source: Data for “slaves’ income” and total income comes from Tables 4-1, 5-1, and 5-2 (pp. 80, 98-99) in Williamson and Lindert (2016). In accordance with their method of estimation, the contribution of enslaved workers is estimated by multiplying “slaves income” by two and dividing it by total income.

While valuable given the lack of data on the contribution of enslaved workers, these estimates are very imprecise – even for the period in question. They require strong assumptions about the relative productivity of free and enslaved workers, the exploitation rates of free and enslaved workers, and the distribution of enslaved workers between different areas of labor. For example, they assume that enslaved workers were as productive as free workers in the same profession in similar regions and that slaveowners only appropriated 50 percent of the value created by enslaved workers. Each of these assumptions are debated areas which, at best, have

yielded ranges of general agreement. For example, in terms of the amount slaveowners appropriated from their chattel, there is a range of estimates in the literature from 10 to 72.2 percent. Here the upper bound of this range potentially still underestimates exploitation of enslaved workers. Given the limitations of the data used to calculate these values, potentially, the amount slaveowners appropriated could have been higher. Lindert and Williamson (2016) do not show how their estimates for the amount produced by enslaved workers would change from a change in this assumption and from many other assumptions. Consequently, they could have significantly undervalued the contribution of enslaved workers.

At the same time, Lindert and Williamson's estimates for the total income of the United States in the late antebellum period are much higher than other comparable estimates. For example, their estimate for total income in 1860 is 26 percent higher than Gallman's (1966) estimate of the value of total output for the same year. Potentially, Lindert and Williamson's higher estimate comes from overestimating wage income where, even under their part-time assumption, everyone except unskilled urban day workers are assumed to labor six days a week, 52 weeks a year. Only those in the construction trades, rural unskilled work, farming, and urban unskilled work are assumed to experience underemployment from seasonal shifts or weather. Even though many contemporaries have commented on the long stretches of underemployment – between four and five month out of the year according to one source⁷ – Lindert and Williamson assume that during these bouts of underemployment workers, except those in unskilled urban jobs, were able to find alternative work, even if less remunerative.⁸ Consequently, their estimates for total income might be upwardly biased. This would mean that their implied estimates for the percent contribution of enslaved workers would be downwardly biased – from potentially two sources. As a result, it is important to build other estimates of the contribution of enslaved workers to output to contrast and hopefully improve on those that do exist.

At the same time, the previous work of several generations of economic historians can be used to reveal the importance of slavery to national growth. For example, Gallman (1960, 1866) calculates gross national product per capita in 1839 and 1859, and Easterlin (1961) breaks down per capita output by sub-regions. Engerman (1971) uses these estimates to show that the southern economy grew at an average annual rate of 1.45 percent—faster than the growth rate of 1.30

⁷ See contemporary quote in Lebergott (1964, p. 170).

⁸ See Lindert and Williamson (2016, Appendix B).

percent for the North. While these figures show that the South was not stagnant, as some earlier historians had argued, they are of limited value for making inferences about the contribution enslaved workers made to output growth. If, for instance, output per capita of enslaved southerners grew at a rate greater than the regional average while output per capita of free southerners remained constant or even fell, the contribution of enslaved workers to regional and national growth in output per capita would be larger, potentially much larger, than that of the South on average. Thus there is substantial room for improvement in identifying enslaved workers' contribution to US economic growth.

In this paper, we use data on slave valuation and prices from Fogel and Engerman (1974ab) and theory about how the price of assets relates to the income they generate to calculate slaves' contribution to gross national product in 1839 and 1859 and growth in per capita output between those years. As we show below, using asset price theory for the antebellum South yields an alternative estimate of slaves' contribution to output and growth – one that requires less assumptions and stems from financial decisions of slaveowners themselves.

We find that the contribution of enslaved workers to output was significantly larger than that implied by Lindert and Williams (2016) and, indeed, the enslaved drove per capita growth in the South and were responsible for somewhere between 11.72 and 16.88 percent of the increase in output per capita nationally in the twenty years before the Civil War. Thus even in the final years of the antebellum period, slavery continued to be an important driver of growth in the United States. Additionally, we find that the output of free non-slave owning southerners fell slightly in the South Atlantic and West South Central regions between 1839 and 1859. Over the same period, as a result of expropriating the increased output of enslaved workers, the income of southern slaveowners increased by 263 percent in the South Atlantic region, 233 percent in the East South Central region, and 60 percent in West South Central region. Thus in the two decades before the Civil War, income inequality increased between enslaved workers, free non-slaveholding southerners, and slaveowners, which had significant political consequences.

Calculating Slaves' Contribution to Gross National Product

To calculate enslaved workers' contribution to gross national product in 1839 and 1859, we utilize theory on the pricing of real assets and historical data on the price of enslaved workers

to estimate the average income earned from owning an enslaved worker of a given age and gender. For enslaved women, we subtract the wealth they created for their masters through procreation because this form of wealth creation was not counted in national output figures. We then multiply our calculations for income created by an enslaved worker of a given age group by the number of slaves in each state in that demographic. Summing across gender and age groups by state and for the nation and repeating this process for 1839 and 1859, lets us capture a snapshot of slaves' contribution to gross national product.

In terms of asset pricing theory, a rational economic agent in a perfectly competitive economy would set the value of an asset equal to the present value of all future net income streams from holding that asset, plus the change in the asset's price from selling it at some point in the future, also discounted back to the present. To the degree that economic agents are irrational or their information is imperfect and thus calculations of an asset's present value are not descriptive or possible, prices would not equal the value of assets' present value. Indeed, this is often the case (Keynes, 1936; Kindleberger and Aliber, 2011; Thaler, 2015). However, as argued by Keynes (pp. 151 - 160), contrasting western economies of the early twentieth century to those of an earlier time, speculation is less prominent when production and ownership have a longer-term orientation or when ownership is in the hands of those managing production.⁹ In the antebellum South, slave plantations, even the largest, were family-run enterprises (Wright, 1978; p. 82). In this case, large deviations between price and present value are likely to be less severe. While Keynes was not specifically talking about antebellum America, his explanation of when speculation is more prevalent, along with other aspects of his theory, were intended as general points.

To be sure, an earlier debate on slave-profitability centered around this very question. Phillips (1905, 1918) argued that slave prices were high because of speculation. Without any supporting data, Phillips assumed that the productivity of enslaved workers could not have increased fast enough to justify the relative increase in their price. Indeed, his assumption of low and stagnant slave productivity came from openly racist ideas about the impossibility of black

⁹ For example, Keynes (1936, p. 153) states that "[a]s a result of the gradual increase in the portion of the equity in the community's aggregate capital investment which is owned by persons who do not manage and have a special knowledge of the circumstances, either actual or prospective, of the business in question, the element of real knowledge in the valuation of investments by those who own them or contemplate purchasing them has seriously declined."

productivity growth.¹⁰ Phillips argued that if slave prices were high as a result of speculation, their price would not equal the present value. However, the slave-profitability debate showed conclusively that slavery was profitable; indeed, highly profitable. While this would not eliminate the possibility of some degree of speculation in slave prices or fluctuations in sanguinity about the earning prospects of owning a slave, it would imply that speculation was not extreme in the late antebellum period the way it has been for stocks or real estate in numerous periods in the twentieth and twenty-first centuries.

Indeed, Kotlikoff (1979; p. 513) argues that the market for enslaved workers was well-functioning in that the prices of enslaved workers represented the sum of their future income discounted to the present. He explains that the upside-down U shape of the age-price profile, the higher prices for enslaved men and for those who demonstrated “good conduct,” “all point to careful, calculating transactors, operating in a highly developed market in human beings.” The degree of commodification of enslaved workers was in fact extreme. For example, Kotlikoff concludes that slaveowners had little regard for protecting the families of enslaved workers, selling slaves individually the vast majority of the time, and Johnson (2013) and Sutch (2018; p. 42) explain that enslaved workers “were stripped of all clothing and closely examined to assess muscle development and to discover physical defects such as whipping scars.”¹¹

To be completely sure that we can use asset price theory to identify the value created by enslaved workers, we compare our estimates for the rental price of slaves with historical observations collected by other scholars. As we shall see, our estimates are both comparable to historical data, and allow us to fill in gaps from previous studies.

In equation (1) we show the yearly net income stream from owning a slave based on present value pricing theory:

$$\delta_{j,k,t} = P_{j,k,t} - \frac{(1 - \lambda_{j,k,t})P_{j+1,k,t}}{1 + i} \quad (1)$$

¹⁰ W.E.B. Du Bois (1918) explained that Phillips’ “main picture, is of ‘inert Negroes, the majority of whom are as yet perhaps less efficient in freedom than their forbears were as slaves’ (p. 396).”

¹¹ Additionally, Naidu (2020) argues that prices for slave labor more closely encapsulate the marginal product of workers than do wages for free workers.

$\delta_{j,k,t}$ is the yearly net income stream from holding a slave of age, j , and gender, k , in year, t . $P_{j,k,t}$ is the price of a slave of age, j , and gender, k , in year, t . $P_{j+1,k,t}$ is then the price of a slave that is the same gender but one year older, $j + 1$. $\lambda_{j,k,t}$ is the mortality rate for a slave of age, j , and gender, k , in year, t . Thus $\frac{(1-\lambda_{j,k,t})P_{j+1,k,t}}{1+i}$ is the price of the slave one year down the line, discounted to present, times the probability that the slave lives until the next year.

For a slave owner, $\delta_{j,k,t}$ for male enslaved workers is equivalent to the price received by the owner if the slave was rented out for one year. For enslaved women, we need to subtract the present value of procreation during the year in question for the worker from $\delta_{j,k,t}$ to obtain the rental value. As pointed out by Conrad and Meyer (1958), the birth of new enslaved workers was an important form of wealth creation for slaveowners. However, capital formation in the form of new enslaved workers was not counted in gross national product.

Although enslaved workers was more common than selling them in antebellum America, the data on renting uncovered by scholars are considerably sparser or do not control for slave demographics, while data on the value of enslaved women, men and children are abundant.¹² For example, Fogel and Engerman (1974) compile data on slave appraisals and sales by gender, age, location, and year for 76,785 different enslaved individuals between 1775 and 1865.¹³ We can thus use Fogel and Engerman's dataset on slave valuations and prices by year, age, gender, and state to estimate a continuous relationship between slave prices and age by gender and region in 1839 and 1859. In Table A.1 in the appendix, we present data on the number of observations in Fogel and Engerman's dataset by state and region for the years in question.

In Figure 1, we display data on slave valuation for 1839 from Fogel and Engerman (1974), depicted as light gray squares for males and dark gray diamonds for females. We overlay our estimates for the continuous relationship between prices for slaves by age and gender in 1839. The light gray lines correspond to estimated male prices; the dark gray lines to estimated female prices. The dotted lines for estimated male and female prices correspond to the lower South, and the solid lines to the upper South. The upper South includes North Carolina, South

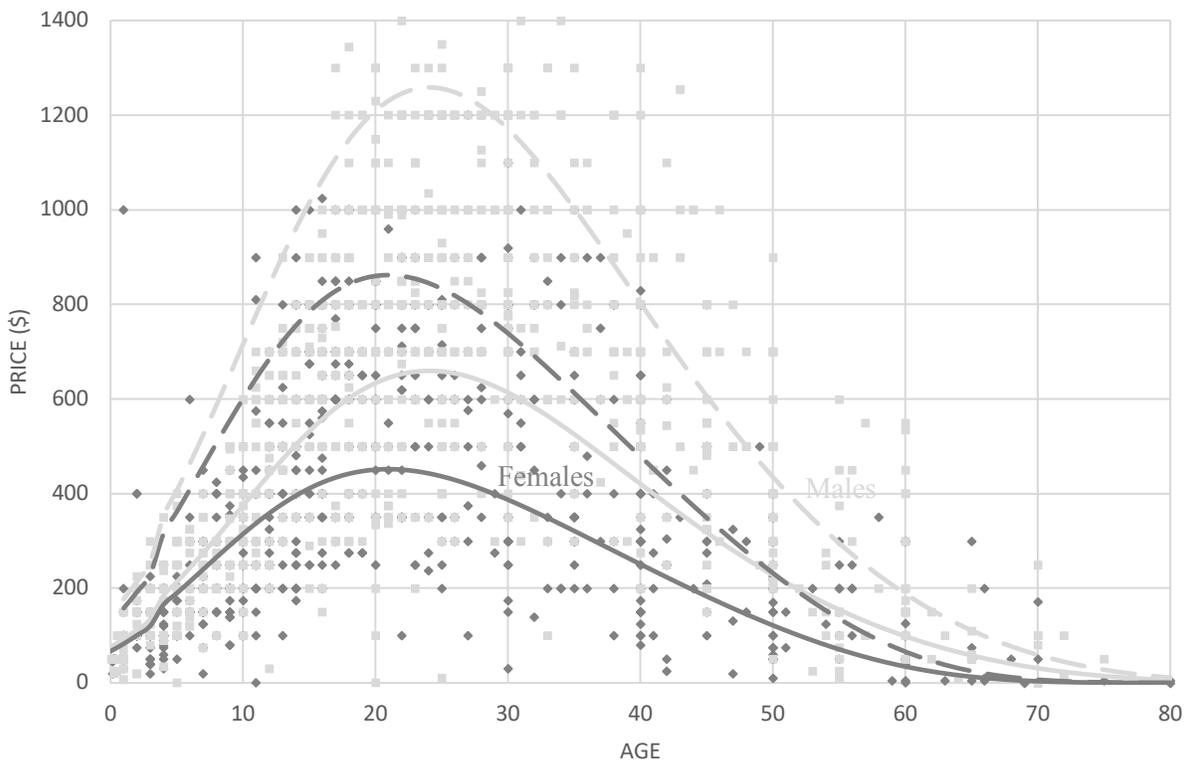
¹² Indeed, Fogel and Engerman (1974) calculate that renting slaves occurred more than five times more frequently than selling slaves. However, of their 20,253 data points on slave rental prices, only 560 control for the age of the slave being rented.

¹³ Fogel and Engerman (1974) collect 68,098 slave appraisal values and 8,687 prices for slave sales. In our regression analysis, we use a dummy for whether the price derived from a sale which is then used to estimate prices for enslaved workers of different age and gender profiles.

Carolina, Maryland, Delaware, and Virginia; and the lower South includes Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Texas, and Tennessee.

The estimates for each year were calculated using a log linear cross-sectional regression. For example, the estimates used in Figure 1 stem from demographic and price data for enslaved workers in 1839 and 1840. Following Kotlikoff (1979), Sutch (2018) and others, we use a fourth-degree, gender specific, polynomial in age while controlling for region and if the price was derived from a sale (rather than an appraisal). The estimates for all coefficients used to identify estimated prices, are statistically significant at the one percent level.¹⁴

Figure 1: Valuation of slaves by age and gender in 1839



Source: Data from Fogel and Engerman (1974); estimation by authors. Regression line calculated from coefficients in equation (2).

¹⁴ Because there were relatively few observations for slave valuations in the upper South in 1859, we included data from 1860 in estimation of 1859 prices. To be consistent we also included data from 1840 in the estimation of 1839 prices. As a result, there are 1,924 and 4,002 price observations for 1839 and 1859, respectively.

From estimates on the continuous distribution of slave prices by age and gender and data on slaveowners' discount rates and slave mortality rates by age, we can use equation (1) to calculate the yearly net income derived from holding a slave of a given age and gender. For female slaves, we then deduct the present value of wealth created for the slave owner from procreation during the year in question. This gives us the income a slave owner would receive from renting the slave, $r_{j,k,t}$:

$$r_{j,k,t} = \begin{cases} \delta_{j,k,t}, & \text{men} \\ \delta_{j,k,t} - P_{j=0,t}\sigma_j, & \text{women} \end{cases} \quad (2)^{15}$$

$\delta_{j,k,t}$ is the same as in equation (1). The second term for enslaved women in equation (2) represents the present value from wealth created by expected procreation during the rental year. $P_{j=0,t}$ is the price of a enslaved worker when born, i.e. when j equals zero. σ_j is the fertility rate of the enslaved worker, which is age specific. For σ_j , we use estimates from Sutch (1975) for the upper and lower South.

The rental price of an enslaved worker is not equal to the total value that worker creates. When an individual in antebellum America rented a slave, he had to pay for room, board, and healthcare for the slave during the rental period. The renter also had to provide the slave with a new set of clothes and shoes at the completion of service (Evans, 1962; Fogel and Engerman, 1974a; Olmstead and Rhode, 2018). Thus the total value created by an enslaved worker equals the sum of the rental fee paid to the slave owner, the cost of room and board for the slave, and the cost of a new suit of clothes and shoes for the worker after completion of service.

There are a number of estimates of the average annual cost of maintaining an enslaved person in antebellum America. Conrad and Meyer (1958), for example, estimate out-of-pocket costs for the period between 1840 and 1860 to be \$20 to \$21 annually. However, these figures do not include the value of food grown on the plantation itself, which is used in the estimation of gross national product. Conrad and Meyer's estimate of the cost of maintaining a slave thus

¹⁵ This could also be calculated by subtracting the present value from expected procreation over the lifecycle from the price: $P_{j,k,t} - \sum_{n=j}^{44} \frac{P_{j=0,t}\sigma_{j=n} \prod_{m=j}^n (1-\lambda_{j=m,k,t})}{(1+i)^{n-j+1}}$. $\prod_{m=j}^n (1-\lambda_{j=m,k,t})$ represents the probability that the enslaved worker is alive at age n , and the term in the denominator, $(1+i)^{n-j}$, discounts the value to the age under analysis.

underestimates slaves' contribution to output. In contrast, Fogel and Engerman (1974a, p. 151; 1974b; pp. 79, 117, 159 – 160) include the value of food grown on the plantation and find the average cost of maintaining a worker to be \$34.13 in 1850 and \$42.99 in 1860. Ransom and Sutch (2001) estimate the value of slaves' consumption to be \$28.95 on average for all farms and \$32.12 for plantations with 51 or more slaves in 1859. And Lindert and Williamson (2016) estimate the average income received per enslaved person to equal \$33.4 In 1860.¹⁶ Overall, Vedder (1975; p. 455) explains that “[m]ost estimates of maintenance costs are less than \$35 per slave,” and he uses \$30 as his best first estimate for the average yearly cost of maintaining a slave in 1860.¹⁷ We use Vedder's figure of \$30 as the average cost per year over the lifecycle of maintaining a slave in 1860.¹⁸ To the degree that this is a lower bound estimate, it will downwardly bias our calculations of slaves' marginal product and thus downwardly bias our calculations of slaves' contribution to output.

We also need data on the mortality rate of slaves to calculate the net income and rental values from enslaved workers. Using data from plantation records, Steckel (1979, 1986) calculates slaves' death rates from birth through age 24. Because his sample overrepresents larger plantations and plantations in regions with high death rates, Steckel potentially overestimates the average death rates of enslaved Americans. At the same time, he finds that, except for the first five years of a slave's life, their mortality rates are similar to contemporary white men, a finding that parallels the assumptions used by Conrad and Meyer (1958).¹⁹ Steckel's estimates for the mortality rates of slaves thus represent a good first estimate. For mortality rates for slaves older than 24 years of age, for which Steckel does not estimate values, we use Haines and Avery (1980).²⁰

Lastly, we need an estimate of the discount rate of slave holders. The discount rate represents how time is valued. Essentially, a higher discount rate means that there are stronger earning opportunities at present. The discount rate is potentially difficult to identify. Conrad and

¹⁶ This estimate is derived using Lindert and Williamson's (2016, Appendix C) estimate of income per enslaved household and the average number of enslaved people per house.

¹⁷ Olmstead and Rhode (2018) use \$30 as a lower bound for the average cost of maintaining a slave in 1850.

¹⁸ Using data on the changes in the price levels of agricultural goods lets us calculate the cost of providing food and shelter in 1840 (Gallman, 1960; p. 43).

¹⁹ Conrad and Meyer (1958; p. 98) use data on the life expectancy of slaves. They conclude that “in 1850 Negroes lived just about as long as whites in” Massachusetts and Maryland.

²⁰ We use the average of the West and Logit models in Haines and Avery (1980, p. 88) as specified by Steckel (1986).

Meyer (1958) use six to eight percent as their discount rate, but they were trying to calculate the economic profitability of slavery relative to investments that were not intertwined with the slave economy. Here, our discount rate represents the percent an individual could have earned on the best available investment and thus the opportunity missed if that individual did not have that money available to invest until one year later. As a result, our discount rate includes the possibility of investing in slaves. Thus, the ex-post rational discount rate for slave owners equals the realized expected rate of return (Shiller, 1981).

Goldsmith (1985) estimates that on average individuals earned 7.8 percent net on personal estate – which included enslaved workers – in the South in the late antebellum period.²¹ Conrad and Meyer found an accounting rate of return from slavery of greater than ten percent, and Evans (1962; p. 217) found even higher rates of return from enslaving workers. Fogel and Engerman (1974) concluded that the average rate of return of slaves was around ten percent. In comparison, in their calculations of the return to capital in manufacturing in 1840, Seaman (1852), Gallman (1960), and Easterlin (1961) use a rate of return of 12.5 percent. To address this potential range of discount rates, we create a lower and upper bound estimate. The lower bound estimate is 7.5 percent, comparable to Goldsmith. The upper bound estimate is 10.0 percent, in accordance with Fogel and Engerman and to a lesser degree Conrad and Meyer and Evans.

In Table 2, we show our estimates for rental values of enslaved workers of different ages and gender for the upper and lower South. Columns labeled (1) use our lower bound estimate for the discount rate. Columns labeled (2) use our upper bound estimate for the discount rate.

Table 2 – Yearly Rental Price for Enslaved Workers by Age and Gender

Year	Age	Female				Male			
		(1)		(2)		(1)		(2)	
		Upper South	Lower South						
1839	10	5.26	10.04	11.18	21.33	2.08	3.97	9.02	17.21
	20	25.28	57.37	34.75	75.44	48.67	92.88	61.24	116.86
	30	42.82	90.84	51.16	196.76	83.99	160.28	96.58	184.30
	40	42.74	90.69	48.12	100.96	79.75	152.19	88.47	168.83

²¹ This was the rate of returned used by Lindert and Williamson (2016) in calculating returns to personal estate in the South in 1860.

1859	10	14.15	19.03	30.43	40.92	6.34	8.53	20.27	27.26
	20	88.32	136.20	112.86	168.81	99.16	133.35	122.73	165.04
	30	117.63	175.62	137.22	201.56	151.37	203.56	174.24	234.31
	40	97.47	148.51	109.49	164.27	144.65	194.52	161.66	217.39

Source: Estimation by authors using equations (1) and (2). Data on prices of enslaved workers is in Table A.2 in the appendix.

The estimates in Table 2 are comparable to those from other sources. For example, Evans’ (1962) collected data on yearly rental prices of enslaved workers. In Figure 2, we display histograms of his data for 1859 through 1860 for the upper and lower South. Much of Evans’ observation didn’t specify age and physical condition. As a result, Evans had to use the context of the source to guess that “it probably represented a healthy adult male performing relatively unskilled labor” (p. 196). Thus, the values in Figure 2 could represent rental rates for an unskilled enslaved male anywhere from 20-years-of-age to potentially 40-years-of-age. At the same time, much of the data encountered by Evans (1962) were for the rental of enslaved workers to southern railroads. This line of work seemed to have been more dangerous, both in terms of the actual work and because of potential conflict with white laborers also working on the railroads (Flanders, 1967, pp. 197-8). Thus, slave owners might have been reluctant to rent their more productive unskilled enslaved workers to railroads.

Figure 2: Histogram of Rental Prices of Enslaved Workers in 1859 and 1860
Upper South **Lower South**

Source: Data on rental prices of enslaved workers from the upper South drawn from Evans (1962, p.231, Table 34). Data on the lower South drawn from Evans (1964, p. 234, Table 41).

Taking these caveats into account, our estimates compare well with Evans. According to Evans' data, the mean rental price of an unskilled enslaved male between 1859 and 1860 was \$142 for the upper South and \$217 for the lower South. The standard deviation of the data he collected was \$18 for the upper South and \$37 for the lower South. Our estimate for the yearly rental price of a 20-year-old enslaved man in the upper South ranged from \$99.16 using our lower discount rate to \$122.73 using our higher discount rate. Both are lower than the average value observed by Evans. Likewise, our estimates for the yearly rental price of a 20-year-old enslaved male in the lower South ranged from \$133.35 to \$165.04 – both of which are lower than mean rental price estimated by Evans.

Our estimates for a 30-year-old enslaved man in the upper South ranged from \$151.37 using our lower discount rate to \$174.24 using our higher discount rate. While both of these values are higher than the mean, they represent values well inside those observed. Indeed, Evans encountered a number of observations significantly higher. In terms of the lower South, our lower bound estimate for the rental price of a 30-year-old enslaved male is below Evans' mean. In contrast, our upper bound estimates for a 30-year-old enslaved man in the lower South is higher than the average from Evans' data. However, it still represents a value inside the range of those observed by Evans and, indeed, is within one standard deviation of Evans' mean.

There is other historical data that supports higher rental prices for enslaved men in their twenties and thirties than those observed by Evans. For example, Scarborough (1966, p. 34) maintains that the average rate of hire for an enslaved worker was around one-seventh of the price of purchasing the worker outright. Given the data Evans' collected on the sale value of prime field hands, this would imply a rental price for a 30-year-old enslaved worker in the upper and lower South in 1859 on par with our estimates displayed in Table 2.

In Table 3, we display our calculation of gross national product deriving from slave labor in current dollars by region and for the nation as a whole. To contextualize the values in Table 3, we also show data on gross national product from both slave and free production and data on the percentage of the enslaved population by region and the percent of output deriving from slaves. Estimates of the gross national product from both slave and free production come from Easterlin (1961) and Gallman (1966). Columns labeled (1) for output from enslaved workers and the

percent of total output derived from enslaved workers use our lower bound estimate for the discount rate. Columns labeled (2) use our upper bound estimate for the discount rate.

As we can see from Table 3, the enslaved comprised a very large portion of the population in some regions and, according to our calculations, were responsible for a very large portion of output in those regions. Indeed, in the South Atlantic (Virginia, North Carolina, South Carolina, Georgia, and Florida) and East South Central (Kentucky, Tennessee, Alabama, and Mississippi), the percent of output derived from slaves' in 1839 and 1859 was considerably higher than the percent of the population enslaved, and in the West North Central (Minnesota, Iowa, Missouri, and Kansas) the percent of gross national product which derived from enslaved workers was slightly higher in 1859.

For the United States as a whole, slaves created between 11.2 and 12.6 percent of gross national product in 1839 and between 10.0 and 11.6 percent in 1859. To put this in perspective, total wages of all factory hands and artisanal workers – that is, from all manufacturing industries in the United States in 1859—represented around 9.1 percent of gross national product in 1859.²² Thus our estimates of slaves' contribution to output for 1859 – well after the onset of the Industrial Revolution in the United States – are larger than that from all workers laboring in manufacturing in the same year. Likewise, our estimate represents a value almost twice as large as that implied by Lindert and Williamson (2016). Thus, we find that enslaved workers contributed significantly more to output than previous scholars assumed.

At the same time, our estimates for the contribution of enslaved workers are less than their share of population in both years. While this might seem to imply their contribution to output lagging behind other groups, one must remember that enslaved workers were largely confined to agriculture and not allowed into many of the more remunerative professions – which makes it surprising that their contribution to national output was so close to their share of the population. Interestingly, the share of gross national product derived from enslaved workers is closer to the share of the population in 1859 compared to 1839.

²² These estimates were derived using data on the total value of wages for manufacturing workers from the *Statistical Abstract of the U.S.* and data on total commodity output from Gallman (1966). To be sure, at this early stage of industrialization, there were fewer manufacturing workers than enslaved workers in the United States.

Table 3: Gross National Product (GNP) from Enslaved Workers by Region

Region	1839						1859					
	<i>GNP from Enslaved Workers (millions of current dollars)</i>		<i>GNP from all workers (millions of current dollars)</i>	<i>GNP Deriving from Slaves (%)</i>		<i>Slaves (% of Population)</i>	<i>GNP from Enslaved Workers (millions of current dollars)</i>		<i>GNP from all workers (millions of current dollars)</i>	<i>GNP Deriving from Slaves (%)</i>		<i>Slaves (% of Population)</i>
	(1)	(2)		(1)	(2)		(1)	(2)		(1)	(2)	
New England	0.0	0.0	265	0.0	0.0	0.0	0.0	0.0	675	0.0	0.0	0.0
Middle Atlantic	5.16	5.70	621	0.83	0.92	1.8	8.60	9.87	1,500	0.57	0.66	1.05
East North Central	0.0	0.0	177	0.0	0.0	0.01	0.0	0.0	684	0.0	0.0	0.0
West North Central	3.15	3.48	28.0	11.25	12.46	14.0	10.7	12.4	187	5.74	6.62	5.20
South Atlantic	81.9	90.9	210	39.0	43.3	39.8	179	206	386	46.4	53.4	37.8
East South Central	65.4	74.6	169	38.7	44.1	31.6	162	188	362	44.7	51.9	32.6
West South Central	17.3	19.7	58.3	29.8	33.8	41.8	56.9	65.6	174	32.7	37.7	37.3
United States	173	194	1,540	11.2	12.6	14.5	417	482	4,170	10.0	11.6	11.87

Source: Data on total state output comes from Easterlin (1961) and Gallman (1966). Data on slave output based on authors' calculations as described in text. New England includes Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. Middle Atlantic includes New York, New Jersey, Pennsylvania, Delaware, and Maryland. East North Central includes Ohio, Indiana, Illinois, Michigan, and Wisconsin. West North Central includes Minnesota, Iowa, Missouri, and Kansas. South Atlantic includes Virginia, North Carolina, South Carolina, Georgia, and Florida. East South Central includes Kentucky, Tennessee, Alabama, and Mississippi. West South Central includes Arkansas, Louisiana, and Oklahoma.

Slaves' Contribution to Growth in Gross National Product

To get a better idea of the importance of slavery for regional and national growth in gross national product in antebellum America, we use estimates from other scholars on per capita growth and growth accounting. Per capita output can be disaggregated as follows:

$$\frac{Y_t}{L_t} = \frac{Y_s + Y_f}{L_s + L_f} \quad (3)$$

In equation (3), Y_t is the total output, Y_s is output derived from enslaved workers, and Y_f is output derived from free workers. L_t is the total population, L_s is the enslaved population, and L_f is the free population.

The rate of change in per capita gross national product can be disaggregated as follows:

$$\left(\frac{Y_t}{L_t}\right) = \frac{1}{Y_t} \frac{\partial Y_s}{\partial t} + \frac{1}{Y_t} \frac{\partial Y_f}{\partial t} - \frac{1}{L_t} \frac{\partial L_s}{\partial t} - \frac{1}{L_t} \frac{\partial L_f}{\partial t} \quad (4)$$

In equation (4), $\left(\frac{Y_t}{L_t}\right)$ is the rate of change of per capita gross national product. $\frac{\partial Y_s}{\partial t}$ and $\frac{\partial Y_f}{\partial t}$ are the change in total output produced by enslaved and free workers, respectively. $\frac{\partial L_s}{\partial t}$ and $\frac{\partial L_f}{\partial t}$ are the change in the enslaved and free population, respectively. Thus the percent change in per capita output deriving from a change in the per capita output of slaves, ψ , is the following:

$$\psi = \frac{\frac{1}{Y_t} \frac{\partial Y_s}{\partial t} - \frac{1}{L_t} \frac{\partial L_s}{\partial t}}{\left(\frac{Y_t}{L_t}\right)} \quad (5)$$

In Table 4, we show slaves' contribution to regional and national growth in gross national product between 1839 and 1859. Data on growth in per capita output comes from Easterlin (1961) and Gallman (1966). Percent of per capita growth deriving from slaves refers to ψ from equation (5). Because the derivatives of output per capita in terms of output and population yield the slope at a single point and some of the second derivatives output per capita are non-zero,

usage of the point values of $\frac{1}{L_t}$ and $\frac{Y_t}{L_t^2}$ for large discrete changes in population and output would create significant error. To get around this problem, we use average values for both along the intervals in question. In the column labeled (1), we use our lower bound estimate for the discount rate, and in the column labeled (2), we use our upper bound estimate for the discount rate.

Table 4: Slaves' Contribution to Growth in Gross National Product (GNP) per Capita Between 1839 and 1859

Region	Growth in GNP Per Capita (%)	Percent of Per Capita GNP Growth Deriving from Slaves (%)	
		(1)	(2)
New England	46.86	0.0	0.0
Middle Atlantic	36.56	1.26	1.48
East North Central	39.61	0.0	0.0
West North Central	19.30	19.94	28.57
South Atlantic	25.88	89.88	115.23
East South Central	26.28	82.58	109.53
West South Central	8.27	34.83	106.10
United States	35.57	11.72	16.88

Source: Data on growth in per capita output, i.e., column 1, comes from Easterlin (1961) and Gallman (1966). Data on slaves' contribution to growth in output per capita from authors. New England includes Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. Middle Atlantic includes New York, New Jersey, Pennsylvania, Delaware, and Maryland. East North Central includes Ohio, Indiana, Illinois, Michigan, and Wisconsin. West North Central includes Minnesota, Iowa, Missouri, and Kansas. South Atlantic includes Virginia, North Carolina, South Carolina, Georgia, and Florida. East South Central includes Kentucky, Tennessee, Alabama, and Mississippi. West South Central includes Arkansas, Louisiana, and Oklahoma.

As we see from Table 4, both the lower and upper bound estimates show that the increase in output per enslaved worker drove per capita growth in the South Atlantic (Virginia, North

Carolina, South Carolina, Georgia, and Florida) and East South Central (Kentucky, Tennessee, Alabama, and Mississippi). In the West South Central (Arkansas, Louisiana, and Oklahoma), the upper bound estimate shows that enslaved workers drove per capita growth. The large difference between the two figures for the percent of per capita gross national product deriving from enslaved workers in the West South Central is largely due to the small change, 8.27 percent, in per capita out over the period.

Using data of the percentage of southern slave-owning households from Wright (1978), we can break down change in real per capita output for free southerners who owned slaves and those who did not. From both our lower and upper bound estimates for the discount rate, we find that output per capita of free southerners who did not own slaves in the South Atlantic (Virginia, North Carolina, South Carolina, Georgia, and Florida) and West South Central (Arkansas, Louisiana, and Oklahoma) fell slightly between 1839 and 1859. Some of the fall in the average per capita output of free non-slave owners in the West South Central is due to the decreasing relative importance of New Orleans in terms of portion of the population in that region. As Easterlin (1974) notes, the high per capita income in west south central states in 1840 was due to the prominence of New Orleans. Indeed, in 1840, the population of New Orleans was almost one quarter of that of the entire West South Central region. However, because of population growth in Alabama, Arkansas, and in Louisiana outside of New Orleans, by 1860 the population of New Orleans represented less than 15 percent of that region's population. Thus, part of the decrease in per capita output there resulted from the increased prominence of family farming compared to mercantile and other activities taking place in New Orleans.

In contrast to the situation of enslaved workers and non-slave-holding free workers, slaveowners in the South saw dramatic increases in their real per capita income between 1839 and 1859—the result of expropriating the increased output of enslaved workers. Using the upper bound estimates for the discount rate and data from Wright (1978) on slave ownership, we find that on average the real per capita income of slave owners increased by 263 percent, 233 percent, and 60 percent for slaveowners in the South Atlantic, East South Central, and West South Central respectively. Thus inequality between enslaved workers and slave owners and between non-slave-holding free southerners and slave owners increased dramatically in the South.

While the decrease in per capita income of non-slave-owning free southern might have come from combining our estimates with estimates on the value of national output which were

derived using different methods, other scholars have also highlighted the declining position of non-slave-owning white southerners (Olmstead, 1854; Douglass, 1855; Schluter, 1913; Simkins and Woody, 1932; Du Bois, 1935; Hahn, 1985; Williams, 2008; Merrit, 2017, Teitelman, 2020). Du Bois asserted that non-slave-holding whites were “a forgotten mass of men,” and that the large out-migration of southern whites to the West during the late antebellum period can be explained by their increasingly precarious economic situation. Williams explains that the economic situation of non-slave-holding whites in the South deteriorated between the late 1830s and 1860 as a result of changes in federal law like the Species Circular Act of 1837, and because federal, state, and local governments were beholden to slaveholders. As the antebellum period progressed, more and more non-slave-holding whites lost their land and were forced into tenancy or onto marginal lands. “By 1860,” Williams claims, “at least 25 percent of southern farmers were tenants, and more were joining their ranks every day” (p. 12). Merritt makes a similar point, arguing that slaveowners used deceit and protection from the law to push “the least affluent yeomen off the land, turning them into tenants and day laborers.” Our calculations of the contributions of slaves to growth in per capita output accords with these accounts of the increasingly dismal situation for non-slave-holding whites.

Conclusion

Most important, however, is our finding that for the United States as a whole, the increase in per capita output of enslaved people accounted for somewhere between 11.72 and 16.88 percent of growth in output per capita between 1839 and 1859. While the lower estimate represents a value slightly less than the share of enslaved workers in the population in 1859, it is still large. As stated before, enslaved workers were largely confined to agricultural production. At the same time, there were no changes in machine technology in the picking of cotton between Eli Whitney’s invention of the cotton gin and the onset of Civil War. In contrast, change in machine technology was the key source of increasing productivity of workers in manufacturing and other industries in the North. And our upper bound calculation is five percentage points larger than the share of the population of enslaved workers.

These findings potentially also shed light on why the South went to war: the sharpening inequality between free southerners was increasingly politically untenable; for slavery and yeoman farming to co-exist, territorial expansion was required. Indeed, Williams (2010) argues

that one of the reasons southern states seceded from the Union and went to war was that slaveholders realized that increasing inequality among whites threatened their position of political authority. They feared the possible sharpening of these inequalities thanks to the new federal government's opposition to slavery's expansion, constraints that could only be overcoming by seceding from the Union.

Our findings on the importance of slave labor to economic growth in the United States are also important in the context of recent research on the importance of slavery to European economies. Viewed from Amsterdam, London or Bordeaux, slavery seems far away, but we now know that slavery was connected to 5.7 percent of the Dutch gross domestic product in 1750, and more than 10 percent of its richest province, Holland (Bosma and Brandon, 2021). More than 40 percent of Dutch economic growth in the eighteenth century was connected to slavery.²³ In Great Britain, it has been estimated, more than 10 percent of economic activity in the late eighteenth century was related to slavery (Rönnbäck, 2018). In France, scholars have observed that 70 percent of eighteenth-century economic growth was directly related to Caribbean slavery (Daudin, 2005 and 2006). Our findings amplify these researchers' conclusions and confirm that in a society in which slavery decisively stamped the economy of a major portion of the country, the slavery complex's importance to the national economy must have been significantly greater than in countries without slavery within their national borders that only drew economic benefits from the slavery complex located in distant territories.

These findings also confirm that slavery did not come to an end for purely economic reasons. Slavery remained a source of profits, wealth, political power and opportunities for growth, including productivity enhancements, up through the 1860s. The collapse of slavery instead must be located in its political instability, the constant challenges brought by the enslaved, and slavery's deep reliance on a federal government that legitimized and enabled territorial expansion, native displacement and the continued enslavement of workers. Slavery rested on a peculiar political economy that was challenged by a new political coalition that emerged in the mid-nineteenth century United States (Beckert, 2001). Slavery could inhabit the same economic space as waged labor, but, by mid-century, it could no longer inhabit the same political space (Beckert, 2014).

²³ Including the slave trade, the trade and processing of slave-grown agricultural commodities, as well as shipping, insurance and banking services linked to the slave economy.

Finally and crucially, these findings are important to better understand the institution of slavery and its connection to economic output and growth in the United States. Our conclusions suggest that output created by enslaved men, women, and children in 1859 was larger than the total value of wages received by all manufacturing workers in the United States that same year – which represents a lower bound estimate of the value created by all workers in manufacturing. And, in the twenty years before the Civil War, around one tenth of the growth in output per worker nationally derived from the increased productivity of enslaved workers – even though there was no change in machine technology in cotton production. These estimates do not consider economic activity, like insurance, banking, transportation and industrial sectors that were stimulated by the slave economy, and thus represent a lower bound estimate for the overall importance of slavery. However, they do show, as argued by Du Bois (1935), Callender (1902), Schmidt (1939), North (1961), Darity (1990), Johnson (2013), Beckert (2014), Baptist (2014), Beckert and Rockman (2016), and Stelzner (2020), that slavery was historically important to US economic development.

Appendix

Table A.1 – Number of Observations by State and Region

State/Region	Years	
	1839 – 1840	1859 - 1860
North Carolina	428	762
Maryland	604	0
Virginia	712	703
South Carolina	683	351
Upper South Total	2427	1816
Louisiana	924	2,244
Tennessee	293	94
Georgia	191	417
Mississippi	92	895
Lower South Total	1500	3650
South Total	3,927	5466

Source: Fogel and Engerman (1974).

Table A.2 – Price for Enslaved Workers by Age and Gender

Year	Age	Female		Male	
		Upper South	Lower South	Upper South	Lower South
1839	10	266	507	308	588
	20	442	843	602	1,148
	30	410	782	638	1,217
	40	279	532	463	883
1859	10	730	982	619	832
	20	1,168	1,571	1,136	1,528
	30	979	1,316	1,158	1,557
	40	626	842	893	1,201

Source: Estimation by authors using equation (1).

References

- Baptist, E. E. (2014).** *The half has never been told: Slavery and the making of American capitalism.* Hachette UK.
- Beckert, S. (2001).** *The Monied Metropolis.* Cambridge University Press.
- Beckert, S. (2014).** *Empire of Cotton: A Global History.* Knopf.
- Beckert, S. (2021).** Revisiting Europe and Slavery. *Slavery & Abolition, Volume 42, Issue 1 (2021)*, pp. 165-178.
- Beckert, S., & Rockman, S. (Eds.). (2016).** *Slavery's capitalism: A new history of American economic development.* University of Pennsylvania Press.
- Berry, Daina Ramey (2017).** Berry Slave Value Database. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor]. <https://doi.org/10.3886/E101113V1>.
- Brandon, P., & Bosma, U. (2021).** Slavery and the Dutch economy, 1750–1800. *Slavery & Abolition*, 42(1), 43-76.
- Burnard, T., & Riello, G. (2020).** Slavery and the new history of capitalism. *Journal of Global History*, 15(2), 225-244.
- Callender, G. S. (1902).** *The early transportation and banking enterprises of the states in relation to the growth of corporations.*
- Conrad, A. H., & Meyer, J. R. (1958).** The economics of slavery in the ante bellum South. *Journal of Political Economy*, 66(2), 95-130.
- Darity Jr, W. A. (1990).** Forty acres and a mule: Placing a price tag on oppression. *The Wealth of Races: The Present Value of Benefits from Past Injustices*, 3-13.
- Darity, W. (1990).** British industry and the West Indies plantations. *Social Science History*, 14(1), 117-149.
- Darity Jr, W. A., & Mullen, A. K. (2020).** *From Here to equality: reparations for Black Americans in the twenty-first century.* UNC Press Books.
- Daudin, Guillaume, 2005.** *Commerce et prospérité : la France au XVIIIe siècle* (Paris: Presses Universitaires de Paris-Sorbonne, 2005).
- Daudin, Guillaume 2006.** “Profits du commerce intercontinental et croissance dans la France du XVIIIe siècle,” in *Revue économique* , May, 2006, Vol. 57, No. 3;
- David, P. A., & Temin, P. (1974).** Slavery: the progressive institution?. *The Journal of Economic History*, 34(3), 739-783.

- De Bondt, W. F., & Thaler, R. (1985).** Does the stock market overreact?. *The Journal of finance*, 40(3), 793-805.
- Douglass, F. (1855).** *My bondage and my freedom*. Miller, Orton & Mulligan, New York and Auburn.
- Du Bois, W. E. B. (1935).** *Black Reconstruction*. New York: Harcourt, Brace.
- Easterlin (1961).** Regional Income Trends, 1840 – 1950. In *American Economic History* by Harris, S.
- Engerman, S. L. (1971).** Some economic factors in southern backwardness in the nineteenth century. *Essays in Regional*.
- Evans Jr, R. (1962).** The economics of American Negro slavery. In *Aspects of Labor Economics*, (pp. 185-256). Princeton University Press.
- Fabricant, S. (1949).** The changing industrial distribution of gainful workers: Comments on the decennial statistics, 1820-1940. In *Studies in Income and Wealth* (pp. 1-45). NBER.
- Fishlow, A. (1964).** Antebellum interregional trade reconsidered. *The American Economic Review*, 54(3), 352-364.
- Flanders, R. B. (1967).** *Plantation slavery in Georgia*. JE Edwards.
- Fogel, R. W., & Engerman, S. L. (1974a).** *Time On The Cross: The Economics Of American Negro Slavery*.
- Fogel, R. W., & Engerman, S. L. (1974b).** *Time on the Cross: Evidence and Methods, a Supplement* (Vol. 2).
- Foner, E. (1988).** *Reconstruction: America's Unfinished Revolution, 1863–1877*.
- Foner, E. (2011).** *The fiery trial: Abraham Lincoln and American slavery*. WW Norton & Company.
- Foust, J. D., & Swan, D. E. (1970).** Productivity and profitability of antebellum slave labor: a micro-approach. *Agricultural History*, 44(1), 39-62.
- Gallman, R. E. (1960).** Commodity Output in the United States, 1839-1899. *Studies in Income and Wealth*, 24, 17.
- Gallman, R. E. (1966).** Gross national product in the United States, 1834–1909. In *Output, employment, and productivity in the United States after 1800* (pp. 3-90). NBER.
- Gallman, R. E. (1970).** Self-sufficiency in the Cotton Economy of the Antebellum South. *Agricultural History*, 44(1), 5-23.

- Goldsmith, R. W. (1985).** *Comparative National Balance Sheets: A Study of Twenty Countries, 1688-1979.* University of Chicago Press.
- Gunderson, G. (1974).** The Origin of the American Civil War. *The Journal of Economic History*, 34(4), 915-950.
- Haines, M. R., & Avery, R. C. (1980).** The American life table of 1830-1860: an evaluation. *The Journal of interdisciplinary history*, 11(1), 73-95.
- Hahn, S. (1985).** *The Roots of Southern Populism: Yeoman Farmers and the Transformation of the Georgia Upcountry, 1850 – 1890.* Oxford University Press.
- Harley, C. K. (1992).** International competitiveness of the antebellum American cotton textile industry. *Journal of Economic History*, 559-584.
- Hilt, E. (2017).** Economic history, historical analysis, and the “New History of Capitalism”. *The Journal of Economic History*, 77(2), 511-536.
- Johnson, W. (2013).** *River of dark dreams.* Harvard University Press.
- Keynes, J. M. (1936).** *The general theory of employment, interest, and money.*
- Kindleberger, C. P., & Aliber, R. Z. (2011).** *Manias, panics and crashes: a history of financial crises.* Palgrave Macmillan.
- Kotlikoff, L. J. (1979).** The structure of slave prices in New Orleans, 1804 to 1862. *Economic Inquiry*, 17(4), 496-518.
- Kravis, I. B. (1972).** The role of exports in nineteenth-century United States growth. *Economic Development and Cultural Change*, 20(3), 387-405.
- Lebergott, S. (1964).** *Manpower in economic growth: The American record since 1800.* New York: McGraw-Hill.
- Lindert, P. H. & Williamson, J. G. (2016).** *Unequal Gains : American Growth and Inequality Since 1700.* Princeton, NJ: Princeton University Press, 2016.
- Merritt, K. L. (2017).** *Masterless men: poor whites and slavery in the Antebellum South.* Cambridge University Press.
- Naidu, S. (2020).** American slavery and labour market power. *Economic History of Developing Regions*, 35(1), 3-22.
- Niemi, A. W. (1977).** Inequality in the Distribution of Slave Wealth: The Cotton South and Other Southern Agricultural Regions. *The Journal of Economic History*, 37(3), 747-754.

- North, D. (1961).** *The Economic Growth of the United States, 1790-1860*. Engle-wood Cliffs, NJ.
- Phillips, U. B. (1905).** *The Economic Cost of Slave-holding in the Cotton Belt*. Ginn 6 Company.
- Phillips, U. B. (1918).** *American Negro Slavery: A Survey of the Supply, Employment and Control of Negro Labor as Determined by the Plantation Régime*. D. Appleton.
- Phillips, U. B. (1929).** *American Negro Slavery* (New York, 1918). Stanley Elkins, *Slavery: A Problem in*.
- Phillips, U. B. (1935).** *Life and labor in the Old South*. Boston.
- Olmstead, F. L. (1854).** *A Journey Through the Seaboard Slaves States*. New York, 358-59.
- Olmstead, A. L., & Rhode, P. W. (2008a).** Biological innovation and productivity growth in the antebellum cotton economy (No. w14142). *National Bureau of Economic Research*.
- Olmstead, A. L., & Rhode, P. W. (2008b).** *Creating Abundance*. Cambridge Books.
- Olmstead, A. L., & Rhode, P. W. (2018).** Cotton, slavery, and the new history of capitalism. *Explorations in Economic History*, 67, 1-17.
- Ransom, R. L., & Sutch, R. (2001).** *One kind of freedom: The economic consequences of emancipation*. Cambridge University Press.
- Rhode, Paul. (2015).** Biological Innovation Without IPRs: Cotton Breeding in the Antebellum American South. Working Paper, University of Michigan.
- Rönnbäck, K. (2018).** On the economic importance of the slave plantation complex to the British economy during the eighteenth century: A value-added approach. *Journal of Global History*, 13(3), 309-327.
- Rosenthal, C. (2019).** *Accounting for slavery: Masters and management*. Harvard University Press.
- Scarborough, W. K. (1966).** *Overseer; plantation management in the Old South*.
- Schlüter, H. (1913).** *Lincoln, Labor, and Slavery: A Chapter from the Social History of America*. Socialist Literature Company.
- Schmidt, L. B. (1939).** Internal commerce and the development of national economy before 1860. *Journal of Political Economy*, 47(6), 798-822.
- Seaman, E. C. (1852).** *Essays on the Progress of Nations, in productive industry, civilization, population, and wealth; illustrated by statistics, etc.* C. Scribner.

Shiller, R.J. (1981). Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends?. *The American Economic Review*, 71(3), 421-436.

Simkins, B. & Woody, R. H. (1932). *South Carolina During Reconstruction*. Chapel Hill: University of North Carolina Press.

Solow, B. L. (1985). Caribbean slavery and British growth: the Eric Williams hypothesis. *Journal of development economics*, 17(1-2), 99-115.

Steckel, R. H. (1979). Slave mortality: analysis of evidence from plantation records. *Social Science History*, 3(3-4), 86-114.

Steckel, R. H. (1986). A peculiar population: The nutrition, health, and mortality of American slaves from childhood to maturity. *The journal of economic history*, 46(3), 721-741.

Stelzner, M. (2020). Slavery and capitalism. *Labor History*, 1-13.

Stelzner, M., & Cerrutti, E. (2018). Workers and technological change in the United States. *Labor History*, 59(6), 657-675.

Sutch, R. (1975). The Breeding of Slaves for Sale and Westward Expansion of Slavery, 1850-60. *Race and Slavery in the Western Hemisphere: Quantitative Studies*, 173-210.

Sutch, R. C. (2018). The economics of African American slavery: the cliometrics debate (No. w25197). National Bureau of Economic Research.

Teitelman, Emma (2020). The Properties of Capitalism: Industrial Enclosures in the South and the West after the American Civil War. *Journal of American History*, Volume 106, Issue 4, March 2020, Pages 879–900,

Thaler, R. H (2015). *Misbehaving: The making of behavioral economics*. New York: WW Norton.

Tucker, G. (1855). *Progress of the United States in Population and Wealth in Fifty Years: As Exhibited by the Decennial Census*. Press of Hunt's Merchant's Magazine.

United States (1975), *Statistical Abstract of the United States, Colonial Times to 1970*.
https://www2.census.gov/library/publications/1975/compendia/hist_stats_colonial-1970/hist_stats_colonial-1970p2-chP.pdf.

Vedder, R. K. (1975). The slave exploitation (expropriation) rate. *Explorations in Economic History*, 12(4), 453.

Vedder, R., Gallaway, L., & Klingaman, D. C. (1990). Black exploitation and white benefits: the Civil War income revolution. *The Wealth of Races: The Present Value of Benefits from Past Injustices*. Westport and London: Greenwood.

Williams, D. (2010). *Bitterly divided: The South's inner civil war*. The New Press.

Williams, E. (1994). *Capitalism and Slavery*. Chapel Hill: U of North Carolina P.

Wright, G. (1978). *The political economy of the cotton South: households, markets, and wealth in the nineteenth century*. New York: Norton.

Wright, G. (2006). *Slavery and American economic development*. LSU Press.