THE PROMISE OF FREEDOM: FERTILITY DECISIONS AND THE ESCAPE FROM SLAVERY

Treb Allen*

Abstract—This paper examines how the fertility of enslaved women was affected by the promise of freedom. Exploiting geographic variation in the effect of the Fugitive Slave Law of 1850, I demonstrate a negative correlation between fertility and the distance to freedom. This negative correlation is stronger on larger plantations but weaker when the slaveholder is a woman. A similar correlation is not present for white children, slave children with white fathers, or slave children born prior to the Fugitive Slave Law. The negative correlation suggests that the promise of freedom played an important role in the everyday lives of slaves.

I. Introduction

DID the promise of freedom matter to those who were enslaved? In the antebellum U.S. South, there were multiple cases of individuals incurring great costs in order to achieve freedom; for these individuals, freedom clearly mattered a great deal. These successful escapes, however, were outliers: the vast majority of the enslaved never reached freedom. If the probability of freedom was low, was the promise of freedom inconsequential?

This paper argues that even though successful escapes were rare, the promise of freedom played an important role in the everyday lives of slaves. In particular, I provide evidence that women systematically reduced their fertility when the likelihood of escape declined. Based on the premise that mothers derive greater utility from children when they are free, I first develop a fertility model that predicts that women choose to reduce their fertility as the distance to freedom increases, even if they ultimately do not successfully escape. I then exploit the passage of the Fugitive Slave Law of 1850 (FSL) and the peculiarities of U.S. geography to demonstrate empirically that an increase in the distance to freedom was associated with a decline in fertility.

The fertility model is simple. In the first stage, an enslaved woman chooses the number of children to have in order to maximize her expected utility; in the second stage, the woman is able to successfully escape slavery with some probability. The model predicts that if a woman derives greater utility from having children when she is free, then the greater the probability of escape is, the more children she would choose to have. Hence, an increase in the distance to freedom (which lowers the probability of escape) should result in a decline in fertility. While alternative theoretical mechanisms can also yield the same prediction, this model highlights how the promise of freedom can affect fertility decisions even for women who do not escape.

With the passage of the FSL, fugitive slaves were no longer assured freedom upon reaching the U.S. North and could be guaranteed freedom only on reaching Canada. Because of the peculiarities of U.S. geography, the FSL did not affect all parts of the U.S. South equally, providing variation in the change in distance to freedom. Using plantation-level data detailing fertility choices before and after the FSL, I find a strong and robust negative correlation between distance to freedom and fertility: for each additional 100 miles to freedom, enslaved mothers had on average 5.1% fewer children. The effect is stronger on larger plantations and in states closer to the border, varies with the difficulty of the route, and depends on the sex of the slave owner and the race of the father. A similar relationship is not present for white children or for slave children born prior to the FSL, and several alternative explanations for the correlation do not appear to be generating the results.

While there has been a recent resurgence of interest in the economic implications of slavery (Nunn, 2008; Wanamaker, 2008; Lagerlof, 2009), less progress has been made in understanding how the institution of slavery shaped the incentives and constrained the behavior of the enslaved. This paper extends the understanding of the institution of slavery in two ways. First, it sheds new light on the extent to which slaves had agency over their own fertility. This question has been subject to much analysis (Fogel & Engerman, 1974; David & Stampp, 1976; Steckel, 1977; White, 1999), but no consensus has arisen. The strong negative correlation between fertility and the distance to freedom suggests that enslaved women made fertility decisions in response to the circumstances of their slavery. Second, this paper emphasizes the important role that the promise of freedom played in the decision making of slaves. Since so few enslaved people were able to successfully escape to freedom, (permanent) escape has been seen as inconsequential in the everyday lives of slaves (Franklin & Schweninger, 2000). This paper suggests the opposite: although escape was rare, the promise of freedom substantially affected mothers' fertility decisions.

The remainder of the paper proceeds as follows. The next section provides a brief overview of the historical setting. Section III presents the model. Section IV discusses the data. Section V introduces the empirical strategy and presents the main results. Section VI presents several placebo tests and examines several alternative explanations for the results. Section VII concludes.

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* Northwestern University.

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II. Historical Background

Since surplus slave labor could be sold on the market and natural increase was an inexpensive alternative to purchasing additional slaves, slaveholders had strong economic incentives to encourage slave fertility. According to one Virginia farmer, a newborn slave was "worth two hundred dollars … the moment it drew breath" (David & Stampp, 1976, p. 160). As a result, enslaved women had to contend with constant interference by owners in their fertility decisions. Some of this interference was reasonably benign; for example, planter P. C. Weston had a rule that "women with six children alive at any one time are allowed all Saturday to themselves" (quoted in Gutman, 1975, p. 98). Other interference was more pernicious and included forced marriage and rape (White, 1999).

Once the children were born, the difficulty of being an enslaved woman did not abate. While the exact incidence of separation of mother from her children has been hotly debated, it appears that about one in three children was separated from one or both parents before the age of fifteen, making the threat of separation ubiquitous (Fogel & Engerman, 1974; Gutman, 1976; Franklin & Schweninger, 2000). Owners, recognizing the power of the threat of separation, used children as a means of maintaining discipline. In "Duties of Christian Masters" (1851), Bishop Holland Nimmons McTyeire, writes, "Family associations … are strong yet pleasing cords binding [the slave] to his master. His welfare is so involved in the order of things, that he would not for any consideration have it disturbed. He is made happier and safer, put beyond discontent, or the temptation to rebellion and abduction; for he gains nothing in comparison with what he loses" (quoted in Gutman, 1975, p. 101). The fact that owners used slaves' children to enforce good behavior was not lost on the mothers; as former slave Harriet Ann Jacobs recounted in her narrative, "I was certain my children were to be put in [my owners'] power, in order to give them a stronger hold on me" (Brent, Child, & Teller, 1973, p. 97).

Given the difficulties associated with being a mother in slavery, it is not surprising that historical evidence suggests women actively resisted owners' attempts to increase their fertility. Contemporary whites were convinced that slaves had secret methods of birth control: Georgian physician E. M. Pendleton wrote in 1849 that all county practitioners "are aware of the frequent complaints of planters about the unnatural tendency in the African female population to destroy her offspring. Whole families of women … fail to have any children" (quoted in Gutman, 1976, pp. 80–81). This belief was not unfounded: the chemical gossypol found in the cotton plant reduces fertility, and it was common practice for women to chew cotton root as a form of birth control (Berry & Alford, 2012). Other methods of controlling fertility included abstinence, abortion, and, in extreme cases, infanticide, although the frequency with which the latter two methods occurred is unclear (Hine, 1979; White, 1999).

In addition, the historical record suggests that the possibility of freedom played an important role in enslaved women's fertility decisions. For example, William and Ellen Craft chose to delay having children until they could attempt escape.[1] As William explains:

> My wife was torn from her mother's embrace in childhood, and taken to a distant part of the country. She had seen so many other children separated from their parents in this cruel manner, that the mere thought of her ever becoming the mother of a child, to linger out a miserable existence under the wretched system of American slavery, appeared to fill her very soul with horror; and as she had taken what I felt to be an important view of her condition, I did not, at first, press the marriage, but agreed to assist her in trying to devise some plan by which we might escape from our unhappy condition, and then be married. (Craft & Craft, 1860, p. 27)

Consistent with the fact that women would have preferred more children had it not been for slavery, there exist numerous documented cases of supposedly infertile women having children after being freed (White, 1999; Perrin, 2001). The tension between fertility and freedom is particularly acute in the heart-wrenching experience of Margaret Garner. Recaptured after escaping from Kentucky to Ohio with her family in 1856, she chose to kill her own two-year-old daughter rather than have her return to slavery (Berry & Alford, 2012).[2]

While the exact number of successful escapes to freedom is unknown, evidence suggests they were rare. In the 1850 Census, only 1,011 slaves were reported by slaveholders to have escaped and not returned in the past year out of a total slave population of over 3 million. A Southern judge in 1855 claimed that by then, the South had lost "upwards of 60,000 slaves," an estimate that historian Kenneth Stampp (1956) deems "reasonable." Of those attempting escape, most were men: only 19% of fugitive slaves advertised for in newspapers between 1838 and 1860 were female (see Franklin & Schweninger, 2000, p. 212).[3] This gender imbalance in attempted escapes may reflect the difficulty of escaping with young children. Leaving children behind, however, appears to have been unthinkable; for example, none of the 151 female fugitive slaves advertised in New Orleans newspapers in the

[1] William and Ellen Craft famously escaped to the U.S. North from Macon, Georgia, in 1848 by posing as a white male planter (Ellen) and his servant (William) while traveling in the open by steamboat and train. Concerned about being recaptured after the passage of the Fugitive Slave Law in 1850, they fled to England, where they had five children.

[2] Margaret Garner's plight provided the inspiration for the novel *Beloved* by Toni Morrison.

[3] This figure accords well with the Census data used for the empirical analysis in this paper. While the official Schedule 2 Census form asked only for the total number of slaves who had run away and not returned over the past year rather than identifying which slaves in particular had run away, certain enumerators did indicate which slaves on the roster were the fugitives, and this was noted for the 5% sample. Of the 60 fugitive slaves in the 1850 5% sample, 21 were identified as such on the roster, of whom 18 were men and 3 were women (14%). Of the 20 fugitive slaves in the 1860 5% sample, 14 were identified as such on the roster, of whom 3 were women (21%).

1850s had run away without her children (White, 1999). One obvious obstacle for escape was the distance to freedom. While "slaves who lived in close proximity to free territory … frequently tempted fate by striking our for freedom," the chances of slaves who "faced a trek of hundreds of miles through uncharted and largely unknown territory" successfully making it to freedom "were remote" (Franklin & Schweninger, 2000, pp. 25, 116).

Despite the rarity of successful escape, the possibility of escape played an important role in shaping the interaction between slaves and owners. According to historians John Hope Franklin and Loren Schweninger, "The journals, diaries, correspondence, and records of slaveholders indicate that it was a rare master who could boast that none of his slaves had absconded. In fact, the vast majority admitted just the opposite" (2000, p. 279). Supporting this view is the evidence documenting the costly efforts slaveholders made to deter potential escapees and reclaim fugitive slaves, including advertising in newspapers, hiring professional slave catchers and specially trained dogs, and exhibiting severe punishments on fugitives unfortunate enough to be recaptured (Franklin & Schweninger, 2000).

While the Fugitive Slave Act of 1793 ostensibly required Northern states to return fugitive slaves to the South, the passage of personal liberty laws throughout the North made the prospect of extraditing a captured fugitive slave difficult. The 1842 Supreme Court ruling in *Prigg v. Pennsylvania*, while confirming the right of Southerners to reclaim fugitive slaves in the North, freed Northern states from having to enforce such rights. As a result, fugitive slaves, on reaching the North, were effectively free (Campbell, 1970). Southern slaveholders were aware of this. As Virginia slave owner Richard Reed complained, "The recovery of slaves who have escaped to the non slaveholding states is, even in ordinary cases … uniformly attended with the utmost danger & difficulty and more often than not altogether impracticable" (quoted in Franklin & Schweninger, 2000, p. 159).

The major conciliation to the South in the Compromise of 1850 was the passage of a new fugitive slave law. The FSL increased the legal protection of slaveholders attempting to capture fugitive slaves who escaped to the North, levied large fines on anyone aiding fugitives, and removed virtually all legal rights of captured fugitives (Campbell, 1970). While the effectiveness of the FSL is disputed, anecdotal evidence suggests that fugitives perceived that their freedom could no longer be guaranteed on reaching the North. Within three months of its passage, 3,000 fugitive slaves had crossed the border into Canada (Landon, 1920). Free blacks in the North fled to Canada as well; for example, the size of the congregation of the Black Baptist Church in Rochester, New York, fell from 114 to 2 after the FSL was passed (Campbell, 1970).

While most slaves knew of the existence of free territory to the North (Gara, 1996), it is not known how widespread the knowledge of the FSL was. However, several pieces of evidence suggest that slaves were aware of both the need to escape to Canada and the difficulties in getting there. An abolitionist visiting Mississippi found that slaves sold from Virginia and other border states had spread word there of the existence and distance to Canada (Ross, 1972). Hudson (2002), using a database he constructed of 1,196 fugitive slaves attempting escape through Kentucky, finds a statistically significant change in the types of escapes attempted before and after the passage of the FSL. Consistent with planning for a longer and more arduous journey, fugitive slaves after 1850 were less likely to attempt escape in the autumn, were more likely to escape in groups, and were more likely to be actively aided by others.

Given the historical context, the remainder of this paper relies on the following three assumptions: (1) mothers derived more utility from each additional child when free than when enslaved, (2) increasing the distance to freedom reduced the probability of successful escape, and (3) prior to the passage of the FSL, mothers believed they would be free on reaching the North, whereas after the passage of the FSL, mothers believed that freedom could be achieved only by reaching Canada. In the next section, I develop a simple model of fertility that predicts that if the first two assumptions are true, fertility should decline as the distance to freedom increases. The third assumption provides the identification strategy for the empirical results presented in section V.

III. Model

In this section, I develop a model of slave fertility that predicts that as the distance to freedom increases, women prefer to have fewer children. The model is based on the premise that women value additional children more when they are free than when they are enslaved. While there exist other theoretical mechanisms that yield the same prediction, the model highlights that the promise of freedom can affect fertility decisions even if the probability of escape is low.

The model is simple and comprises two periods. In the first period, a woman chooses the number of children to have, incurring a cost $c > 0$ for each child. In the second period, the woman and her children escape slavery with some probability. Let $F_s(n)$ denote the total value of having n children to a mother who remains enslaved, and let $F_f(n)$ denote the total value of children to a mother who successfully escapes. Let $P(d)$ be the probability that a mother is able to escape as a function of the distance to freedom d. For simplicity in what follows, I ignore integer constraints and assume that all functions are twice continuously differentiable. I make the following three assumptions regarding the functions $F_s(n)$, $F_f(n)$, and $P(d)$:

1. Regardless if she is free or enslaved, a woman's value of children is increasing and concave: $\forall x \in s, f,\ n \geq 0$: $F'_x(n) > 0$ and $F''_x(n) < 0$.
2. The probability of successful escape is lower the greater the distance to freedom: $P'(d) < 0$.
3. The marginal value of an additional child is always larger when a mother is free: $F'_f(n) > F'_s(n)\ \forall n \geq 0$.

The first assumption guarantees a positive and finite optimal number of children. The second and third assumptions are consistent with the historical evidence presented in section II.

The total value of children to a mother, $V(n)$, is simply her expected value less the costs incurred in having the children:

$$V(n) = (1 - P(d))\, F_s(n) + P(d)\, F_f(n) - cn.$$

The woman chooses her number of children n^* so as to equate the marginal benefit of her last child with its marginal cost:[4]

$$(1 - P(d))\, F_s'\left(n^*\right) + P(d)\, F_f'\left(n^*\right) = c.$$

Applying the implicit function theorem to this optimality condition yields the following expression for how the optimal number of children changes with the distance to freedom:

$$\frac{\partial n^*(d)}{\partial d} = -\frac{P'(d)\left(F_f'(n^*) - F_s'(n^*)\right)}{(1 - P(d))\, F_s''(n^*) + P(d)\, F_f''(n^*)} < 0. \tag{1}$$

As the distance to freedom increases, the probability of escape declines, causing the woman to place more weight on the value she receives from children in slavery. This reduces the marginal expected value of children, resulting in the woman choosing to have fewer children. As a result, increases in the distance to freedom result in women choosing to have fewer children.

Given the very real possibility of separation and the other horrors accompanying motherhood in slavery, it seems reasonable to assume that women derive greater utility from their children when they are free. However, it is important to note that there are other possible mechanisms through which women would prefer to have fewer children the greater the distance to freedom. For example, it could be that having children lowered the probability of freedom directly by increasing the difficulty of an escape; alternatively, it could be that women had fewer children only to increase the threat of escape, thereby eliciting greater transfers from owners. In the online appendix, I show that each of these mechanisms also yields the prediction that the optimal number of children declines with the distance to freedom. Since each of these alternative explanations yields the same prediction, they cannot be empirically disentangled from each other. However, each of these explanations implies that the promise of freedom can have important everyday implications for the behavior of the enslaved, even if the probability of successful escape was low. As a result, the remainder of the paper empirically tests this more general prediction rather than identifying the specific underlying mechanism.

[4] Note that the concavity of the value of children (assumption 1) implies that the second-order conditions hold at the optimum.

TABLE 1.—SUMMARY STATISTICS FOR PLANTATION DATA

	1850 (1)	1860 (2)	Total (3)
Fertility rate: Children 0–4/ women 16–44	0.798	0.829	0.814
	(0.839)	(0.811)	(0.824)
Fraction of potential mothers under 30	0.645	0.630	0.637
	(0.398)	(0.396)	(0.397)
Fraction of adults who are male	0.346	0.356	0.351
	(0.260)	(0.254)	(0.257)
Female slaveholder	0.084	0.104	0.095
	(0.277)	(0.306)	(0.293)
Male slaveholder	0.483	0.342	0.407
	(0.500)	(0.474)	(0.491)
Slaveholder sex unknown	0.434	0.554	0.499
	(0.496)	(0.497)	(0.500)
Total number of slaves	11.039	12.568	11.864
	(15.508)	(19.298)	(17.671)
1-slave household	0.083	0.068	0.075
	(0.276)	(0.252)	(0.263)
2-slave household	0.096	0.085	0.090
	(0.295)	(0.279)	(0.286)
3-slave household	0.095	0.087	0.090
	(0.293)	(0.281)	(0.287)
4-slave household	0.091	0.085	0.088
	(0.287)	(0.279)	(0.283)
5- to 10-slave household	0.325	0.332	0.328
	(0.468)	(0.471)	(0.470)
Rural household	0.890	0.896	0.893
	(0.312)	(0.305)	(0.309)
Observations	12,187	14,294	26,481

Standard deviations are reported in parentheses. The sample includes all plantations with at least one women aged 16 to 44.

IV. Data

In 1850 and 1860, the U.S. government included a slave holdings schedule in the national census (Schedule 2). As initially drafted, it was to include each slave's name and number of children (alive and dead). Amid objections from Southern congressmen as to the use and accuracy of such records, however, the actual schedule included only the slave's age, sex, skin color (black or mulatto), and whether the slave was deaf and dumb, blind, insane, or idiotic.[5] In addition, slaveholders were asked the total number of slaves who had been manumitted and had run away and not returned in the past year.[6]

The empirical results are based on the 5% sample of Schedule 2 available from Menard et al. (2004). For each plantation, I observe the name of the owner; the county of residence; whether the plantation was rural or urban (and if urban, the size of the town); the total number of fugitive and manumitted slaves; and the age, sex, and color of each slave owned. Table 1 presents the summary statistics for the plantation-level data. In total, I observe 26,481 slave-owning households with at least one women aged 16 to 44, roughly

[5] Leading the call to strike the question on number of children, Alabama senator William R. King argued, "The woman herself, in nine out of ten cases, when she has had ten or fifteen children, does not know how many she has actually had" (Paterson, 2004).

[6] Enumerators were instructed to ignore slaves who had run away after the beginning of the Census enumeration in June, regardless of when the interview actually took place. Hence, this question largely measured successful escapes.

TABLE 2.—SUMMARY STATISTICS FOR COUNTY DATA

	1850 (1)	1860 (2)	Total (3)
Distance to freedom (miles)	210.138	442.903	333.599
	(147.953)	(154.987)	(191.076)
Value of cotton production (000s)	1.302	2.485	1.931
	(2.864)	(5.271)	(4.353)
Value of rice production (000s)	0.056	0.043	0.049
	(0.655)	(0.527)	(0.590)
Value of tobacco production (000s)	0.174	0.312	0.247
	(0.589)	(0.968)	(0.816)
Value of sugar production (000s)	0.223	0.185	0.203
	(1.541)	(1.437)	(1.486)
Total value of agricultural production (000s)	4.618	6.314	5.520
	(4.551)	(6.537)	(5.755)
Change in total value of agricultural production over past 10 years (000s)	1.044	2.290	1.741
	(3.744)	(4.357)	(4.144)
Railroad access	0.126	0.283	0.210
	(0.332)	(0.451)	(0.407)
Water transport access	0.402	0.377	0.389
	(0.491)	(0.485)	(0.488)
Adult white population (000s)	4.541	5.097	4.836
	(6.155)	(6.712)	(6.461)
Adult slave population (000s)	2.421	2.622	2.528
	(3.067)	(3.170)	(3.123)
Change in adult white population over last 10 years (000s)	1.370	0.976	1.150
	(3.473)	(4.463)	(4.058)
Change in adult slave population over last 10 years (000s)	0.701	0.517	0.598
	(1.094)	(0.944)	(1.017)
Observations	911	1,029	1,940

Standard deviations are reported in parentheses.

evenly distributed between 1850 and 1860. The vast majority of the households (89%) are rural. Although there were 11.9 slaves per household on average, the distribution was highly skewed: 34% of plantations had fewer than five slaves and two-thirds had ten or fewer.

Because children and mothers are not linked in the data, I measure fertility at the plantation level. In what follows, I use the ratio of the number of children under 5 years of age to the number of women aged 16 to 44 as the measure of fertility. I focus on children under 5 because older children may have been sold separately from their mother (David & Stampp, 1976; Johnson, 2001), which may introduce (potentially nonclassical) measurement error into the measured fertility (see section VI.B).[7]

I link the Schedule 2 data with county-level demographic and economic data from Minnesota Population Center (2004). Table 2 presents the summary statistics for the county data. As can be seen, from 1850 to 1860, there were substantial increases in agricultural production, driven primarily by a rapid expansion in cotton production. Adult slave and white populations grew modestly, but at a lower rate than from 1840 to 1850. Railroad access (i.e., having a railroad depot in the county) more than doubled (from 12.6% of counties reporting access in 1850 to 28.3% reporting access in 1860), but water transportation access declined slightly.

To determine the distance to freedom, I calculate great circle route distances from each county to the nearest county in the North and to the nearest entry point into Canada.[8] Consistent with the passage of the FSL, I define the distance to freedom as the distance to the North in the 1850 Census (corresponding to slave fertility from 1846 to 1850) and the distance to Canada in the 1860 Census (corresponding to slave fertility from 1856 to 1860). Since slaves could also escape southward to Mexico (Tyler, 1972), if Mexico is nearer than the North (Canada), I replace the distance to freedom in 1850 (1860) with the distance to Mexico. The top and middle panels of figure 1 depict the resulting measure of distance to freedom for each Southern county in 1850 and 1860, respectively.

Table 2 indicates that the FSL increased the average distance to freedom from 210 miles to 443 miles. The bottom panel of figure 1 illustrates the change in the distance to freedom from 1850 to 1860. As is evident, counties fortunate enough to be directly beneath the entry points into Canada had the smallest increase in the distance to freedom, while counties in Texas and southern Louisiana were unaffected by the FSL since Mexico was the nearer destination. This will form the basis of my identification strategy in the next section.

V. Results

In this section, I use the passage of the FSL to estimate how slave fertility responded to the distance to freedom. Section V.A presents the empirical strategy, section V.B presents the main results, section V.C examines the heterogeneity in fertility responses, and section V.D incorporates the difficulty of the route.

A. *Empirical Strategy*

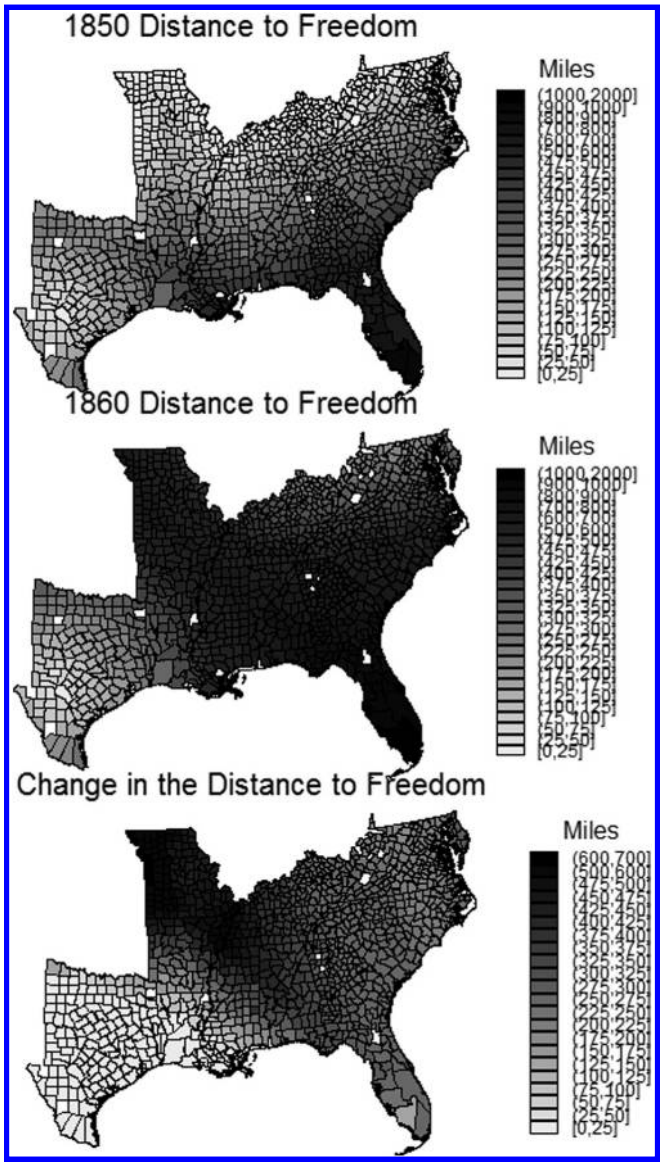
To estimate the relationship between slave fertility and distance to freedom, I exploit the fact that the border between the U.S. South and the U.S. North is not parallel to the U.S.-Canadian border, so the FSL had a differential effect on slaves depending on the difference between their distance to the North and to Canada. Specifically, I regress fertility on plantation p in county c in state s in year t, $fert_{pcst}$,[9] on the distance to freedom in county c in state s in year t, $dist_{cst}$, where $dist_{cst}$ is defined as the distance to the nearest Northern county in 1850 and the distance to the nearest entry into Canada in 1860

[7] In the online appendix, I show that the results are robust to alternative age cutoffs for children.

[8] From Siebert (1898), the major entry points into Canada were through the Upper Peninsula, Michigan, to Sault Ste. Marie, from Chicago, over Lake Michigan, through Detroit, Michigan to Windsor, from Cleveland, over Lake Erie, through Buffalo, New York, to St. Catharines, and through upstate New York to Ottawa or Montreal.

[9] The plantation p remains in the same county c and state s in both years; the additional indices are included to highlight which variables vary at the plantation level and which vary at the county level.

FIGURE 1.—THE DISTANCE TO FREEDOM



The figure indicates the change in the great circle distance to freedom before and after the passage of Fugitive Slave Law of 1850. Prior to the passage of the law, the distance to freedom is defined as the smaller of the distance to the nearest county in the U.S. North and the distance to Mexico. After the passage of the law, the distance to freedom is defined as the smaller of the distance to the nearest entry point into Canada and the distance to Mexico.

(unless Mexico is nearer; see above), as well as a vector of controls and fixed effects:

$$fert_{pcst} = \beta dist_{cst} + \gamma dist_{cst}^2 + \theta_t' X_{pcst} + \delta_c + \delta_{st} + \varepsilon_{pcst}. \quad (2)$$

I include both distance to freedom and distance to freedom squared to allow for nonlinear impacts of the distance to freedom on fertility. Because the probability of escape was exceedingly remote for slaves living far from freedom, it seems reasonable to expect that increases in the distance to freedom would have smaller effects on fertility when the distance to freedom is large.[10] Hence, to the extent that enslaved women would reduce their fertility the greater the distance to freedom, we should expect that $\beta < 0$, while to the extent that this effect dissipates as the possibility of escape becomes increasingly remote, we should expect $\gamma > 0$.

As mentioned above, I define $fert_{pcst}$ as the ratio of children under 5 years old to the number of women aged 16 to 44 on a plantation so that plantations that have a greater number of children under 5 years old per potential mother can be said to have had higher fertility rates in the past five years.[11] To allow for the fact that the particular demographic composition of a plantation affects fertility rates, I include a number of controls of the plantation demography in X_{pcst}: the fraction of slaves over the age of 16 who are male, the fraction of potential mothers who are under 30, the total number of slaves, and indicator values for if there are one, two, three, four, or five to ten slaves on the plantation. X_{pcst} also includes controls for the sex of the plantation owner, an indicator if the plantation was rural, and a multitude of county-level controls, including access to water and rail transportation, total agricultural production, and the production of cotton, rice, tobacco, and sugar separately (to control for both total agricultural productivity and the relative crop production of a particular county), the adult white and slave population of the county, and the change in the adult white and slave population of the county over the previous ten years.

In addition to the vector of controls, I include both year and county fixed effects. The county fixed effects control for any time-invariant county-level unobservables that affect fertility (e.g., geography, disease environment). The year fixed effects control for the overall fertility trend and the average change in the distance to freedom. Hence, the identification of β and γ is based on the variation across countries in changes in fertility and distance to freedom between 1850 and 1860. For the estimates of β and γ to be unbiased, it must be that there exists no unobserved variable that is correlated with both deviations from the average change in distance to freedom and deviations from the average change in fertility, conditional on the included controls. I examine several possible correlated unobservables in section VI.

B. *Main Results*

The results of regression (2) are presented in table 3. To allow for potential spatial autocorrelation in unobservables,

[10] In the online appendix, I show that the results are similar when only a linear term in distance to freedom is included.

[11] Since I measure the fertility of an entire plantation and there is variation across plantations in the number of slaves, I use an iterated two-step GLS methodology to construct plantation weights. The standard approach to weight plantation averages by the square root of the number of observations (in this case, the number of slaves) is valid only if the unobserved errors within a particular plantation are independent of each other. Not surprisingly, statistical results not reported here strongly reject within-plantation independence of errors. The iterated two-step GLS methodology estimates weights that allow for within-plantation correlation of errors. See Dickens (1990) for details.

TABLE 3.—EFFECT OF DISTANCE TO FREEDOM ON SLAVE FERTILITY

	(1)	(2)	(3)	(4)	(5)
Distance to freedom (100 miles)	−0.010	−0.036***	−0.048**	−0.068***	−0.062*
	(0.009)	(0.014)	(0.020)	(0.026)	(0.036)
Distance to freedom squared	0.002	0.004*	0.004*	0.004*	0.004
	(0.001)	(0.002)	(0.002)	(0.003)	(0.004)
Plantation and county controls	Yes	Yes	Yes	Yes	Yes
County fixed effects	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes
Controls × Year	No	No	No	Yes	Yes
State-year fixed effects	No	No	No	No	Yes
Observations	26,481	26,481	26,481	26,481	26,481
R^2	0.594	0.613	0.613	0.614	0.614
Mean fertility	0.814	0.814	0.814	0.814	0.814

The dependent variable is the ratio of the number of children younger than age 5 to the number of women aged 16 to 44 on a plantation. Each observation is a plantation with at least one women aged 16 to 44 in a particular year; plantations are weighted by the number of slaves using a GLS procedure that allows an arbitrary correlation in fertility within a plantation. Plantation controls include the total number of slaves; indicator variables for whether there were one, two, three, four, or five to ten slaves in the household; the fraction of potential mothers under the age of 30, the fraction of adults who were male; an indicator for whether the plantation was rural; and the sex of the slaveholder. County controls include whether the plantation was rural; the value of cotton, rice, tobacco, sugar, and total agricultural production; the change in total agricultural production over the past ten years; the adult white and slave populations; the change in the white and slave populations over the past ten years, and indicator variables for whether there was railroad or water transportation access in the county. Since county-level data are missing for some counties, missing variables are set equal to 0 and indicator variables for missing values are included to control for level differences. Controls × Year indicates that interactions with all demographic and county control variables and the year 1860 are included to allow the control variables to have different effects in 1850 and 1860. Standard errors allowing for spatial correlation between plantations (using a Barlett kernel with a 100-mile bandwidth) are reported in parentheses. Statistically significant at *10%, **5%, ***1%.

I construct the standard errors by calculating a nonparametric spatial heteroskedasticity and autocorrelation consistent estimator of the variance covariance matrix using the Conley (1999) approach.[12] The first column finds no statistically significant correlation between the distance to freedom and fertility rates in the cross section. Of course, a number of variables are correlated with both the distance to freedom and fertility rates that may bias this estimation; for example, the "breeding states" had high levels of fertility and a low distance to freedom. The second column includes county fixed effects, so identification arises from changes in the distance to freedom and fertility rates. With county fixed effects, there is a negative and statistically significant relationship between the distance to freedom and fertility rates; as expected, the effect declines in magnitude as the distance to freedom becomes increasingly large. The third column includes a year fixed effect to control for the average change in fertility and the average increase in the distance to freedom. The negative relationship between distance to freedom and fertility gets stronger, indicating that the fertility rates in counties with above-average increases in the distance to freedom declined more than the fertility rates in counties with below-average increases in the distance to freedom. The fourth column interacts all control variables with the year to allow for the possibility that the effect of social and economic conditions on fertility changed over time; the negative relationship between distance to freedom and fertility remains negative and statistically significant. Finally, the fifth column includes state-year fixed effects so that identification arises only from across-county deviations from the state average in changes in fertility and the distance to freedom; while the standard error increases, the estimated negative coefficient remains statistically significant and of a comparable size (although the quadratic term is no longer statistically significant).[13]

Hence, consistent with women reducing their fertility because of the possibility of escape, there is a strong negative correlation between the distance to freedom and fertility rates. Furthermore, the size of the estimated coefficients is economically significant; using the preferred specification from column 4, a 100-mile increase in the distance to freedom at the average distance to freedom is associated with a 5.1% $\left(\frac{0.068-2\times0.004\times3.34}{0.814}\right)$ decline in fertility.[14] Furthermore, the estimated nonlinear effect seems reasonable; along the border with freedom, a 100-mile increase in the distance to freedom is associated with an 8.4% $\left(\frac{0.068}{0.814}\right)$ decline in freedom, while the effect falls to 0 when the distance to freedom reaches 850 miles. Because the FSL increased the distance to freedom from on average 210 miles to 443 miles, the results suggest that the FSL resulted in a

[12] I calculate the standard errors using the Jeanty (2012) command *sphac* with a Barlett kernel and a 100-mile bandwidth; the results are nearly identical if I use a 50-mile bandwidth. These standard errors tend to be more conservative than standard errors clustered at the state-county level.

[13] When state-year fixed effects are included, the identification assumption requires that slaves had sufficiently accurate knowledge of the effect of the FSL on their distance to freedom so that slaves living in different parts of the same state would on average differ in their perception of the change in the distance to freedom. To avoid this strong assumption, in the remainder of the paper, I use the the year fixed-effect regression as my preferred specification.

[14] A back-of-the envelope calculation suggests that this estimated effect is consistent with the slaves placing a large value on freedom. Suppose that mother's utility function is logarithmic in the number of children and the relative value of children, while free to children, while enslaved is equal to some constant $V_{free} > 1$. Then equation (1) implies that V_{free} can be written as

$$V_{free} = \frac{\frac{\partial n^*(d)}{\partial d}\,(1 - P(d)) + P'(d)\, n^*}{P'(d)\, n^* - \frac{\partial n^*(d)}{\partial d} P(d)}.$$

This expression is intuitive: all else equal, the greater the value enslaved women placed on freedom, the more they reduced their fertility in response to an increase in the distance to freedom. Given estimates of the probability of escape as a function of distance $P(d)$, observed fertility n^*, and the estimated effect of distance to freedom on fertility (see table 10 in the online appendix for details), the value of children when free is estimated to be eleven times as large as the value of children in slavery.

TABLE 4.—HETEROGENEOUS EFFECTS OF DISTANCE TO FREEDOM ON SLAVE FERTILITY

	(1)	(2)	(3)	(4)	(5)
Distance to freedom (100 miles)	−0.068***	−0.063**	−0.069***		
	(0.026)	(0.026)	(0.026)		
Distance to freedom squared	0.004*	0.005*	0.004*	0.002	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Distance × Plantation has more than 10 slaves		−0.017**			−0.017**
		(0.008)			(0.008)
Distance × Female Slaveholder			0.028**		0.027**
			(0.012)		(0.012)
Distance × Male Slaveholder			−0.000		−0.000
			(0.007)		(0.007)
Distance × Upper South				−0.080**	−0.076**
				(0.031)	(0.031)
Distance × Middle South				−0.061**	−0.058**
				(0.025)	(0.026)
Distance × Deep South				−0.062*	−0.059*
				(0.032)	(0.032)
Distance × Peripheral South				−0.009	−0.003
				(0.046)	(0.046)
Plantation and county controls	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Controls × Year	Yes	Yes	Yes	Yes	Yes
Observations	26,481	26,481	26,481	26,481	26,481
R^2	0.614	0.614	0.614	0.614	0.614
Mean fertility	0.814	0.814	0.814	0.814	0.814

The dependent variable is the ratio of the number of children younger than age 5 to the number of women aged 16 to 44 on a plantation. Each observation is a plantation with at least one women aged 16 to 44 in a particular year; plantations are weighted by the number of slaves using a GLS procedure that allows an arbitrary correlation in fertility within a plantation. Plantation controls include the total number of slaves; indicator variables for whether there were one, two, three, four, or five to ten slaves in the household; the fraction of potential mothers under the age of 30; the fraction of adults who were male; an indicator for whether the plantation was rural; and the sex of the slaveholder. County controls include whether the plantation was rural; the value of cotton, rice, tobacco, sugar, and total agricultural production; the change in total agricultural production over the past ten years; the adult white and slave populations; the change in the white and slave populations over the past ten years; and indicator variables for whether there was railroad or water transportation access in the county. Since county-level data are missing for some counties, missing variables are set equal to 0 and indicator variables for missing values are included to control for level differences. Controls × Year indicates that interactions with all demographic and county control variables and the year 1860 are included to allow the control variables to have different effects in 1850 and 1860. Standard errors allowing for spatial correlation between plantations (using a Barlett kernel with a 100-mile bandwidth) are reported in parentheses. Statistically significant at *10%, **5%, ***1%.

12.0% $\left(\frac{0.068\times(4.43-2.10)-0.004\times(4.43^2-2.10^2)}{0.814}\right)$ decline in fertility on average.

C. *Heterogeneous Effects*

This section examines how the negative relationship between fertility and the distance to freedom varied across plantations.

Larger plantations provided mothers with a greater support network (Hine, 1979; White, 1999) and reduced the oversight of an individual slave's actions (Fogel & Engerman, 1974). In the second column of table 4, I allow the effect of the distance to freedom to depend on whether a plantation has more than ten slaves. Although there is a negative relationship between distance to freedom and fertility for smaller plantations, this negative effect was 27% $\left(\frac{0.017}{0.063}\right)$ larger on plantations with more than ten slaves, suggesting that slaves on large plantations were better able to control their own fertility.

The Schedule 2 data report the name of the plantation owner, from which I can deduce the sex of the plantation owner.[15] If plantations run by women treat their female slaves better, there may be less of an incentive to escape, reducing the incentive of mothers to lower their fertility. The third column of table 4 shows that consistent with slaves being less concerned with escape when they are better treated, the negative relationship between fertility and distance is 41% $\left(\frac{0.028}{0.069}\right)$ smaller on on plantations with female slave owners than on other plantations.

Finally, I estimate the effect of distance on fertility separately for the Upper South (Delaware, Kentucky, Maryland, North Carolina, Virginia, and West Virginia), the Middle South (Missouri, Arkansas, and Tennessee), the Deep South (Alabama, Georgia, Louisiana, Mississippi, South Carolina), and the Peripheral South (Texas and Florida). The fourth column of table 4 presents the results. In all regions except the Peripheral South,[16] there exists a negative and statistically significant relationship between the distance to freedom and fertility, although the effect is strongest in the Upper South, where slaves were likely most aware of the change in the distance to freedom due to the FSL. The fifth column of table 4 shows that including all interactions simultaneously does not affect the results.

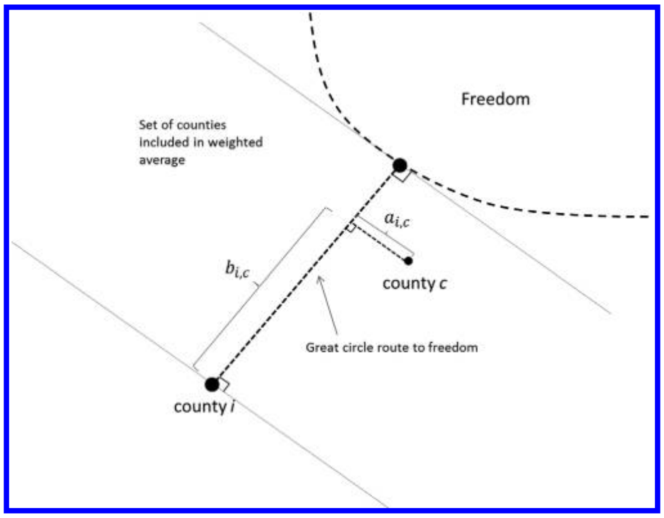
D. *Difficulty of the Route*

In this section, I construct a measure of the distance to freedom that incorporates the difficulty and the uncertainty of the route chosen.

[15] To do so, I match the first name of the owner with the 200 most common male and female names in 1880 from (SSA, 2012). I successfully identified the sex of half the owners; of those identified, 20% were female.

[16] Because the FSL did not affect the distance to freedom in most of Texas since escape to Mexico was an option, identification of the relationship relies almost entirely on Florida.

FIGURE 2.—CALCULATING THE DIFFICULTY OF THE ROUTE



This figure presents the methodology of determining the difficulty of the route to freedom. The difficulty of the route in county i according to some county-level characteristic X_c is a weighted average of X_c across all counties between county i and freedom, where the weight is lower the greater the distance from county c to the great circle route ($a_{i,c}$). To take into account the uncertainty of the route taken, the bandwidth of the kernel is larger the greater the distance the nearest point along the great circle route to county c is from county i ($b_{i,c}$). Only counties for which $b_{i,c}$ is nonnegative and less than the distance to freedom are included in the weighted average.

Define the difficulty of escape from a county i according to some county-level characteristic X_c as

$$D_i^X = \sum_{c=1}^{C} 1\{0 \leq b_{i,c} \leq d_i\} w\left(a_{i,c}, b_{i,c}\right) X_c,$$

where w is a kernel function; $a_{i,c}$ measures how far c is from the great circle route, and $b_{i,c}$ measures how far c is along the great circle route (see figure 2).[17] This formulation has a simple interpretation. The difficulty at any point along the route is a weighted average of all counties nearest to that point, where the closer counties (i.e., those with lower $a_{i,c}$) are given higher weights. Because the uncertainty of the route increases as one moves farther away from the origin, the bandwidth of the kernel increases as $b_{i,c}$ increases. The total difficulty of a route is simply the average difficulty across all points along the route.

Table 5 examines how the difficulty of a route affects the relationship between the distance to freedom and fertility. For comparability across the columns, each difficulty measure is converted to a z-score with mean 0 and standard deviation 1.

Access to waterways and railroads along the route may have affected the difficulty of escape, as these were common means of escape (Siebert, 1898). The first and second columns of table 5, however, find no statistically significant effect of either on distance to freedom.

The support a slave could expect to receive on the route was also an important determinant of the difficulty of escape. To measure support for slavery, I calculate the average (proslavery) Democratic vote share in the 1848 presidential election along the path to freedom.[18] The third column of table 5 indicates that the greater the support of slavery along the route, the more fertility declined with distance, suggesting that escaping through proslavery territory was more difficult. The effect is substantial: a 1 standard deviation increase in the support for slavery nearly doubles the negative correlation between distance to freedom and fertility, increasing the magnitude of the coefficient from -0.043 to -0.072.

A larger fraction of the population of free blacks or slaves along a route reduced the conspicuousness of a runaway slave (Gara, 1996); however, areas with a greater concentration of slaves were more heavily patrolled by slave catchers (Franklin & Schweninger, 2000). Columns 4 and 5 show no statistically significant effect of either on the distance to freedom.

The sixth column of table 5 reports a regression including all the measures of difficulty; the results are similar. In all columns of table 5, the relationship between fertility and the distance to freedom is negative and statistically significant, suggesting that the main result is robust to controlling for the difficulty of the route.

VI. Placebo Tests and Alternative Explanations

Even with county and year fixed effects, the estimates of the relationship between fertility and distance to freedom may be subject to omitted variable bias. Figure 1 shows that change in the distance to freedom is greater in the West than the East, so that unobserved variables correlated with longitude and changes in fertility are especially problematic.

Table 6 regresses a wide variety of county characteristics on the distance to freedom, controlling for year and county fixed effects. Counties with larger-than-average increases in the distance to freedom also had statistically significant larger-than-average increases in total agriculture production and adult white populations and lower-than-average changes in the rate of slave migration. These results suggest that an unobservable correlated with both economic and demographic changes and fertility may be driving the results.

To address the concern of omitted variable bias, I first examine the effect of distance to freedom on three placebo groups whose fertility should not have been reduced by the change in distance to freedom. I then consider several alternative explanations in detail.

A. Placebo Tests

If slaves did not adjust their fertility rates in expectation that the FSL would be passed, then fertility decisions made prior to the FSL should not be affected by the FSL. The first column of table 7 presents the results of regression (2) when

[17] In the results that follow, I assume that w is the gaussian kernel, $w\left(a_{i,c}, b_{i,c}\right) = \frac{1}{C_i}\frac{1}{cb_{i,c}}\exp\left(-\frac{1}{2}\frac{a_{i,c}^2}{c^2 b_{i,c}^2}\right)$, where C_i is a normalization to ensure the weights sum to 1 and c determines how quickly the bandwidth increases with $b_{i,c}$. I choose $c = 0.2$ so that after traveling 100 miles from the origin, the probability of being within 20 miles of the great circle route is 68.2%.

[18] One of the major issues of the 1848 election was the expansion of slavery into new territories; Democratic candidate Lewis Cass was pro-expansion; antislavery Democrats quit the party and formed the Free Soil party.

TABLE 5.—DIFFICULTY OF ROUTE

	(1)	(2)	(3)	(4)	(5)	(6)
Distance to freedom (100 miles)	−0.092**	−0.066**	−0.043*	−0.067***	−0.062**	−0.075*
	(0.039)	(0.029)	(0.025)	(0.026)	(0.026)	(0.042)
Distance to freedom squared	0.008*	0.004	0.004	0.004	0.003	0.006
	(0.004)	(0.003)	(0.002)	(0.003)	(0.003)	(0.004)
Distance × Railroads	−0.015					−0.021
	(0.014)					(0.014)
Distance × Waterways		0.001				−0.001
		(0.006)				(0.008)
Distance × Support of Slavery			−0.029***			−0.038***
			(0.008)			(0.009)
Distance × Free Black Fraction				−0.004		−0.009
				(0.006)		(0.007)
Distance × Slave Fraction					−0.009	−0.016
					(0.011)	(0.012)
Plantation and county controls	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls × Year	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26,467	26,467	26,431	26,467	26,467	26,431
R^2	0.614	0.614	0.614	0.614	0.614	0.614
Mean Fertility	0.814	0.814	0.814	0.814	0.814	0.814

The dependent variable is the ratio of the number of children younger than age 5 to the number of women aged 16 to 44 on a plantation. Each observation is a plantation with at least one women aged 16 to 44 in a particular year; plantations are weighted by the number of slaves using a GLS procedure that allows an arbitrary correlation in fertility within a plantation. For comparability across regressions, the difficulty variables are Normalized to have a mean of 0 and standard deviation of 1. The difficulty variables are included in levels as well to control for any direct correlation between fertility and the difficulty of the route. Plantation controls include the total number of slaves; indicator variables for whether there were one, two, three, four, or five to ten slaves in the household; the fraction of potential mothers under the age of thirty, the fraction of adults who were male; an indicator for whether the plantation was rural; and the sex of the slaveholder. County controls include whether the plantation was rural; the value of cotton, rice, tobacco, sugar, and total agricultural production; the change in total agricultural production over the past ten years; the adult white and slave populations; the change in the white and slave populations over the past ten years; and indicator variables for whether there was railroad or water transportation access in the county. Since county-level data are missing for some counties, missing variables are set equal to zero and indicator variables for missing values are included to control for level differences. Controls × Year indicates that interactions with all demographic and county control variables and the year 1860 are included to allow the control variables to have different effects in 1850 and 1860. Standard errors allowing for spatial correlation between plantations (using a Barlett kernel with a 100-mile bandwidth) are reported in parentheses. Statistically significant at *10%, **5%, ***1%.

the dependent variable is the ratio of the number of children aged 10 to 14 to the number of potential mothers aged 21 to 49. While distance to freedom is negatively correlated with the fertility prior to the FSL, the estimated coefficient is tiny (one-tenth the size of the estimated effect for children born after the FSL) and statistically insignificant.[19]

White fertility should also not be directly affected by the change in the distance to freedom directly. The second column of table 7 indicates that an increase in the distance to freedom was correlated with a slight but statistically insignificant increase in white fertility.

Finally, if the father of the child was white, distance to freedom should not affect fertility for at least two reasons: first, if the child was a result of rape, mothers would have had little control over their fertility; second, if the liaison was consensual, mothers may have had less reason to attempt to escape.[20] Because Schedule 2 reported the skin color of each slave, if a child is reported as mulatto and all the potential mothers on the plantation were black, then it is likely that the child's father was white.[21] To see how fertility decisions responded to the distance to freedom when the father was white, I make the dependent variable the ratio of the number

TABLE 6.—CORRELATION BETWEEN DISTANCE TO FREEDOM AND COUNTY CHARACTERISTICS

	(1)
Total agricultural production	0.645**
	(0.272)
Change in agricultural production	−0.159
	(0.254)
Adult white population	0.147**
	(0.071)
Adult slave population	0.051
	(0.043)
Change in adult white population	−0.106
	(0.092)
Change in adult slave population	−0.096**
	(0.048)
Extent of child age-heaping	−0.068
	(0.819)
Extent of total age-heaping	−0.610
	(0.630)
Number of fugitive slaves	0.012
	(0.013)
Fraction of slaves over 60 years old	−0.002
	(0.001)
Observations	1,940

Each row is a separate regression, where the dependent variable is indicated. The reported coefficient is the coefficient on the distance to freedom. Year and county fixed effects are included in all regressions. Each observation is a county in a particular year. Robust standard errors are reported in parentheses. Statistically significant at *10%, **5%, ***1%.

[19] In the online appendix, I present the effect of distance to freedom on each age of child, which allows me to flexibly assess when the distance to freedom begins to affect fertility. The oldest age for which there is consistently a negative and statistically significant relationship between number of children and distance to freedom is ten years, which is the first cohort of children that could have possibly been affected by the FSL.

[20] Indeed, there is some evidence of slave women negotiating better treatment in exchange for sex (White, 1999).

[21] Enumerators were instructed to record any child as mulatto if he or she was not entirely of African descent. However, the question was asked of the slaveholder, who may have been reluctant to so clearly indicate which children were his. Hence, it is likely that the number of children who had white fathers was underestimated. Among plantations with children and without mulatto mothers, 8.2% of children were mulatto, suggesting the incidence of miscegenation was widespread. This figure is consistent with estimates from previous studies (e.g., David & Stampp, 1976).

TABLE 7.—PLACEBO TESTS

	Slave Children 10–14/ Women 21–49 (1)	White Children under 5/ Women 16 to 44 (2)	Mulatto Children under 5/ Women 16 to 44 (3)
Distance to freedom (100 miles)	−0.006	0.010	0.005
	(0.027)	(0.030)	(0.012)
Distance to freedom squared	0.002	0.001	−0.001
	(0.003)	(0.003)	(0.001)
Plantation and county controls	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Controls × Year	Yes	Yes	Yes
Observations	22,602	21,628	21,461
R^2	0.613	0.606	0.166
Mean Fertility	0.903	0.908	0.069

The dependent variable is indicated above each column. Each observation is a plantation with at least one women aged 16 to 44 in a particular year; plantations are weighted by the number of slaves using a GLS procedure that allows for an arbitrary correlation in fertility within a plantation. Plantation controls include the total number of slaves; indicator variables for whether there were one, two, three, four, or five to ten slaves in the household; the fraction of potential mothers under the age of 30; the fraction of adults who were male; an indicator for whether the plantation was rural; and the sex of the slaveholder. County controls include whether the plantation was rural; the value of cotton, rice, tobacco, sugar, and total agricultural production; the change in total agricultural production over the past ten years; the adult white and slave populations; the change in the white and slave populations over the past ten years; and indicator variables for whether there was railroad or water transportation access in the county. Since county-level data are missing for some counties, missing variables are set equal to 0, and indicator variables for missing values are included to control for level differences. Controls × Year indicates that interactions with all demographic and county control variables and the year 1860 are included to allow the control variables to have different effects in 1850 and 1860. Standard errors allowing for spatial correlation between plantations (using a Barlett kernel with a 100-mile bandwidth) are reported in parentheses. Statistically significant at *10%, **5%, ***1%.

TABLE 8.—ECONOMIC AND DEMOGRAPHIC CHANGES AND THE DISTANCE TO FREEDOM

	All Controls (1)	No Economic Controls (2)	No Demographic Controls (3)
Distance to freedom (100 miles)	−0.068***	−0.049**	−0.053**
	(0.026)	(0.020)	(0.024)
Distance to freedom squared	0.004*	0.002	0.004*
	(0.003)	(0.002)	(0.002)
Plantation and county controls	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Controls × Year	Yes	Yes	Yes
Observations	26,481	26,481	26,481
R^2	0.614	0.614	0.614
Mean fertility	0.814	0.814	0.814

The dependent variable is the ratio of the number of children younger than age 5 to the number of women aged 16 to 44 on a plantation. Each observation is a plantation with at least one women aged 16 to 44 in a particular year; plantations are weighted by the number of slaves using a GLS procedure that allows for an arbitrary correlation in fertility within a plantation. Plantation controls include the total number of slaves; indicator variables for whether there were one, two, three, four, or five to ten slaves in the household; the fraction of potential mothers under the age of 30; fraction of adults who were male, an indicator for whether the plantation was rural; and the sex of the slaveholder. County controls include whether the plantation was rural; the value of cotton, rice, tobacco, sugar, and total agricultural production; the change in total agricultural production over the past ten years; the adult white and slave populations; the change in the white and slave populations over the past ten years; and indicator variables for whether there was railroad or water transportation access in the county. Since county-level data are missing for some counties, missing variables are set equal to 0, and indicator variables for missing values are included to control for level differences. In column 2, all controls are included except all vaules of agricultural output (and their interactions with year 1860); in column 3, all controls are included except the level and change in the white and slave population (and each variable's interaction with year 1860). Controls × Year indicates that interactions with all demographic and county control variables and the year 1860 are included to allow the control variables to have different effects in 1850 and 1860. Standard errors allowing for spatial correlation between plantations (using a Barlett kernel with a 100-mile bandwidth) are reported in parentheses. Statistically significant at *10%, **5%, ***1%.

of mulatto children under the age of 5 to women aged 16 to 44 and confine the sample to plantations without mulatto women of these ages. The third column of table 7 presents the results. When the father of the child is white, there is no relationship between distance to freedom and fertility.

The placebo tests suggest that any omitted variables must only be correlated with the fertility of slave children born after the FSL and not with white fertility, slave children born prior to the FSL, or slave children with white fathers. I examine several such alternative explanations below.

B. *Economic and Population Changes*

It is possible that unobserved economic or population changes may be creating omitted variable bias. For example, the marginal product of labor may have increased more in the West than in the East, increasing the opportunity cost of having children and causing fertility rates to disproportionately decline in areas where the change in the distance to freedom was the largest. Another possible story is that less fertile slaves were sold westward without their children.

While plausible, neither economic nor population changes appear to be driving the relationship between distance to freedom and fertility. Since the regressions already include economic and population controls, to the extent that the included economic and population controls proxy for omitted variables, if the correlation between distance to freedom and fertility is due to omitted variable bias, then the correlation should get stronger when the controls are excluded.[22] Table 8 shows that excluding either economic or population controls

[22] McCallum (1972) formalizes this argument by showing that the bias of an estimate is always (weakly) reduced when the proxy of a variable is included if the proxy measures the true variable with classical measurement error.

weakens the correlation between the distance to freedom and fertility, suggesting that omitted variable bias is unlikely to be driving the results.

C. *Child Mortality*

Since I measure fertility using surviving children, changes in child mortality will be interpreted as changes in fertility, which may lead to omitted variable bias. For example, if child mortality fell less in the western part of the South than the eastern part, I would erroneously conclude that changes in fertility are negatively correlated with changes in distance to freedom. To the extent that mortality of younger and older children and white and slave children is correlated, however, the placebo tests should suffer the same bias. Indeed, Steckel (1979) finds that the reduction in child mortality of slaves from the 1840s to the 1850s was most substantial for children aged 5 to 14; because the number of children aged 10 to 14 is uncorrelated with the change in the distance to freedom, it is unlikely that unobserved child mortality is driving the results.

D. *Underenumeration*

One potential concern with measuring fertility is the systematic underenumeration of young children, a problem that plagued early censuses (Steckel, 1991; Knights, 1991). While measuring underenumeration directly is difficult, I am able to observe the extent to which there is age heaping (i.e., disproportionate clustering of reported ages on certain values) in each county. It seems reasonable to expect that in areas where underenumeration problems are substantial, so too are age-heaping problems, as slave owners or enumerators who fail to account for some children also are less accurate in identifying the ages of the ones for whom they do account.

To see if age heaping is systematically correlated with distance to freedom, for each county in each year, I calculate the Myers's blended index of digit preference (Myers, 1940) and then regress it on the distance to freedom. The results are presented in the seventh and eighth rows of table 6. The results indicate that counties with larger changes in the distance to freedom had greater reductions in the problem of age heaping (although the correlation is statistically insignificant). To the extent that age heaping is positively correlated with underenumeration, this suggests that underenumeration, if anything, is biasing the negative correlation between fertility and distance to freedom toward 0.

E. *Selection*

The sample of analysis is necessarily only the slaves who have not escaped. Since the model predicts that mothers are more likely to escape the lower their fertility, there is reason to believe that the observed slaves likely had greater fertility rates than the overall slave population; hence, my results may be biased due to sample selection. In particular, if the decline in escapes between 1850 and 1860 was greater in the western parts of the South than the eastern parts of the South, I might observe a spurious correlation between fertility and distance to freedom. Given the low probability of escape, it seems unlikely that such a bias would be driving the entirety of the results. Furthermore, the ninth row of table 6 shows no statistically significant relationship between the change in the observed number of fugitive slaves and the change in the distance to freedom, which is probably a result of there being so few observed fugitive slaves.

F. *Factors Outside the Mother's Control*

Increases in the distance to freedom may have effects on other factors outside a mother's control that indirectly affect her fertility decision. To the extent that this is the case, while increases in the distance to freedom may still cause reductions in fertility, I would be falsely attributing the reason of the reduction to the choice of the mother.

Perhaps the most important of such factors would be that the observed decline in fertility with the distance to freedom reflects slave owner interference in the fertility decision. As mentioned in section II, slave owners had strong financial incentives to increase slave fertility, and there exists much historical evidence that owners attempted to interfere with the fertility decision in a number of ways. However, because an increase in the distance to freedom reduces the probability of escape, it strengthens the property rights an owner has over a mother and her children. This should increase the value of children to the owner; to the extent the owner is able to influence fertility, fertility rates should increase rather than decrease with the distance to freedom. In addition, to the extent that owners had greater influence on the fertility decision when the father of the child is white, if slave owners preferred women to have fewer children the greater the distance to freedom, we should observe a stronger negative relationship between distance to freedom and fertility for children with white fathers. That we see a (small) positive relationship suggests, if anything, that owners would prefer fertility to increase with the distance to freedom. Hence, it is unlikely that slave owners are responsible for the observed negative relationship between distance to freedom and fertility.

A related factor beyond the mother's control is how well she was treated by the owner. It may be the case that an increase in the distance to freedom leads owners to treat the enslaved women more poorly, resulting in a decline in fertility. However, because increases in the distance to freedom increase the value of slaves to owners by providing more secure property rights over them, this provides a greater incentive for owners to treat their slaves better. Additionally, indirect evidence suggests that there was no relationship between the quality of care and distance to freedom: because elderly slaves were more likely to perish as a result of declines in the quality of care, one measure of the quality of care is the fraction of slaves who are elderly.[23] The last row of table 6 shows that there is no statistically significant relationship between the change in the fraction of elderly slaves and the change in the distance to freedom.

VII. Conclusion

Prior to the passage of the Fugitive Slave Law of 1850, fugitive slaves could expect to become free upon reaching the North; after the FSL was passed, however, freedom could only be guaranteed upon making it to Canada. Because women derived greater utility from children when they were free, the optimal number of children declined as the distance to freedom increased. Exploiting the FSL and the particularities of U.S. geography, this paper finds a statistically significant negative relationship between distance to freedom and slave fertility. The magnitude of the relationship is large: fertility decreased on average by 5.1% for each additional 100 miles to freedom. This negative relationship between fertility and distance to freedom was stronger on larger plantations, when the slave owner was male, and when the route was more difficult. When the father of the child was white, the relationship between distance and fertility disappears. A similar relationship between distance to freedom is not observed for white fertility or for children born prior to the FSL. Several alternative explanations are unable to explain the correlation.

Taken together, these results provide evidence that women systematically varied their fertility with the probability of escape. While only a few women actually secured their freedom by running away, this paper provides new evidence that the promise of freedom provided an important incentive for the many more who remain enslaved.

[23] While Southern states had laws requiring owners to provide health care for old slaves, as Stacey (1997) notes, these laws were infrequently enforced.

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