Online Appendix

Fertility and the Price of Children: Evidence from Slavery and Slave Emancipation

IMPACT OF ENDOGENOUS SLAVE FERTILITY

The fertility of household slaves was not entirely outside the control of the slaveowner. Slaveowners influenced slave fertility using a variety of methods, and it is therefore inappropriate to view slave fertility as an entirely exogenous event. A valid instrument for slave fertility is not readily apparent.

Under the assumption that slave fertility is correlated with the error term in Equation 1A in the main text, the plim of $\widehat{\gamma_k}$is given by:

$$plim\, \widehat{\gamma}_k^{OLS} = \gamma_k + \frac{cov(\varepsilon_t, F_{t-k}^S)}{var(\varepsilon_t)},$$

where the sign and magnitude of $\frac{cov(\varepsilon_t, F_{t-k}^S)}{var(\varepsilon_t)}$ determine the bias of the estimate. Because $var(\varepsilon_t)$ is strictly positive, the direction of the bias is determined by $cov(\varepsilon_t, F_{t-k}^S)$. As $\widehat{\gamma}_k^{OLS}$ is negative, a positive value for $cov(\varepsilon_t, F_{t-k}^S)$ indicates the true value of γ_k is further from zero. A negative value for $cov(\varepsilon_t, F_{t-k}^S)$ indicates that γ_k is closer to zero.

The sign of $cov(\varepsilon_t, F_{t-k}^S)$ is determined by the relationship between shocks to the household's white fertility in period t, and slave fertility in period $t-k$. It seems more likely that these two variables are positively correlated than negatively. If white fertility shocks result from changes to weather or health, these variables are likely to affect slave and white fertility similarly so that $cov(\varepsilon_t, F_{t-k}^S) > 0$. Other shocks, such as changes in income or crop prices or the death of older children, that would lead households to increase (decrease) white fertility would also lead to an increase (decrease) in the value of slave fertility such that, again, $cov(\varepsilon_t, F_{t-k}^S) > 0$ if households are actively encouraging or discouraging slave fertility.

Examples of shocks to the household's white fertility that would be negatively correlated with slave fertility are less obvious. One potential scenario would be the illness of the female slaveowner. This would serve as a negative shock to white fertility but, perhaps, result in higher slave fertility if slaveowners sought to replace reductions in their own fertility with slave fertility. But, noting that white fertility responses in Table 2 of the main text are observed in years following slave fertility, confounding bias comes not from simultaneous covariance in slave fertility and own fertility, but from covariance between slave fertility in years prior and current shocks to white fertility. Conditions leading to this type of correlation seem more difficult to envision, especially considering that there is no significant correlation between current year slave and white fertility in Columns 2 and 3 of Table 2, only in lagged years.

Although the size and sign of $cov(\varepsilon_t, F_{t-k}^S) < 0$ is unknowable, downward bias in $\widehat{\gamma}_k^{OLS}$ seems a less likely scenario than conditions involving an upward bias or no bias at all.

Table S1
EQUATIONS 1B AND 1C ESTIMATION RESULTS FOR HOUSEHOLDS WITH AND WITHOUT MULATTO SLAVES

	(1)	(2)	(3)	(4)	(5)	(6)
	All Households		<8 Slaves		<4 Slaves	
	No Mulatto Slaves	Mulatto Slaves	No Mulatto Slaves	Mulatto Slaves	No Mulatto Slaves	Mulatto Slaves
2-year slave fertility (γ_{12})	–0.018 (0.020)	0.013 (0.036)	–0.057** (0.027)	–0.051 (0.063)	–0.10*** (0.043)	–0.064 (0.13)
4-year slave fertility (γ_{1234})	–0.043** (0.021)	–0.00099 (0.047)	–0.051** (0.025)	–0.070 (0.065)	–0.063* (0.036)	–0.066 (0.11)
Number of Households	734	161	495	48	314	20
Slave Fertility Events	1605	947	343	71	81	16

* = Significant at the 10 percent level.
** = Significant at the 5 percent level.
*** = Significant at the 1 percent level.
Notes: See Notes for Table 2 in the main text. Mulatto Slave households (Columns 2, 4, and 6) include those with at least one mulatto child aged 10 and under.
Source: Author's calculations from Census data described in main text.

SLAVE PATERNITY

The conceptual framework yields additional predictions for household behavior in the presence of white paternity amongst slave children. The slave schedules record the race of slaves as black or mulatto, and I assume that mulatto children are born to slave women and have white paternity. If the substitutability between own white children and own slave (mulatto) children was higher than that between own white children and slave children without white paternity, then own white fertility should be more responsive to the birth of mulatto slaves.

I repeat the analysis in Table 2 of the main text separately for those households where the census enumerator reports the presence/absence of mulatto slave children less than age ten.[1] Households with at least one mulatto child are then compared to

[1] Because the reporting of mulatto race in the slave census was entirely subjective, mulatto and non-mulatto status is assigned based on whether the census enumerators recorded *any* mulatto children (10 or under) amongst the slave holdings rather than assigning mulatto status to individual slave children. This threshold method of assigning mulatto assignment makes it more likely to categorize farms with large slaveholdings as mulatto than farms with small slaveholdings, and so comparing differences across columns 1, 3, and 5 or across columns 2, 4, and 6 of Table S1 is ill-advised for this reason. But comparisons within categories of slaveowners (e.g., column 3 vs. column 4) remain valid.

Table S2
EQUATION 1B–1C ESTIMATION RESULTS BY CROP MIX

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	ALL HOUSEHOLDS			<8 SLAVES			<4 SLAVES		
	All Counties	Above-Median Cotton Counties	Above-Median Sugar Counties	All Counties	Above-Median Cotton Counties	Above-Median Sugar Counties	All Counties	Above-Median Cotton Counties	Above-Median Sugar Counties
2-year slave fertility (γ_{12})	–0.0083	0.016	–0.032	–0.10***	–0.090	–0.11**	–0.20***	–0.16	–0.17*
4-year slave fertility (γ_{1234})	–0.017	0.052*	–0.049	–0.15***	–0.10	–0.21***	–0.25***	–0.20	–0.24*

* = Significant at the 10 percent level.
** = Significant at the 5 percent level.
*** = Significant at the 1 percent level.
Notes: See notes to Table 2 in the main text.
Source: Author’s calculations from Census data described in text.

households without the same in Table S1. When all households are included in the estimation, the white fertility response to a slave birth is significant only on non-mulatto farms with slave births in the last four years. For households with smaller numbers of slaves in columns 3 through 6, the 2-year response is stronger for households with no mulatto slaves. The 4-year response displays the opposite pattern. In neither case are the differences economically significant. The lack of a difference across mulatto status categories may in part be a reflection of the high variability with which this characteristic was recorded in the slave census.

IMPACT OF CROP MIX AND INCREASING RETURNS

Southern farms differed in crop mix, and those differences may have implications for the substitutability between slaves and own children. Fogel and Engerman (1974) show that crop mix largely dictated size of plantations and, if so, the results in Table 2 of the main text, delineated by the size of the slave population, may represent differences across crops.

To evaluate empirically the importance of crop mix considerations, I bifurcate the sample into above- and below-median cotton producers and into above- and below-median sugar producers. Unfortunately, crop mix at the household level is not observed in the 1860 population schedule, and households are assigned the cotton or sugar production rate (per capita) of their county in the 1860 agricultural census returns.[2] I then repeat the estimation of Equations 1B, 1C, and 2, accounting for crop mix. Table S2 gives the results of estimating Equations 1B and 1C (analogous to Table 2 in the main text) for the full sample (columns 1, 4, and 7 corresponding to all households, those with fewer than 8 slaves, and those with fewer than 4 slaves) and then for households above the median in value of cotton per capita (columns 2, 5, and 8) and value of sugar per capita (columns 3, 6, and 9). The results are strikingly similar across crop mix categories. Subtle differences in the estimates for γ_{1234} are apparent in above-median cotton counties for households with fewer than 8 slaves, but are otherwise unremarkable.

Table S3 repeats the estimation of Equation 2 (Table 6 of the main text) for households in above-median cotton counties. There are few remarkable differences, although the statistical significance of key coefficients is reduced, perhaps due to the reduction in sample size.

In addition to the confounding effect of crop mix, increasing returns in the Southern slave system might complicate the working assumption that substitutability between slave and own children was highest on the smallest farms. Increasing returns on the largest farms is a statement about the average slave, but not the marginal slave. An arbitrage condition implies that the marginal slave on small and large farms would have been equally productive. Transactions costs may have introduced a wedge between marginal productivity across farms, but the wedge would be only as large as the transaction cost in slave sales. In any case, the arbitrage condition does not imply that the derivative of the marginal product of the household's white children with respect to slave children (or adults) is equivalent across households. That derivative depends on the nature of the household's production process. As long as substitutability is greater for households with fewer slaves, the magnitude of the derivative of the marginal product therein will be greater as well.

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[2] The Parker-Gallman includes crop data for individual households as well as slave holdings. Unfortunately, it is not appropriate for this project as it reports slave ages in aggregated categories which prevent the estimation of Equation 1.

Table S3
EQUATION 2 ESTIMATION RESULTS FOR ABOVE-MEDIAN COTTON COUNTIES

Dependent Variable: White Household Fertility, 1866-1870

Ages and Gender

Size of Slaveholdings	(1) No interaction	(2) Ages 0–2	(3) Ages 3–6	(4) Ages 7–10	(5) Ages 11–15	(6) Female Ages 16–35	(7) Male Ages 16–35	(8) Ages 36+
No interaction	—	0.0554	0.0460	–0.0291	–0.00823	–0.154	–0.0252	–0.182
		(0.143)	(0.147)	(0.133)	(0.115)	(0.147)	(0.128)	(0.119)
1– slaves	–0.0431	0.622*	–0.124	0.00470	–0.0725	–0.0995	0.164	–0.162
	(0.153)	(0.326)	(0.313)	(0.286)	(0.116)	(0.184)	(0.199)	(0.211)
8 or more slaves	–0.232	–0.909	–0.00450	–0.128	–0.106	–0.305	–0.0212	-0.186
	(0.166)	(0.180)	(0.190)	(0.172)	(0.172)	(0.242)	(0.184)	(0.162)

* = Significant at the 10 percent level.
Notes: See notes to Table 6 in the main text. Sample limited to households with cotton production above the sample median.
Source: Author's calculations from Census data described in text.

VARIABLE DEFINITIONS

Equations 1A–1C include household and year fixed effects, but no additional covariates. Variable definitions for the components of X_{it} in Equation 2 are as follows:

- Female/male age (1870): Age of the female/male head of household as recorded in the 1870 Census.
- Household RE Wealth 1860: Combined real estate wealth of all members of the slaveowner's nuclear family (spouse and children) in the 1860 Census.
- Household PE Wealth 1860: Combined personal wealth of all members of the slaveowner's nuclear family (spouse and children) in the 1860 Census.
- Male Place of Birth: Indicators for the male head's place of birth as reported in 1860. Birthplaces were classified as one of the following: Alabama, Florida, Georgia, Mississippi, South Carolina, Texas, other Southern states, Atlantic states, Midwest states, New England states, Canada, or Europe.
- Male Occupation Category (1870): The occupation of the male head of household was categorized into a binary agriculture/non-agriculture variable. The following qualitative responses (and variants thereof) to "What is your occupation" in the 1870 Census schedules were coded "1" for employment in agriculture: farmer, planter, dairyman, farm agent, farm manager, farm renter, manager of farm, orange planter, overseer, cattle raiser, stock driver, stock raiser, and stockman.

Education has repeatedly been shown to be correlated with fertility in the literature. However, less than 5 percent of the individuals report that they cannot read or write. Instead, the households' responses to age questions are used to construct a measure of numeracy. Numeracy is then used as a rough proxy for education.

Numeracy here is defined as the ability of a household to correctly report the ages of its household heads in the 1870 and 1880 Census enumerations, given that they were correctly reported in the 1860 enumeration.[3] Formally, numeracy, bounded between 0 and 100, is:

$$Numeracy = Average\left(\sum_{j=Male,Female} Q_{j,t}\right)$$

where

$$Q_{j,t} = 100 \; if \; |Age_{j,1870} - Age_{j,1860}| = 10 \; or \; |Age_{j,1880} - Age_{j,1860}| = 20$$

$$Q_{j,t} = 60 \; if \; |Age_{j,1870} - Age_{j,1860} - 10| = 1 \; or \; |Age_{j,1880} - Age_{j,1860} - 20| = 1$$

$$Q_{j,t} = 20 \; if \; |Age_{j,1870} - Age_{j,1860} - 10| = 2 \; or \; |Age_{j,1880} - Age_{j,1860} - 20| = 2$$

[3] For other purposes, I have linked households forward to the 1880 census as well and use their reported ages in this census to gain a better proxy for numeracy.

and

$$Q_{j,t} = 0, otherwise$$

where the average is taken only over those cells where data exist. If the household correctly reports the ages in 1870 and 1880 of both the male and female heads of household, under the assumption that the 1860 value was correct, it receives 100 points for each of four data cells (the male in 1870, male in 1880, female in 1870, and female in 1880). For each age that the household misses by one year, it receives 60 points; if it misses by two years, it receives 20 points and if it misses by more than two years, it does not receive any points.

SUMMARY STATISTICS AND ESTIMATES OF X_{it} AND β FROM EQUATION 2

Average values for variables contained in X_{it} in Equation 2 are contained in Table S4 and the estimated coefficients on those variables for the specification corresponding to the top row of Table 6 (age and gender categories, uninteracted) are contained in Table S5.

MODEL OF HOUSEHOLD DECISION MAKING

Intuitions from the "Conceptual Framework" section of the main text can be formalized with a model of household fertility choice in the Civil War-era South.

Suppose households make decisions to optimize their expected lifetime utility:

$$MAX\ E_t \sum_{k=t}^{T} \beta^{k-t} U(C_k)\ , \tag{S1}$$

TABLE S4
SUMMARY OF VARIABLES CONTAINED IN X_{it} OF EQUATION 2

	Mean	Standard Deviation
$F^{W}_{i,1856-1860}$	1.52	0.99
Female age (1870)	37.0	5.42
Male age (1870)	44.4	7.28
Male employed in agriculture (1870)	0.709	—
Numeracy	63.4	25.8
Log household wealth (1870)	7.05	2.05
Change household real estate wealth (1870–1860)	(1584)	7384
Change household personal wealth (1870–1860)	(8826)	20260

Source: See text.

TABLE S5
ESTIMATES OF β IN EQUATION 2

Dependent Variable: White Household Fertility, 1866-1870	
$F^W_{i,1856-1860}$	0.200*** (0.0332)
Female age (1870)	–0.00618 (0.0755)
Male age (1870)	–0.0283 (0.0429)
Male employed in agriculture (1870)	0.134* (0.07745)
Numeracy	0.00309** (0.00130)
Log household wealth (1870)	–0.00257 (0.0134)
Change household real estate wealth (1870–1860)	$4.18\text{x}10^{-6}$ ($4.78\text{x}10^{-6}$)
Change household personal wealth (1870–1860)	$1.23\text{x}10^{-6}$ ($2.69\text{x}10^{-6}$)

* = Significant at the 10 percent level.
** = Significant at the 5 percent level.
*** = Significant at the 1 percent level.
Notes: Coefficients reported are for a specification of Equation 2 including all age variables and an interaction between age 0-2 and size variables. The coefficients do not change remarkably under alternative specifications.
Source: Author's calculations from Census data described in the text.

where C_t is a composite consumption good including all pecuniary and non-pecuniary consumption by the household in time period *t*. The contents of C_t include the tangible components of consumption (food, clothing, housing, etc.) as well as the standard intangible benefits associated with children (love, companionship, etc.). Children do not enter the household utility function directly. Instead, children are valued for the goods and services they produce.[4] The model reflects both a household

[4] This formulation emphasizes the interrelationship between slaves and the household's own children in household production. It contrasts with some household fertility models where children do enter U(.) directly. In this context, however, the two formulations generate equivalent predictions about household behavior as long as the consumption value of children is unchanged with the slave fertility and emancipation events in question.

production function motivation and a life-cycle savings model as the household invests today to maximize a stream of consumption over its lifetime.

The household, in addition to being a consumer represented by Equation (S1), is also a producer utilizing factors of production including land and other non-human capital ($\overline{K}$) and labor (L_t) in the production of a composite output (Y_t). Labor (L_t) is comprised of adult labor rented on the market or from adult slaves (R_t), slave children (S_t), and its own children (N_t). $\overline{K}$ is assumed to be fixed over the lifetime of the household and is one way the household can save to smooth future consumption. But the household can also save through their own children and slaves.

The number of slave children, S_t, evolves as a result of births to adult female slaves.

$$S_{t+1} = S_t + A_t \; where \; A_t \in \{0,1,2,\ldots,\bar{A}\}.$$

A_t represents births to female slaves in the household and $\bar{A}$ represents the biological upper limit on slave fertility for the household in each period.[5] A_t is assumed to be outside of the control of the household.

The number of own children, N_t, evolves according to the following equation:

$$N_{t+1} = N_t + F_t \; where \; F_t \in \{0,1,2,\ldots,\bar{F}\}.$$

$\bar{F}$ represents the biological upper limit on fertility for the household ine ach period. Households choose F_t in each period. And because own children enter the household production function in all years of the household's existence, investments in children early in the household's life cycle have returns years into the future. (Children do not depreciate.)

Labor and capital combine to produce output via a Cobb-Douglas production function:

$$Y_t = \overline{K}^{\alpha} L_t^{1-\alpha}.$$

The three labor factors are incorporated into the model using a Constant Elasticity of Substitution (CES) framework. Nesting is assumed to first occur between slave children (S_t) and own children (N_t). H_t is defined as the total amount of child labor available to the household: $H_t = [\chi S_t^{-\delta} + (1-\chi) N_t^{-\delta}]^{-1/\delta}$and L_t as the combination of this child labor component (H_t) and adult labor (R_t):

$$L_t = [\pi R_t^{-\rho} + (1-\pi) H_t^{-\rho}]^{-1/\rho}.$$

The implication of these functional forms is that own children (N_t) and slave children (S_t) are imperfectly substitutable at a rate that depends on δ. When δ approaches –1, the relationship is linear, and the factors are perfectly substitutable. However, as δ approaches ∞, the two factors become perfect complements. A parallel relationship exists between child labor (H_t) and adult labor (R_t). The relationship

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[5] Households may also have affected S_t through buying and selling slaves on the market. The market for slave children sold alone was thin and inactive. The market for slave children sold with a parent was more substantial. In that case, a more accurate formulation is $S_{t+1} = S_t + A_t + G_t$ where G_t reflects the net purchases of child slaves on the market.

depends on ρ and, again, as ρ approaches –1 the relationship is linear (perfect substitutes) and becomes Leontief (perfect complements) as ρ approaches ∞.[6]

In each period, the household must choose R_t to maximize its utility subject to a budget constraint. I assume a single-period decision as antebellum households could buy and sell adult slaves on the open market. Thus, even if the household purchased (rather than rented) a slave in period *t*, the slave could be sold at *t* + 1 such that the household's decision was binding in period *t* only and was analogous to renting labor for period *t* only.

The budget constraint is:

$$C_t + P_{R_t}R_t + P_{S_t}S_t + P_{N_t}N_t + P_{A_t}A_t + P_{F_t}F_t \leq Y_t + I_t,$$

where P_{R_t} is the rental rate of adult labor, P_{S_t} is the maintenance price of slave children, and P_{N_t} is the maintenance price (explicit costs) of own children. In addition, slave and own children incur additional costs for the household resulting from lost maternal labor effort in the period of their birth. P_A is the cost resulting from the birth of slave children and P_{F_t} represents the costs of newborn own children.[7] All prices are subscripted by time period *t* and are in terms of the composite good Y_t. The price of the household's consumption good, C_t, is normalized to 1. I_t is any non-labor income the family receives including the income flow from a wealth endowment.

In Equation S1, the uncertainty over future utility comes from the stochastic nature of the price vector and from uncertainty over future values of A_t and I_t. If future prices, slave fertility, and non-labor income were known at time *t*, the household would maximize a deterministic stream of future utility. But with these quantities unknown, the household must form expectations over the future value of its choices. In particular, as own children cannot be bought or sold, the household must use its expectations over future prices, slave fertility, and non-labor income to make choices about current period fertility, F_t.

The household's decision rules for choosing F_t will be used to predict how the household's behavior might change after a slave fertility event and after emancipation. The household's decision rule for choosing F_t involves an asset value. An additional child in the household brings costs in the current period (P_{F_t}) and in each subsequent period in the form of maintenance costs (P_{N_t}). On the other hand, additional fertility brings returns to the family determined by the size of $\frac{\partial Y}{\partial N}$. The net price of an additional child in period *t*, denoted P_t, is:

$$P_t = \sum_{k=t+1}^{T} \beta^{k-t} E_t U'(C_k)\left(P_{N_k} - \frac{\partial Y_k}{\partial N_k}\right) + P_{F_t}U'(C_t). \quad \text{(S2)}$$

As long as P_t is negative, the household has a motivation to bear more children. But the household is biologically constrained in the number of offspring it can produce such that the household may not be able to generate $P_t = 0$ as would be indicated by

[6] A model of household behavior fully-informed by the historical record would also allow for gender specificity among the factors of production as the complementarity/substitutability of adult labor, slave children, and own children likely depended on the gender of each. I have abstracted from this additional complexity here for simplicity of exposition, but the possibility of such a relationship is explored further in the results presented in the main text.

[7] For simplicity, I assume capital is fixed and has no cost.

utility optimization with no constraints on F. In the conceptual framework in the main text, household fertility is estimated as a function of P_t under the demand theory premise that fertility is decreasing in P_t.[8]

Equation S2 provides predictions for white fertility following a slave fertility event and slave emancipation. First, a slave fertility event represents an increase in A_t which then increases S_t, and will affect the price of the slaveowner's own children through $\frac{\partial Y}{\partial N}$. The gross substitutability of slave and own children is determined entirely by ρ. But net substitutability depends on the relative rates of substitutability between own children and slave children (ρ) and between children in general and adult labor (δ). When $\rho > \delta$, $\frac{\partial Y}{\partial N \partial S} < 0$. The historical record indicates that ρ was largest on farms with small numbers of slaves. This leads to the first testable implication.

1. *When own children and slave children were net substitutes in the household production function ($\rho > \delta$), an increase in the number of slave children in the household resulting from a slave fertility event would have increased the price of own children and, in turn, decreased fertility. The white fertility response will be more pronounced on farms with smaller numbers of slaves where ρ would have been largest.*

The changes imparted on Equation S2 by slave emancipation are two-fold. First, slave children were no longer available for purchase following emancipation and the former child slaves were not necessarily available for hire in the post-war years. Even when formerly enslaved children were available for hire (generally in conjunction with their parents), they could no longer serve as old-age security for former slaveowners as the slaveowner had no ownership rights over these children. In the model, this can be understood as a decrease in S_t.[9] The testable implication follows:

2. *When $\rho > \delta$ a reduction in the slave child labor force (S) following slave emancipation decreased the price of own children for former owners of slave children and would have, in turn, increased white fertility. The impact will be more pronounced on farms with smaller numbers of slaves.*

Finally, in addition to the reduction in the number of slave children, the price of adult labor (P_{R_t}) increased following emancipation. The assumption that $\rho > \delta$ implies that adult slaves and own children were complements in production such that $\frac{\partial Y}{\partial N \partial P_{R_t}} < 0$ and an increase in P_{R_t} should reduce white fertility ($\frac{\partial P_t}{\partial P_{R_t}} > 0$). In addition, because female slaves were more likely to be complements to own children while male slaves were substitutes, I further hypothesize that $\frac{\partial P}{\partial P_{R_{t,male}}} < \frac{\partial P}{\partial P_{R_{t,female}}}$ where $P_{R_{t,male}}$ represents the price of male adult labor and $P_{R_{t,female}}$ represents the

[8] An alternative model assumes that fertility is not a household choice, but that effort in producing children is. Then fertility is some non-deterministic function of effort in producing children subject to uncertainty. Effort would then be a function of P_t. This has the same implications for household behavior.

[9] Modelling emancipation as an increase in P_S does not change the testable implications derived here.

price of female adult labor. For an equivalent price shock, owners of adult female slaves would have experienced a sharper increase in the price of their own children than owners of adult male slaves. This would have been especially true on farms with large numbers of slaves where the complementarity between adult female slaves and own children was strongest. A final testable implication is:

3. *When $\rho > \delta$, own children and adult labor were net complements in the household production function. As a result, an increase in the price of adult labor resulting from emancipation should have resulted in a decrease in white fertility. The impact should be larger for former owners of female slaveswith large numbers of slaves in 1860.*[10]

[10] In addition, emancipation represented a shock to wealth for slaveowners represented by a decline in I. $\frac{\partial Y}{\partial I}$ depends on U'(C), and when U(.) is concave, U'(.) is decreasing in I. But U'(.) appears as both a cost (in the current period) and a benefit (in all subsequent periods) in Equation (2). Thus, the sign of $\frac{\partial Y}{\partial I}$ is ambiguous. All the same, I control for changes in non-labor income (wealth) in the empirics in the main text.