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ABSTRACT

We re-characterize American slavery as inefficient, whereby emancipation generated substantial aggregate economic gains. Coercive labor markets were severely distorted, with the social marginal cost of labor substantially above its marginal benefit. Production during enslavement came at immense costs imposed upon enslaved people that reduced aggregate economic surplus, or the total value of output minus total costs incurred. The costs of enslavement are inherently difficult to quantify, which leads to a wide range of quantitative estimates, but we calculate that emancipation generated aggregate economic gains worth the equivalent of a 4% to 35% increase in US aggregate productivity (7 to 60 years of technological innovation). Emancipation decreased output but sparked dramatic aggregate economic gains by decreasing costs substantially more, illustrating the substantial potential for aggregate economic gains in the presence of severe misallocation.

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The widespread enslavement of Black people in the United States is universally recognized to have been morally wrong, but there is an enduring view of slavery as “economically productive.” American slavery produced high crop yields and generated substantial income and wealth for enslavers and others economically connected to the enterprise (Conrad and Meyer, 1958; Yasuba, 1961; Bergstrom, 1971; Fogel and Engerman, 1974; Baptist, 2014; Berry, 2017; Hilt, 2020). Some views emphasize the “efficiency” of markets during enslavement, in which enslaved labor was traded and allocated across tasks and locations to achieve high levels of output per worker (Fogel and Engerman, 1977; Beckert, 2014; Naidu, 2020). After emancipation, there were substantial declines in crop yields and output value as production in the South adapted to the change in labor institutions (Ransom and Sutch, 1977; Litwack, 1979).

Characterizations of slavery as efficient and productive reflect the benefits and costs for slave owners, with market transactions oriented around extracting value from enslaved people. In this paper, we challenge this view. We re-characterize slavery as economically inefficient because there was a massive externality whose implications have been under-explored: enslavers considered their own private marginal benefits and private marginal costs of slave labor when making production decisions in the antebellum era, but they did not internalize the costs slavery imposed on enslaved people. When including costs incurred by enslaved people themselves, the tremendous inefficiency of slavery becomes readily apparent because the value extracted by enslavers was substantially less than the costs imposed on enslaved people. Focusing on the cost of enslavement to the enslaved shows that slavery was a market failure in addition to a moral failure.

Since American slavery was economically inefficient, in this aggregate sense, emancipation generated substantial aggregate economic gains. While output declined after emancipation, input costs declined substantially more, which increased aggregate economic surplus: the total value of output minus total costs incurred. The aggregate economic gains from emancipation are similar to the effects of aggregate productivity growth: when output increases beyond accompanying input costs, or when input costs decline beyond accompanying declines in output.

Emancipation reduced input costs that were not paid under slavery, due to coercion, but were still incurred by enslaved people and reduced aggregate surplus in the US economy. Given 4 million enslaved people in the United States on the eve of the Civil War – 13% of the total population (Census of Population, 1860) – the aggregate economic gains from emancipation were potentially substantial. Indeed, we calculate that emancipation generated economic gains that exceed estimated costs of the Civil War. Economic gains from emancipation are comparable to those from the largest increases in aggregate productivity

in American history.

Aggregate economic surplus is measured using prices that reflect peoples' valuations, and is closely related to aggregate productivity growth and aggregate welfare (Solow, 1957; Weitzman, 1976; Basu and Fernald, 2002), but we do not impose a social welfare function that would weight the well-being of enslavers and the enslaved. It is a truism that slavery reduces aggregate welfare, when sufficient weight is given to enslaved people, but it is not a truism that slavery was economically inefficient such that emancipation generated substantial economic gains. Slavery could have been efficient, in theory, if it had been more effective: if enslavers had extracted more value, captured in higher market valuations of enslaved people. But slavery was not only theft, it was inefficient theft that lost substantial economic value in the process.

Approximating the economic gains from emancipation requires approximating the total cost of slavery imposed on enslaved people. This cost to enslaved people is inherently difficult to conceptualize, which is related to the difficulty in considering the cost of threats to peoples' lives and the debasement of the enslavement process. The horrors of American chattel slavery were not hypothetical, however, so difficulties in measuring this cost should not preclude its consideration. Such a calculation could include the needed wage premium to compensate people for working under the gang labor system (Seagrave, 1971), the value of their time (Craemer et al., 2020), and other aspects of enslavement. Rather than attempt to quantify all costs of particular aspects of slavery, we also report estimates that draw on a more holistic measure associated with people's valuation of mortality risk – “value of statistical life” (VSL) – that reflects a characterization of slavery as “social death” (Patterson, 1982). This value to enslaved people is notably larger than the market value of enslaved people, which only reflects the economic value extracted by enslavers rather than costs imposed on enslaved people. Our calculations provide a range of approximate magnitudes, but illustrate the paradigm shift in characterizing American slavery and the economic impacts of emancipation.

Emancipation generated aggregate economic gains worth 7 – 60 years of technological innovation in the 19th century (Abramovitz and David, 1973). Some technologies can increase aggregate economic surplus more than is reflected in GDP, such as antibiotics, but one implication of our analysis is that some technologies can decrease aggregate economic surplus when they exacerbate underlying inefficiencies (e.g., when the cotton gin increases the use of enslaved labor). The literature has more narrowly focused on output under enslavement, and its distribution, which neglects that beneficial technological innovations increase output *more than costs*.

Emancipation was an institutional innovation, decreasing costs more than output, with impacts that exceeded major technological innovations. Our smallest estimated gains, worth

4% of GDP, imply aggregate economic gains from emancipation that exceed earlier estimates of the aggregate economic gains from the railroads (Fogel, 1964; Donaldson and Hornbeck, 2016). Our larger estimates, worth 35% of GDP, imply aggregate economic gains from emancipation that exceed much larger gains from the railroads when allowing for misallocation (Hornbeck and Rotemberg, 2022). Railroads generated large gains by increasing production that was inefficiently low; emancipation generated large gains by decreasing production that was inefficiently high. Dismantling the “peculiar institution” of slavery then brought about benefits that imply a substantially different cost-benefit impact of the Civil War (Goldin and Lewis, 1975).

Emancipation increased aggregate performance of the US economy by reducing social costs of production that were not being internalized. To illustrate this point, consider carbon emissions. If a new technology could remove all carbon emissions from the atmosphere, costlessly, it would be a substantial technological innovation but would not directly increase aggregate economic surplus when the costs of annual carbon emissions are not deducted from the value of output. Assigning a social cost of carbon, this new technology would properly generate substantial economic gains. Assigning a social cost of enslavement, which reflects costs incurred by enslaved people, our estimated aggregate economic gain from emancipation is over 7 times greater than the implied US aggregate economic gain from the hypothetical elimination of *all* annual US carbon emissions (as a share of GDP).

The last section of the paper explains how our analysis departs from the literature on American slavery. Prior economic history literature on slavery has looked to characterize various aspects of the slave economy. This analysis and discussion has largely conflated the “economics of slavery” with the “business of slavery,” analyzing slavery from the perspective of its operation as a business. This literature correctly emphasizes the significant economic gains to enslavers, disputing an earlier view of slavery as an old-fashioned stagnant means of social control rather than source of economic returns. But this focus on enslavement as economic behavior neglected the totality of coercion under enslavement, particularly the costs imposed on enslaved people, that we view as central in analyzing its economic implications. We emphasize that prior focus on the trees has missed the forest: coercion induced a deep inefficiency, which was corrected through emancipation that dramatically increased the social value of production minus the social costs of production (i.e., aggregate economic surplus). Emancipation illustrates the substantial potential for economic gains in contexts with coercion or other sources of severe misallocation.

Our analysis thereby connects the literature on slavery with a recent literature that highlights how misallocation impacts aggregate economic performance (Hsieh and Klenow, 2009; Petrin and Levinsohn, 2012; Hsieh et al., 2019; Findeisen et al., 2021; Hornbeck and

Rotemberg, 2022). We characterize the institution of slavery as creating an extreme case of labor misallocation.¹ Enslavement was an assigned social identity, with supporting coercive institutions, which created misallocation and shaped the economic impacts of emancipation. Prior economic history literature has implicitly assumed efficient labor allocation, focusing on the “expropriation rate” or the share of enslaved peoples’ marginal product that went to enslavers (Fogel and Engerman, 1974; Ransom and Sutch, 1977). We highlight that even if enslaved people had received 100% of what they produced, that compensation would be substantially less than the costs of slavery incurred by enslaved people. This is the core misallocation under slavery: enslaved people were coerced to work and live under conditions with immense costs to themselves, which exceeded the marginal value of output they produced.

The impact of emancipation provides a stark illustration of how labor misallocation can substantively impact aggregate productivity, which yields a new fact of American history: emancipation led to the single greatest annual increase in aggregate economic surplus, by far, in American history. Recent debates about the role of enslavement in American political and economic development highlight the ways in which America’s development was influenced by enslavement. This discussion, as many others, has not focused on the enslaved themselves. We show that turning the focus of economic analysis to the enslaved, and the cost of enslavement incurred by them, reveals that ending America’s slave regime did not precipitate a period of economic struggle to be endured; rather, emancipation led to an immediate and miraculous increase in aggregate economic performance.

We revisit this topic now, despite all that has been written about slavery, for several reasons. Re-characterizing the economic impacts of emancipation sees the “peculiar institution” of American slavery as foundational in the country’s development, which generated wealth for enslavers (and some others) but at tremendous costs for the aggregate economy. Emancipation then unleashed immediate aggregate economic gains in the American South and nationwide, with the potential for further gains through later declines in racial occupational discrimination (Hsieh et al., 2019). Slavery and emancipation illustrate how aggregate economic surplus can be substantively influenced by market distortions that misallocate workers. Coercion creates an order-of-magnitude degree of misallocation that better puts into context the sorts of inefficiencies that can arise in voluntary market-oriented transactions. If the moral failure of slavery was indeed an economic success (Fogel and Engerman, 1974; Baptist, 2014), it would cast doubt on the value of economic success. Slavery would

¹To the extent that enslaved people functioned as capital, this would reflect an extreme case of capital misallocation as well, but in other settings it is generally not necessary to think about the costs incurred by capital beyond the costs internalized by capital owners (e.g., depreciation).

have been morally wrong, even if it were an economic success, but American society did not face such a tradeoff: emancipation eliminated a private source of wealth for some, but sparked dramatic aggregate economic gains in the US.

I Emancipation and Aggregate Economic Gains: Theory

We start with a model to clarify how we view emancipation impacting aggregate economic gains in the United States. The model captures the core inefficiency of slavery: that landowners consider their private costs of employing enslaved people and free people, and the private cost of employing enslaved people is less than the cost imposed on enslaved people. This is the fundamental difference from voluntary labor markets, in which people choose to work only when their compensation is at minimum their cost of working. The model then motivates our calculations in Section II.

I.A Model Setup

We assume that individual landowners produce a commodity output Y with fixed price.² There are two sectors: a slave sector s and a free sector f . In the slave sector, landowners/enslavers pay for enslaved people at a total private cost r . This total private cost includes labor payments that are received by enslaved people (their consumption) and labor payments expropriated by enslavers (captured in the annualized market price of enslaved people).³ In the free sector, landowners/employers pay for free people at wage w . This wage reflects the market cost of free workers, including wage labor or sharecropping or other contractual arrangements, and we set aside ways in which enslavement could affect market wages (Merritt, 2017; Clegg, 2020).

Output in each sector is a function of labor and other inputs, $Y^s = F^s(L, X)$ and $Y^f = F^f(L, X)$. The production function varies by sector, reflecting a greater intensity of work in the slave sector and thereby higher output per person. We assume that markets are efficient, from the enslavers' and employers' perspectives, such that the value marginal product of labor equals its marginal cost. In the slave sector, the additional value produced by an additional enslaved person is equal to the total private cost r ($\frac{dF^s}{dL} = r$). In the free sector, the additional value produced by a free person is equal to the wage w ($\frac{dF^f}{dL} = w$).

We define aggregate economic surplus as the total value of output minus the total cost of inputs. Growth in aggregate economic surplus is closely connected to growth in aggregate welfare (Weitzman, 1976; Basu and Fernald, 2002), though it does not reflect the distribution

²We use "landowner" here for exposition, but note that enslavers were also involved in production outside of agriculture and that enslavers leveraged the value of enslaved people to secure credit and other non-agricultural economic activities (González, Marshall and Naidu, 2017).

³See Stelzner and Beckert (2023) for a recent example of using the prices of enslaved people to consider the contribution of enslavement to US GDP growth.

of surplus across people and an aggregate welfare function. Aggregate economic surplus increases with aggregate productivity growth (Solow, 1957; Jorgenson, 2018), which yields more output value from the same input costs or the same output value from fewer input costs.

Importantly, we define the total cost of labor inputs as the total cost incurred by people (and not only the private cost paid by enslavers or employers). In the free sector, the wage paid is equal to costs incurred by a free person. In the slave sector, we define c as the costs incurred by an enslaved person.

I.B Aggregate Economic Gains from Emancipation

We now consider the aggregate economic gains from emancipating one person, who moves from the slave sector to the free sector. The value of output increases in the free sector ($\frac{dF^f}{dL}$) and decreases in the slave sector ($\frac{dF^s}{dL}$), with a decline in aggregate output value because enslaved people are coerced to produce more than free people. Aggregate input costs also decline, however, with a decline in labor costs in the slave sector (c) and an increase in labor costs in the free sector (w). Emancipating one person results in aggregate economic gains (AEG) equal to the externality in the slave sector ($c - r$):

$$\begin{aligned}
 (1) \quad AEG &= \left[\frac{dF^f}{dL} - \frac{dF^s}{dL} \right] - [w - c] \\
 &= \left[\frac{dF^f}{dL} - w \right] - \left[\frac{dF^s}{dL} - r \right] + [c - r] \\
 &= c - r
 \end{aligned}$$

This expression, $c - r$, reflects the gap between the total cost of labor and the private cost of labor in the slave sector. The aggregate economic gain from emancipation is this gap multiplied by the number of emancipated people. Emancipation may also induce changes in other inputs X , but the value marginal product of these other inputs is assumed to be equal to their marginal cost so induced changes in other inputs do not have first-order impacts on aggregate economic gains (i.e., the envelope theorem). If the slave sector and/or free sector were not privately efficient, then there would be additional terms corresponding to the relative magnitudes of private inefficiencies in both sectors, but we focus on the main inefficiency: that enslavers consider only the private cost of using enslaved labor and not the total cost imposed on enslaved people.

In using equation 1 to quantify the effect of emancipation, the main challenge is quantifying the total cost incurred by enslaved people (c). Formerly-enslaved people required a substantial wage premium to work under the intensive gang labor system, used under slavery

to increase agricultural output per person (for cotton production, in particular). Even this substantial wage premium would not be compensation for all conditions of slavery, however, that were inextricably linked to labor coercion and the extraction of economic value from enslaved people. Rather than attempt to quantify all specific costs of life under slavery, we also use the “value of statistical life” (VSL) literature to create a more holistic measure of the economic value lost through the “social death” of enslavement. We later discuss reasons why the VSL may overstate or understate the cost of enslavement, but notably this measure only captures gains for the first generation of emancipated people.

From equation 1, the effect of emancipation on aggregate economic gains also depends on enslavers’ private cost of labor (r). This private cost includes the annualized market value of enslaved people, which reflects the value produced by enslaved people in excess of enslavers’ other private costs. In principle, if the market value of enslaved people were sufficiently high, then enslavement could be efficient and emancipation would generate aggregate economic losses. Enslavement would still be morally wrong, but there would then be a tradeoff between morality and aggregate economic gains because enslavement was so effective at creating and extracting economic value.

Notably, the market value of enslaved people is not directly connected to the costs incurred by enslaved people. For example, suppose that enslaved people were paid their full marginal product in-kind and there were no surplus value reflected in positive prices for enslaved people. In this case, enslaved people were still coerced to live and work under conditions such that their marginal product of labor was less than the costs incurred by them. Similarly, an enslaved person with little market value, such as a young child or elderly person, would receive substantial value from emancipation. The market value of enslaved people reflects the effectiveness of expropriation, and would decrease with the costs of enforcing coercion, which is distinct from the costs incurred by enslaved people.

The economic inefficiency of slavery is not that enslavers extracted substantial value from enslaved people; rather, the economic inefficiency is that enslavers only captured a portion of the total costs imposed on enslaved people. It is uncontroversial that slavery was morally wrong, and the economic value produced was received by the wrong people, but equation 1 highlights the economic inefficiency from costs incurred by enslaved people exceeding value received by enslavers (equal to costs paid by enslavers). Slavery was not only a substantial transfer of value from enslaved people to enslavers, it was also an inefficient mechanism of transferring value.

There are other inefficiencies of slavery that are not the focus of our analysis. Enslavers incurred costs to provide food, housing, and other consumption goods to enslaved people, though enslaved people would prefer their own consumption choices if they received the wage

value of those in-kind transfers. In the free sector, landowner expenditures on labor are fully received by free people in the form of wages; in the slave sector, however, much of landowner expenditure is “lost” and not fully received by enslaved people. Similarly, public and private expenditures on the enforcement of slavery represent further losses in aggregate economic surplus. Acemoglu and Wolitzky (2011) focus on inefficiencies from these costs of coercion itself, considering the endogenous determination of coercion levels, whereas we focus on the inefficiency from the labor market distortion, even when coercion is free, and the aggregate economic gains from emancipation.

Earlier literature explores the Pareto optimality of slavery (Bergstrom, 1971; Findlay, 1975; Canarella and Tomaske, 1975), with an appeal to Coase (1960), but the externality we emphasize can not be internalized due to legal frictions, borrowing constraints, and other transaction costs. Enslaved people valued their time more than enslavers (Moes, 1958), so their inability to purchase their freedom represents a market failure. For the decline in Black labor supply after emancipation to be efficient, it would need to be entirely driven by an income effect from increased consumption through owning their own labor; by contrast, Black labor supply under enslavement was artificially elevated further through coercion. This earlier literature also relates to the Scitovszky critique of Kaldor-Hicks compensation criteria (Kaldor, 1939; Hicks, 1939; Scitovszky, 1941): enslaved people may be unable to pay enslavers enough for their freedom, but enslavers also cannot pay people enough for their enslavement, so the continuation of slavery does not imply its efficiency. Welfare comparisons are fraught (White, 2008), but we focus instead on how emancipation impacts the total value of output minus total input costs (i.e., aggregate economic surplus).

II Emancipation and Aggregate Economic Gains: Calculations

II.A Labor Income

To begin assessing the approximate magnitude of aggregate economic gains from emancipation, we assign \$40 to be free farms’ annual agricultural labor income per person in 1860. This number comes from the Parker-Gallman samples on agricultural output for free farms in the South in 1859/1860, and prices from Towne and Rasmussen, as calculated by Fogel and Engerman (1974). This number reflects the total value of agricultural output, multiplied by a 0.58 labor share, and divided by the number of people. For consistency, we report all numbers on a per capita basis that includes all adults and children.

We then assign \$60 to be enslaver farms’ annual agricultural labor income per person in 1860, which corresponds to r in equation 1. This is consistent with the consumption of enslaved people being roughly \$30 per capita and enslaved people receiving roughly 50% of their output (Ransom and Sutch, 1977). The remaining \$30 would be capitalized into

the market value of enslaved people, which at a 7% rate of return implies an average per-capita market value of \$430 for enslaved people. Estimated per-capita market values of enslaved people in 1860 are somewhat higher (\$750 from Wright, 2006), but cotton prices were increasing rapidly in the 1850s and market values of enslaved people in 1860 also reflected expected growth in their value as enslaved people could be forcibly relocated along Westward expansion of cotton production (Ransom and Sutch, 1977; Pritchett and Freudenberger, 1992; Pritchett and Chamberlain, 1993; Steckel and Ziebarth, 2013; Calomiris and Pritchett, 2016; Rosenthal, 2018; Berry, 2017). This \$60 number also reflects labor productivity of enslaved people being 50% greater than if they were free, which is at the upper range of estimated productivity differences due to greater intensity of work under enslavement (Fogel and Engerman, 1977).

II.B Cost of Enslavement

We now consider the cost of slavery incurred by enslaved people, which corresponds to c in equation 1. These costs are inherently difficult to assess. Our numbers represent only approximate magnitudes, but the challenges of considering these costs should not distract from their central importance to understanding the consequences of emancipation.

II.B.1 Gang Labor Premium

After emancipation, there was a substantial decline in labor supplied by formerly-enslaved people (Ransom and Sutch, 1977; Litwack, 1979; Foner, 1988). Landowners considered paying people a substantial premium to continue working under the “gang labor” system, which had organized enslaved people into high-intensity work groups that generated greater agricultural output per person (Fogel and Engerman, 1980). This wage premium was generally insufficient compensation for the greater intensity of work, however, and these labor arrangements were uncommon (Genovese, 1976; Foner, 1988; Litwack, 1979; Seagrave, 1971). Given a roughly 2.5x wage payment for gang labor contracts after emancipation (Seagrave, 1971), and a \$40 annual agricultural labor income per free person, this gang labor premium implies the cost of enslaved labor exceeded \$100 per person. Fogel and Engerman (1974, 1977) consider costs imposed by the gang system, along with smaller gains to cotton consumers, but working in the gang labor system represented only one component of the costs incurred by enslaved people and a more comprehensive accounting is necessary.

II.B.2 Value of Time

Enslaved people lost control of their lives for the entire year (8,760 hours), and research on reparations payment magnitudes has valued this additional time at the free labor wage rate (Craemer et al., 2020). Multiplying the \$40 free labor income by 2, representing payment

for approximate “non-working” hours enslaved, and adding the gang labor wage premium gives an enslaved labor cost of \$180 per person. One might question whether sleeping hours should be compensated, but enslaved people gave up year-round control over where they would sleep, how much they would sleep, and they faced separation from their spouse and children, such that non-working hours should not be considered “leisure” in the typical sense of free people. This payment for non-working hours also hardly reflects the physical violence endured, fear and mental strain, and general loss of agency over one’s own life. Ransom and Sutch (1977) discuss gains for emancipated workers, which include calculations for the value of time from post-emancipation declines in Black labor supply, yet they focus on economic struggles of Black people after emancipation and general economic struggles in the South.

II.B.3 Value of Statistical Life (VSL)

We consider a more comprehensive measure of the valuation that people attach to their lives, rather than attempt to assess the financial cost associated with particular abuses endured under slavery. There is little evidence on people’s willingness to risk enslavement, but there is a substantial literature on people’s willingness to risk their lives (for reviews and meta-analyses, see Viscusi, 1993; Mrozek and Taylor, 2002; Viscusi and Aldy, 2003; Kochi, Hubbell and Kramer, 2006). For example, if a person is indifferent to accepting another job with 0.1% higher annual mortality risk and 15% higher annual salary, then their “value of statistical life” (VSL) is approximately 150 times their annual income. The VSL is not well-defined in cases of certainty (i.e., how much someone would need to be paid for a 100% chance of death), but a well-defined 13% mortality risk is analogous to a 13% chance of enslavement for a person born in the United States ignorant of their birth circumstances. The economic gains from preventing mortality, or losses from inducing mortality, are generally valued using this probabilistic VSL.

Estimates of the “value of statistical life” (VSL) can vary substantially across contexts and people’s preferences, but typical values are roughly 100-200 times annual income and we assume an income elasticity of one (Viscusi and Masterman, 2017). The implied VSL is generally larger than the net present value of people’s incomes, as people value their lives substantially more than their material consumption.

For an annual income of \$40 and VSL multiplier of 150, this implies a VSL of \$6,000 for enslaved people and an implied annualized cost to enslaved people of \$420 (\$6,000 VSL multiplied by a 7% interest rate). We use the annual income for free people (\$40), as the annual consumption of enslaved people is artificially suppressed through coercion and their free lives are not worth less to themselves because they receive less in-kind consumption under enslavement.

Use of the VSL aligns with characterization of slavery as a “social death,” wherein the enslaved person’s life does not exist outside of enslavement (Patterson, 1982). This social death implies their removal from society and denied recognition as full persons institutionally and legally. Characterization of enslavement as all-encompassing is common in slave narratives and in interviews with the formerly enslaved. Doddington (2018), using WPA slave narratives, finds numerous instances where formerly enslaved people spoke of preferring death to a return to enslavement, where suicide was observed as preferable to severe punishments, and also discusses enslavement as creating a dead person inside of the enslaved one.⁴

Humanists and historians have emphasized the dominion of enslavers over the life of the enslaved (Gutman, 1975; Steckel, 1986*a,b*). Hartman (1997) argues, for example, that the frequent public displays of abuse and terror were not only forms of labor discipline, but displays of power necessary to keep the social and cultural norms of American enslavement intact. Indeed, many practices of enslavement were designed to abase enslaved people. Frederick Douglass notes that witnessing one particularly harsh whipping of an elderly stableman, Old Barney, was the moment that convinced him that he had to escape enslavement because of its ritualistic brutality (Douglass, 1994).

An enslaved person’s VSL is not precisely their value of freedom, but it is not obvious that the VSL exceeds the value of freedom. Formerly-enslaved people describe enduring worse than their own death to support their family and lived for the hope of freedom, in which attempts to escape were generally unsuccessful, and failure resulted in punishment for themselves and their family (Stampp, 1956; Blassingame, 1972). Patrick Henry’s quote (“give me liberty or give me death”) is perhaps rhetorical, but revolutionaries have risked death for freedom from comparatively mild oppression despite Henry invoking imagery of the chains of slavery.⁵ Doddington (2018) notes that “liberty or death” was a common refrain amongst the enslaved.⁶

Restricted ability to pay for freedom does not imply a willingness to accept enslave-

⁴From the WPA narrative of Walter Rim of Fort Worth, TX: “I seed him git one whippin’ and nothin’ I can do ’cept stand dere and cry. Dey gits whippin’s every time massa feels cross. One slave name Bob Love, when massa start to whip him he cuts his throat and dives into de river. He am dat scairt of a whippin’ dat he kilt himself.” The full narrative has been digitized here: https://freepages.rootsweb.com/~ewyatt/genealogy/_borders/

⁵The full speech is available here: https://avalon.law.yale.edu/18th_century/patrick.asp.

⁶For example, “Henry Bibb was equally clear in highlighting how resistance was inseparable from the masculine role of protector: ‘I thought if I must die, I would die striving to protect my little family from destruction, die striving to escape from slavery’ (p. 28). Similarly, when Peter Bruner was captured, he voiced a similar sentiment: “Bruner stoically informed his captor ‘that I would rather he would kill me than to take me back home and that it did not make a bit of difference with me what he did with me, I would as lief die now as any other time’ ” (p. 43-44).

ment, and the imposed cost of enslavement on otherwise free people is the realized cost of enslavement. Enslaved people also had severely restricted opportunity to purchase their freedom, including impediments to borrowing against future earnings and reducing future consumption below subsistence levels to finance their freedom (Conrad and Meyer, 1958). The natural default allocation of property rights is for people to own themselves, as people are born free prior to the imposition of social structure. The costs of enslavement are then imposed on otherwise free people.

These VSL calculations also do not directly consider the value of emancipation to future generations, who cannot finance freedom for their ancestors, beyond how the lives of future generations are reflected in peoples' valuation of their own lives.

II.C Aggregate Economic Gains from Emancipation

When enslaver farms used the lives of enslaved people, with an implied annualized cost to enslaved people of \$420, this cost was unpaid but nonetheless incurred. This imposed cost exceeds the private cost to enslavers of \$60, such that the externality in equation 1 ($c - r$) is \$360 per person. Multiplying by 4 million enslaved people gives \$1.44 billion, which is 35% of total US GDP in 1860 (\$4.17 billion in 1860 dollars, Gallman (1966)).

Emancipation generated substantial aggregate economic gains, which were worth the contribution to GDP from a 35% increase in aggregate productivity. Aggregate productivity growth generally increases the value of output in excess of accompanying increases in input costs; in the case of emancipation, output declined but the cost of inputs declined much more when including the costs incurred by enslaved people.

Focusing on slave states only, their agricultural output is estimated to have declined 33% from 1860 to 1880 (Ransom and Sutch, 1977; Wright, 1978; Brinkley, 1997). Ransom and Sutch (1977) attribute this to declining Black labor supply, rather than destruction from the Civil War, and this voluntary decline in labor supply is itself an indication that output was artificially and inefficiently high through coercion. Indeed, the VSL numbers imply an economic gain from emancipation that was worth 99% of slave states' GDP (\$1.46 billion in 1860).⁷

Annual technology growth in this era was roughly 0.5% (Abramovitz and David, 1973), raising output by 0.5% without increases in inputs, so the aggregate economic gains from emancipation were worth roughly 60 years of technology growth (compounded). Some technologies would generate aggregate economic gains that exceed their contribution to GDP (e.g., antibiotics that are cheap but substantially decrease mortality), but a further impli-

⁷For slave states' GDP, we assign a portion of national GDP using regions' relative 1860 real product per capita (Lindert and Williamson, 2012). The estimates are similar using relative 1840 incomes by state (Easterlin, 1960).

cation of our analysis is that technological innovations that expanded the use of slavery, such as the cotton gin, would generate more aggregate economic losses because the resulting increase in the cost to enslaved people exceeded the gain in output.

We compare the aggregate economic gains from emancipation to GDP, as a benchmark, because enslavement was designed to increase output, but at the unaccounted expense to enslaved people. The gains from technological innovation, or the costs from pollution, are conventionally expressed relative to GDP. We could express the gains from emancipation relative to aggregate VSL in the US economy, based on \$130 GDP per capita, which would imply that emancipation increased the aggregate value of life by 3.4%. This calculation implicitly values the lives of enslaved people at three-tenths the average person in the US, based on their relative consumption; assigning enslaved people the average VSL implies a percent increase roughly equal to enslaved people’s 13% population share. Regardless of benchmark, the absolute economic gain from emancipation (\$1.44 billion) is large relative to GDP, the aggregate gains from annual technological innovation, or the aggregate gains from the railroad network.

It is an illustrative comparison to the aggregate economic gains from the railroad network, because emancipation and the railroads both have large effects due to misallocation in opposite directions. When the economy is assumed to be efficient, the aggregate economic gains from the railroad network are roughly 2.7% (Fogel, 1964) or 3.2% (Donaldson and Hornbeck, 2016). When the railroad network is allowed to increase production in an inefficient economy, where the marginal product of inputs is greater than their marginal cost, the railroad network is estimated to generate economic gains worth 27% of GDP (Hornbeck and Rotemberg, 2022). In reverse, the slave economy created conditions where the marginal product of enslaved labor was less than its marginal cost; such that emancipation generated economic gains worth 35% of GDP.

Emancipation could have decreased aggregate economic surplus, in principle, if enslavement were more “effective” (i.e., enslavement induced work whose value marginal product was greater than its marginal cost). This additional output would be reflected in higher market values for enslaved people. If enslavers were able to capture more value from enslaved people, such that the average market value of enslaved people were \$5600 in 1860, then the private cost to enslavers (r) would equal the cost to enslaved people (c) and slavery would be economically efficient (i.e., equating the social marginal product and social marginal cost of inputs).

Relatedly, if enslavers were required to pay an annual \$360 tax per enslaved person, that would force enslavers to internalize the costs imposed on enslaved people. This tax would be generally prohibitive, however, at 600% the value of enslaved people’s annual output.

This substantial implied Pigouvian tax, for any remaining enslavement to be economically “efficient,” suggests a comparison to carbon emission externalities that is illustrative.

In the modern United States, the economic cost of annual US carbon emissions is not deducted from GDP despite the imposed current and future costs of CO₂ emissions. The introduction of a new technology that costlessly absorbs all US carbon emissions would then not directly increase GDP, but would increase actual US aggregate economic surplus by reducing these unaccounted-for costs. For an estimated social cost of carbon of \$51 per ton (EPA, 2021), removing all 6.3 billion tons of US annual carbon emissions would be worth 1.2% of US GDP (26 trillion in 2022, BEA 2023). For a higher \$185 social cost of carbon (Rennert et al., 2022), eliminating all US carbon emissions would be worth 4.5% of US GDP. These aggregate economic gains are substantially less than the gains from eliminating the use of enslaved labor in the US, as a share of contemporaneous GDP. By comparison, EPA guidelines value mortality risk with a VSL that is 200 times average income: \$4.8 million in 1990 dollars, compared to 1990 GDP per capita of \$24,000 (EPA, 2016).

The aggregate economic gains from emancipation are more than double the substantial direct costs of the Civil War. The Civil War had an estimated \$6.7 billion direct cost, including war expenditures by the Union and Confederate governments and the destruction of human and physical capital (Goldin and Lewis, 1975). These estimated direct costs include lost wages of those killed; for comparability, we replace the calculated \$1.6 billion in lost wages with a \$6,000 VSL associated with 618,000 deaths and calculate a new adjusted total direct cost of \$8.8 billion (\$616 million annualized). Further increasing the estimated Civil War deaths to 750,000, following estimates by Hacker (2011), implies a total direct cost of \$9.6 billion (\$672 million annualized) that is still less than half the annualized economic gain from emancipation. We set aside potential indirect effects of the Civil War on economic growth, other than noting the decline in Southern output by enslaved people is already included in its impact on aggregate economic surplus.

Emancipation could also have been achieved at lower cost, through compensation to enslavers (Goldin, 1973), though gradual emancipation would have prolonged the substantial costs of enslavement that was not only a redistribution of wealth between enslavers and the enslaved. For emancipations prior to the Civil War, including self-emancipations, people who escaped enslavement also improved aggregate economic efficiency. For every \$1 dollar increase in their consumption (from \$30 to \$40), they generated a \$36 increase in aggregate economic surplus (\$420 minus \$60). Assisted emancipations, such as through the underground railroad, generated substantial social return at much lower cost than the Civil War.

Following the Civil War, there was consideration given to providing formerly-enslaved

people 40 acres of land per family. In contrast to the substantial costs that had been imposed on enslaved people, this transfer would have cost roughly 15% of GDP as a one-time cost or 1.1% of GDP on an annualized basis. This calculation reflects an average 1870 land value of \$13 per acre in Kansas (Census of Agriculture, 1870; Haines, 2010), which was a destination of Black Exodusters, and 1.2 million families of the formerly-enslaved (3.3 people per imputed family in the complete 1870 Census of Population from IPUMS), with the cost annualized at a 7% interest rate (similar to mortgage interest rates at the time, from Fogel (1964)).

These land transfers were not made, and the value would be substantially larger now when compounded at 7% interest from 1870 to 2023. This would be worth \$500,000 for each of the estimated 40 million descendants of people enslaved in the US. This is larger than the modern racial wealth gap of \$160,000 per person, which is a focus in research on reparations payment magnitudes (Darity and Mullen, 2020). However, the total annualized cost of these \$500,000 payments is only 5.3% of US GDP and smaller than the gains from emancipation as a share of GDP. These payments are also a transfer, rather than an actual lost “cost,” in contrast to the lost aggregate value through inefficient transfers under enslavement.

We do not consider general equilibrium effects from emancipation. This large reallocation of people, from the slave sector to free sector, had a variety of further economic and political consequences.⁸ Increased production in the free sector would generate more gains if input-use was otherwise distorted below efficient levels (Hornbeck and Rotemberg, 2022), but we focus on the direct distortion from enslavers not internalizing the costs imposed on enslaved people. Enslavers’ descendants recovered from the loss of slave wealth, as enslavers’ families leveraged marriage networks and social connections (Ager, Boustan and Eriksson, 2021), but advancement of formerly-enslaved people was delayed by Jim Crow (Althoff and Reichardt, 2022) and eventually generated 20–40% aggregate gains through decreases in occupational discrimination (Hsieh et al., 2019). We focus on the contemporaneous gains to enslaved people and do not consider gains to future generations.

The above calculations reflect averages over the total enslaved population, but these differences between private costs and social costs are particularly apparent in the case of enslaved children. Enslaved children were of relatively small value to slave owners, but were of great value to their parents. That is, the gap between private value and social cost was especially large for enslaved children. Consistent with this substantial difference in

⁸Related, we focus on the aggregate economic gains from emancipation, given the existence of slavery in the United States, which is different than considering a counterfactual in which there had never been the transfer of enslaved people to the United States from Africa. Similarly, though, the enslavement and transfer of people from Africa imposed costs that we expect substantively exceed any differences in material consumption.

valuations, mortality rates were very high for enslaved children and declined substantially after emancipation.

The birth of enslaved children also makes slavery more inefficient, in aggregate, because the private cost of their enslavement is substantially below the value of their lives to them and their parents. As the enslaved population increases, emancipation would generate greater aggregate economic gains.

Through future generations, emancipation also allowed for further aggregate economic gains through reallocation of workers (Hsieh et al., 2019). Our calculations assume a \$40 income per capita for emancipated people, but GDP per capita was \$130 and so there is substantial scope for increased income and associated VSL through further improvements in education and labor market opportunities.

Table 1 summarizes the calculated aggregate economic gains from emancipation, under alternative calculations. Row 1 reports our baseline calculation, based on VSL-implied costs to enslaved people. Rows 2 and 3 report a broader range of estimates, where the assumed VSL is 200-times or 100-times annual per capita income (\$40 for agricultural labor income per capita). Row 4 reports substantially larger gains from emancipation, valuing enslaved peoples' lives based on average GDP per capita (\$130) that assigns equal economic value to people in the US – and an average income that could presumably be reached in the long-run without further differential treatment in society. Rows 5 and 6 report smaller gains from emancipation, based on valuation of time and the gang labor wage premium.

The smallest estimated gain from emancipation, worth 3.8% of US GDP and 11% of slave states' GDP on an annualized basis, is still worth 7 years of aggregate technological innovation in the era. This aggregate gain, as a share of national GDP, also exceeds Fogel's estimated gains from the entire railroad network. This smallest estimated gain also reflects a very partial measure of the costs of enslavement, neglecting many associated costs of enslavement beyond a greater intensity of labor effort.

III Shifting the Literature on American Slavery

This section discusses how our characterization of American slavery overlaps with and departs from the prior literature. We focus on the literature that has been instrumental in the continuing debates in the economic history of slavery for the last several decades, as it is the most concerned with the technical and substantive issues related to our approach. Our main departure comes from emphasizing the perspective of enslaved people in considering economic concepts like efficiency and aggregate surplus, which has different implications for characterizing the economic impacts of emancipation. We draw on a modern literature that highlights the connection between misallocation and aggregate economic growth (Hsieh

and Klenow, 2009), rather than focus on who consumes the output of enslaved people (e.g., Fogel and Engerman (1974); Ransom and Sutch (1977)), which illustrates how extreme misallocation can create the potential for extreme economic gains.

III.A The “Efficiency” and “Productivity” of Slavery

Historical debates on the economics of slavery have explored many issues, including the profitability of slavery and the material well-being of enslaved people relative to free wage laborers. These debates precede the Civil War (Estes, 1846; Fitzhugh, 1857), with origins in abolitionist and pro-slavery writings, and have continued through later writings (e.g., Stamp, 1956; Conrad and Meyer, 1958; Fogel and Engerman, 1974; Gutman, 1976; Genovese, 1976; Baptist, 2014).

Slavery was profitable, from the perspective of enslavers, because the labor income generated by enslaved people was higher than the financial costs of maintaining an enslaved person. These profits were capitalized in the substantial market value of enslaved people. This view is largely accepted despite abolitionist arguments that slavery was a backward unprofitable institution (see Wright (2006)) and arguments that unprofitable slave labor existed more as a social institution (as in Philips (1918)). A more-contested issue, outside our focus, is whether slavery discouraged Southern economic growth more generally, as suggested by comparisons at the border (Bleakley and Rhode, 2022), or whether slavery broadly encouraged US economic growth (Baptist, 2014; Beckert, 2014; Hilt, 2020; Wright, 2022).

Particularly controversial has been estimating the material well-being of enslaved people, which has included estimating the “rate of expropriation” (i.e., the share of enslaved people’s output that enslaved people did not receive). Ransom and Sutch (1977) estimate that enslaved people did not receive 50% of their output, an upward revision to the 10% estimate by Fogel and Engerman (1974) who compare this favorably to average tax rates. This “rate of expropriation” does not reflect what was truly taken from enslaved people, however, when the value marginal product of enslaved people’s output is not equal to its marginal cost (i.e., misallocation). Enslaved people could have received all of their marginal output, or even more than they produced, but still incurred costs of enslavement that substantially exceeded what they received. The previous focus on expropriation rates is about who consumes the output of enslaved people, which is distinct from costs of enslavement, and then misses the core inefficiency of slavery and its implications. An alternative calculation would be (one minus) the output received by enslaved people (\$30) as a share of the costs incurred (\$420), which we estimate at 93%. Further, enslavers kept only 7% of the cost imposed on enslaved people and 86% of this cost was entirely wasted.

Characterizations of slavery as “efficient” reflect enslaved people working within a market

economy, from the perspective of enslavers, whereby enslavers sought to maximize their own profits by equating the marginal product of labor with their private marginal cost of labor. We emphasize an aggregate perspective that includes all input costs, and not only those internalized by enslavers, whereby enslavement is inefficient because it did not equate the marginal product of labor with the social marginal cost of labor that includes costs incurred by enslaved people. Free labor markets generally do not have this issue because the costs incurred by free workers are reflected in the wages they accept voluntarily. Coercion makes enslavement distinct from increased factory intensity, for example, which is reflected in compensating wage differentials. Similarly, while early economic growth may have come at health costs, such as increasing urban mortality through the industrial revolution (Beach and Hanlon, 2017; Antman, 2022; Alsan and Goldin, 2019), peoples' choice of material well-being creates more presumption that the gains exceed the costs in contrast to when that decision is coerced.

Slavery was “productive,” in the sense that enslaved people produced high levels of output, and total factor productivity (TFP) declined after emancipation reflecting lower output relative to workers, capital, and land (Ransom and Sutch, 1977). Declining TFP does not reflect people forgetting production methods after emancipation; rather, formerly-enslaved people could not be paid enough to endure such conditions, which indicates those methods produced less than the costs incurred.⁹

This now generally accepted view of slavery as productive is in contrast to Adam Smith and Von Mises (1927), among others, who argued that people not working on their own account had less incentive and would therefore be less productive. Hummel (2012) reviews this literature, with a focus on the “deadweight loss” output consequences of slavery from misaligned incentives for work and innovation, along with reference to costs of enforcement (Acemoglu and Wolitzky, 2011) and costs imposed by gang labor (Fogel and Engerman, 1974).

Slavery increased output through imposing “non-pecuniary” costs on enslaved people (Baptist, 2014; Naidu, 2020), but these were only “non-pecuniary” because enslavers used coercion to avoid paying those costs. These costs were still incurred, in practice, and emancipated people required substantial payment to endure such conditions. Aggregate economic surplus is the value of output minus the value of costs, and these costs should be subtracted from output value to characterize aggregate performance of the US economy under slavery. Technological innovations that increase aggregate productivity generate economic

⁹While sharecropping produced less than plantation methods, observers found that formerly-enslaved people “appear to be willing to work, but are decisive in their expressions, to work for no one but themselves” (Litwack, 1979, p. 446).

surplus not because they increase output itself, but because they increase output beyond any accompanying increases in inputs (or they decrease inputs by more than they decrease output).

We characterize emancipation as not only a transfer of measured income into unmeasured non-pecuniary income (Atack, Passell and Lee, 1994), but something more because the non-pecuniary costs were greater than the income gains. This makes emancipation an efficiency-enhancing transfer reflected by the growth in aggregate economic surplus. The cost savings by formerly-enslaved people are not reflected in GDP, or material consumption, but still reflect a dramatic improvement in aggregate economic performance and overall economic surplus.

Output declined after emancipation, with particular declines in child and female labor (Ransom and Sutch, 1977; Litwack, 1979; Jones, 1985), but these voluntary declines in labor force participation indicate the costs of working exceeded the return from working. We also leave aside the decline in child labor due to schooling, which reflects further generational gains as education and human capital investment increases productivity.

Emancipation also brought about changes in the geographic allocation of workers. In the antebellum era, the movement was from the the “Old South” to the “New South,” where enslaved people were allocated to places and tasks where their marginal product was highest (Naidu, 2020), but with emancipation the strong desire of formerly-enslaved people to relocate and connect with family members illustrates that higher marginal product came at even higher marginal costs. One of the main costs of enslavement was separation from family, or living under the threat of separation, whereas one of the main benefits to enslavers in the 1850s was the ability to transfer enslaved people Southwest to areas with increasing cotton production (i.e., the “New South”). There was only an elastic supply of enslaved people at private cost r because of this coercion and relocation, which is part of the high cost c to enslaved people. This separation between the costs and benefits of geographic relocation highlights part of the core externality creating a disconnect between the private and social costs of enslaved labor.

From the perspective of maximizing aggregate output value minus aggregate costs, including costs to enslaved people, the geographic and occupational mobility of formerly-enslaved people after emancipation suggests they had been forced to live in the wrong places under the wrong conditions. Goldin (1973) emphasizes the private efficiency from inducing enslaved people to work in agriculture where they produced relatively more, in contrast to urban sectors in which free labor and enslaved labor were more similarly productive, but this comparison reflects the relative output for enslavers rather than the output of enslaved people relative to their costs incurred by sector.

Post-emancipation production exhibited greater dispersion in marginal products that can indicate lower allocative efficiency (Naidu, 2020), but this reflects closer alignment between marginal products and marginal costs under (more) voluntary labor markets when including costs that were incurred by enslaved people. The post-reconstruction economy was characterized by various efforts to restrict black labor mobility and extract additional value (Naidu, 2010), but these reflect milder coercion than under enslavement. Market frictions after emancipation are also part of the legacy of slavery, as the formerly-enslaved had reason to distrust contracts signed with people who only a short time earlier had coerced their labor and lives.¹⁰

The general notion of loss after the Civil War is in sharp contrast to the gains from emancipation that should be celebrated as miraculous growth in aggregate economic surplus comparable to gains from the largest sources of aggregate productivity growth. Wright (1997) focuses on Southern economic struggles after the Civil War, which reflects the perspective of output, but the Southern economy had actually just experienced dramatic growth in the difference between output and costs. This is because the antebellum economy used enslaved labor far beyond what would equate marginal value and marginal cost, which was an economic problem solved through emancipation.

We are characterizing aggregate economic gains after emancipation, which are distinct from changes in social welfare under some social welfare function. Economic analyses of slavery generally presume that emancipation increased welfare of enslaved people, transferring material consumption from enslavers to the formerly-enslaved with a decline in total consumption. Declining output and total consumption then represent the price paid for abolishing slavery, an uncontroversial moral wrong, but efficient markets maximize the difference between output and costs rather than output itself.

Growth in aggregate economic surplus is meaningful for society because there is more output without correspondingly more use of inputs. If output only increases because labor inputs increase, then there are not more resources for society to consume net of the value of labor. If the value marginal product of labor is lower than its marginal cost, then aggregate economic surplus declines as labor inputs increase. When the value marginal product of labor is substantially below its marginal cost in one sector (the slave sector) and more approximately equal to its marginal cost in another sector (the free sector), then aggregate economic surplus increases when reallocating workers from the slave sector to the free sector through emancipation – just as aggregate economic surplus increases from technological innovation.

¹⁰Former enslavers also proved themselves to be untrustworthy: “a Tennessee planter promised, they would be awarded a share of the crop... But when the two freedmen stood before their former master to obtain the promised shares, he refused to pay them anything, declared he could no longer support them, and ordered them off his land” (Litwack 1979, p. 420).

This is an under-appreciated implication of input misallocation, which has substantial implications for aggregate economic growth (Hsieh and Klenow, 2009), and emancipation provides a clear illustration of the potential aggregate economic gains from reallocating inputs in the presence of severe misallocation.

Enslavement was not a market economy, from the perspective of enslaved people who were coerced to work without a direct relationship between the value of their labor and cost of providing that labor, so there would be no presumption that market forces would direct production toward efficient outcomes. Whether this system was “capitalist” depends on the definition of capitalism, but historians and economists have focused on the market-aspects of the slave economy from the perspective of enslavers in adopting various definitions (Baptist, 2014; Hilt, 2020). Lamoreaux and Wallis (2023) define advanced capitalist societies as those where more people are free to use their labor and resources as they see fit; in this sense, emancipation was a dramatic movement toward the US becoming a more capitalist society.

Fogel (1989) argues that the “material success” of slavery should be held in contrast to its moral horror and exploitation (p. 9). We propose an alternative comparison, in which slavery was also an aggregate economic failure because it produced much less than the costs it induced. The key paradigm shift is in treating enslaved people and their costs incurred as part of the aggregate economy, rather than focusing on aggregate output or aggregate output net of costs incurred by enslavers only. Even the material well-being of enslaved people, often focused on in the literature, is not particularly informative about aggregate well-being because people do not directly maximize their caloric intake, overall nutrition, or height. The immorality of slavery becomes more reflected in the economics of slavery once the costs are appropriately included.

David and Temin (1974) argue that Fogel and Engerman (1974) “overlook the economic essence of slavery, namely, that the slaves lost the freedom to exercise choices as producers and consumers.” David and Temin (1974, 1979) then focus on welfare, and the inability of economic analysis of material well-being to inform the broader question of social welfare. We re-focus on aggregate economic surplus, which is distinct from welfare because enslavement will always reduce aggregate welfare if enslaved people receive sufficient weight in the social welfare function.

Emancipation brought economic prosperity, as abolitionists had hoped, when economic prosperity is defined to include the value of enslaved peoples’ lives as they valued them. But enslavement was not counterproductive, as abolitionists claimed, as it extracted substantial wealth.

III.B Centering the Costs of Slavery

Our framework connects economic analysis of slavery with the broad more-qualitative literature that highlights the myriad substantial costs imposed on enslaved people. These costs were not tangential to “economic production;” rather, enslavers’ extraction of value from enslaved people was inextricably linked to the all-encompassing control of enslaved people’s lives. Enslavers’ journal entries note many deaths as overworked and undernourished people perished as they labored (Steckel, 1986*a,b*). Through coercion, enslaved people were induced to work to the point of heatstrokes, fainting, and muscle tears. Enslavers remarked that maintaining a productive slave system required fear of severe punishment or death (Stamppp, 1956). Overseers were incentivized to induce additional output, and contemporaries noted how the profit motive lay behind the harsh overwork of enslaved people. One white Mississippian told Frederick Law Olmsted, the *New York Daily Times* journalist who wrote a widely popular series detailing his research visits to the antebellum South, “I’d ruther be dead than be a nigger on one of these big plantations” (Stamppp, 1956, p. 85).

While enslaved people had some influence over their work (Blassingame, 1972; Genovese, 1976), these were insufficient checks for enslavers to fully internalize the costs imposed on enslaved people. There was a general rule that work on Sundays was forbidden, which reflected practical limits to what enslavers could extract.¹¹ Extreme mistreatment of enslaved people was also limited by the market itself, particularly the rising prices of enslaved people. One enslaver in 1849 noted “The time has been that the farmer could kill up and wear out one Negro to buy another; but it is not so now. [The prices of] Negroes are too high in proportion to the price of cotton, and it behooves those who own them to make them last as long as possible” (Stamppp, 1956, p. 81). Indeed, the Alabama agricultural society noted that crop yields were related to enslaved people being overworked, with excess mortality and infant mortality explicitly noted (Stamppp, 1956). Checks on extreme work reflect limits comparable to the use of a machine or mule that might break down, rather than additional costs borne by the machine or animal itself.

Enslavement extended far beyond a labor relationship to impact every feature of enslaved peoples’ lives. The typical plantation was not a farm business as much as a combined agricultural and socially policed operation (Stamppp, 1956; Blassingame, 1972; Genovese, 1976; Baptist, 2014; Rosenthal, 2018). The enslaved were constantly monitored and counted, enslaved individuals were to have as little contact as possible with free Blacks, could not work without direct approval, and had to obey strict requirements on conduct at all times. The

¹¹If work was required on Sunday, Louisiana law stated that “slaves are entitled to the produce of their labor on Sunday; even the master is bound to remunerate them [the enslaved], if he employs them” (Genovese (1976), p. 315).

nature of the autonomous and isolated plantation severely limited the social lives of the enslaved. Religious songs with hopeful aspirations have been elevated in the narrative, highlighting hopes for freedom and an end to misery, but songs also featured family breakup and violence at the hands of enslavers (Levine, 2007). Enslavers encouraged Christian practices among the enslaved, but religious practices were overseen by enslavers to maintain control (Franklin, 1979; Genovese, 1976; Levine, 2007; Jones, 1985), and the post-emancipation ability to organize freely and worship without white supervision was a critical and highly-valued component in early post-emancipation life (Sernett, 1999).

Enslavement substantially disrupted enslaved peoples' family form, function, and relationships (Gutman, 1976; Frazier, 1939). Characterizations have varied on the rates of family breakup and enslaver control over intimate family behavior (Franklin, 1979; Fogel and Engerman, 1974; Pritchett and Logan, 2018), but such relations were manipulated for the purpose of labor coercion. After the Civil War, the narrative record describes formerly enslaved people searching for family members separated by enslavers (Litwack, 1979; Foner, 1988; Gutman, 1976). Emancipation and the ability to form and manage households of one's choosing, along with the free agency to manage daily mundane tasks, was highly valued in these WPA narratives, contemporaneous slave narratives, interviews, and media reports. The coercion under enslavement that existed outside of work times was necessary to ensure labor coercion. During enslavement, the two were related and inseparable in forming cultural and social relationships that governed plantation life (Genovese, 1976; Stamp, 1956; Blassingame, 1972; Jones, 1985).

Slavery treated enslaved people as commodities or capital that were traded and used within that market system (Steckel and Ziebarth, 2013; Berry, 2017; Jones-Rogers, 2019). Enslavers' accounting practices even formed the basis of modern accounting methods (Rosenthal, 2018), but from the narrow perspective of enslavers' profit maximization. The consideration of aggregate economic performance under enslavement, and the impacts of emancipation, requires a different accounting of the costs imposed on enslaved people than that considered by enslavers in making their production decisions. While enslaved people were treated like capital, the costs imposed on them are distinct from the costs of using capital goods. These further costs of enslavement are well-known in the historical record, but have been neglected in considering their implications for aggregate economic gains after emancipation.

Forms of coercion on plantations were numerous. While there were incentive systems on a limited number of plantations (Fogel and Engerman, 1974), incentives were substantively rarer than punishments (Gutman, 1975). Henry Bibb's 1949 narrative describes an enslaver offering prizes based on quantities of cotton picked and using that information to punish

people if their future picking fell below those individual-specific thresholds (Rosenthal, 2018, p. 96). The fear of punishment is also costly, and induces more-than-optimal effort even when punishment is not applied in equilibrium. Steckel (1986*a*) estimates mortality rates for enslaved people that are inconsistent with “benevolent” slavery and further showed that enslaved children were very malnourished (Steckel, 1986*b*). Slave narratives further detail forms of physical, emotional, and sexual abuse that came to define the American enslavement experience.

This does not imply that enslavers used violence “irrationally” or excessively from their own private perspective; rather, it may pay an enslaver to coerce someone into higher production, which lowers the enslaved person’s health and life expectancy. Enslavers used whippings to punish adultery and discourage divorce (Stampp, 1956; Fogel and Engerman, 1974; Franklin, 1979), but it would not follow that this tradeoff is socially optimal. Similarly, emancipation could even reduce the material well-being of Black people in some dimensions (DeCanio, 1974; Downs, 2012), but caloric intake or consumption are not the totality of what people optimize for themselves. Even if there was a post-emancipation increase in drunkenness, or buying of “frivolous things,” there was a sharp dividing line between freedom and slavery for emancipated people (Gutman, 1976, pp. 136-7).¹²

The lives of enslaved women are particularly illustrative of coercion under enslavement and the impacts of emancipation. Enslaved women worked in the fields up to the week of the birth of their children and were returned to the fields less than a month later (Fogel and Engerman, 1977). Relatedly, the infant and child mortality of enslaved children was particularly pronounced, with infant mortality twice the national rate and remaining at that level until age 10 (Steckel, 1986*a*). The coercion of enslaved women included sexual exploitation, which extended also to enslaved men (Foster, 2019). Even after giving birth, enslaved women found their biological products marketed for consumption as wet nurses (Jones-Rogers, 2019).

Labor force participation declined considerably after emancipation, particularly for Black women. By hours worked, the decline was between 40% and 55% for Black women, while for Black men the declines were 15% to 20% (Ransom and Sutch, 1977). Even with the promise of contractually higher earnings for greater productivity, emancipated people were generally vigilant in protecting their leisure time, particularly time away from the fields for women and children (Litwack, 1979). This is consistent with a significant decline in excessive labor

¹²Some estimates indicate overall declines in Black life expectancy after emancipation, which was driven by migration to urban areas and the urban mortality penalty (Downs, 2012). This does not indicate reductions in well-being after emancipation, however, because one mechanism underlying people’s valuation of their lives is their ability to make decisions that could result in their deaths (through migration to cities, consumption of alcohol, etc).

effort due to enslavement and coercion.

The decline in labor force participation was not entirely spent in leisure, however. A significant reallocation was made to household work and childcare, particularly by Black women, as these tasks had been centralized and/or discouraged on large plantations. Black women advocated for this time to attend to their own households, and some labor contracts after emancipation explicitly noted household tasks that Black women were to perform, and therefore they were not expected to provide labor outside of their household during those times (Litwack, 1979; Jones, 1985). Forcing these women into the labor force would increase measured market output, but decrease aggregate output relative to input costs as valued by them. A similar argument can be made for children, who would be forced out of school and into the labor market.

This formulation of the aggregate economic gain due to the end of enslavement in the United States is consistent with Adam Smith's negative view of slavery, but for different reasons. Smith maintained that enslaved labor would not be as productive as free labor because free workers have better incentives. Indeed, reductions in serfdom may have improved incentives such that output increased (Markevich and Zhuravskaya, 2018). The high levels of output per capita of American slavery brought this long-held view under question. We contend that enslaved people in the United States were coerced to produce more output than free people, but the costs imposed on enslaved people ultimately exceeded the increase in marginal output. Enslavement in the United States distorted the incentives of workers such that the marginal cost of labor far exceeded the marginal benefit, rather than enslavement reducing the incentives of enslaved people to work.

IV Conclusion

The substantial aggregate economic gain from emancipation is important to highlight for several discussions. First, this paper focuses on the cost incurred by enslaved people, shifting the perspective that economic historians have taken to characterize enslavement in the United States (reviewed in Logan, 2022). Second, the experience of American enslavement highlights how growth in aggregate economic surplus can be substantively influenced by inefficiencies in input allocation. Aggregate economic surplus increases when economic activity expands in places where market distortions have reduced input-use below efficient levels, which has the same consequences as aggregate productivity growth from technological innovation (Petrin and Levinsohn, 2012; Hornbeck and Rotemberg, 2022), and American slavery illustrates the opposite case in which market distortions induce input-use much above efficient levels and so reductions in input-use increase aggregate economic surplus. We discuss a similar case of climate change, with carbon emissions imposing social costs, but show that the

aggregate economic gains of emancipation substantially exceed the gains from eliminating carbon emissions. This approach can be applied to a wide range of settings to consider aggregate economic gains when input-use is distorted from optimal levels.

We also reconsider American enslavement because of its foundational importance in characterizing the economic, social, and political development of the United States. Emancipation provided one of the largest sources of aggregate economic gains in American history, which arose not from technological innovation or economic policy but institutional innovation that ended chattel bondage. This fundamentally changes the implications of the Civil War and characterizations of Southern economic decline and its subsequent convergence. Output declined in the South, and later converged, but the costs to many people declined so substantially that this output decline itself represents a miraculous aggregate economic gain and the beginning of a new age in the American economy. Indeed, continued drag on the Southern economy after the Civil War plausibly stemmed from efforts to re-establish coercive antebellum structures after emancipation.

Free markets can be subject to a variety of distortions that reduce efficiency, but free labor markets generally avoid the fundamental distortion of imposing costs on coerced workers far beyond the value they produce. This episode highlights how the lack of agency among workers can induce substantial distortions. Emancipation, and the move to an economy based on voluntary labor market transactions, launched aggregate economic gains in the United States.

Our analysis also highlights the economic losses from coercion and, more generally, racial and sexual harassment and oppression. Such actions may generate some gains to those exerting power, but generally substantially larger costs for those affected. Such actions are not predominately redistributive, benefiting some at the expense of others, but lead to substantial aggregate losses. When those in power benefit from such systems, though, institutional changes can be required to generate these large aggregate gains.

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Table 1. Aggregate Economic Gains from Emancipation, Alternative Scenarios

Scenario:	Annual Cost to Enslaved People	Annual Value of Output	Emancipated People	Aggregate Economic Gain	Share of US GDP	Share of Slave States GDP
	(1)	(2)	(3)	(4)	(5)	(6)
1. VSL cost (150x, \$40 income)	420	60	4 million	\$1.44 billion	35%	99%
2. VSL cost (200x, \$40 income)	560	60	4 million	\$2.00 billion	48%	137%
3. VSL cost (100x, \$40 income)	280	60	4 million	\$0.88 billion	21%	60%
4. VSL cost (150x, \$130 income)	1,365	60	4 million	\$5.22 billion	125%	358%
5. Gang labor cost & Value of Time	180	60	4 million	\$0.48 billion	12%	33%
6. Gang labor cost	100	60	4 million	\$0.16 billion	3.8%	11%

Notes: Each row reports calculated aggregate economic gains from emancipation under alternative scenarios. Row 1 calculates the annual cost of enslavement (in Column 1) based on the value of statistical life (VSL): 150 times annual income per capita (\$40), annualized at 7% interest. Column 4 is the difference between Column 1 and Column 2 (the annual value of output, which is equal to the annual cost to enslavers, including annual consumption of enslaved people and the annualized market value of enslaved people), multiplied by Column 3 (the number of enslaved people emancipated). Column 5 expresses this aggregate economic gain as a share of United States GDP, and Column 6 expresses this aggregate economic gain as a share of slave states GDP.

Rows 2 and 3 report alternative calculations, based on the VSL being alternative multiples of annual income (200 or 100). Row 4 calculates VSL based on GDP per capita, rather than lower agricultural income per capita.

Row 5 assigns an annual cost to enslaved people based on the post-emancipation wage premium associated with the intensive gang labor system and assigning a wage value to "non-working" time enslaved. Row 6 uses only the gang labor wage premium.