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X

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AND THE WESTWARD EXPANSION
OF SLAVERY, 1850-1860

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THE BREEDING OF SLAVES FOR SALE AND THE WESTWARD
EXPANSION OF SLAVERY, 1850-1860

by

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One of the tenets which distinguishes the "revisionist" approach to the study of American slavery is the assertion that the American slaveowner was able to regard his slaves solely as capital assets: no different in kind from acres of land, from farming implements, or from work animals. According to this view, the Southern planter made his decisions to buy or sell slaves, and to employ them at one task or another based only upon economic criteria without thought of the humanity or inhumanity involved. Because the slaveowner retained slaves for the purpose of employing their labor in a profit-maximizing agricultural enterprise and because the market for his output was quite competitive, only the planter who employed his slaves in the most efficient manner could earn sufficient return to justify their price. The pressure of

The author would like to express his thanks to Harriet Fishlow for advice on several demographic problems, to William Parker and Robert Gallman for the use of data which they collected from the manuscripts of the 1860 Census of Population and Agriculture, and to James Foust and Gavin Wright for providing the information necessary to make use of that data. Robert Fogel and Stanley Engerman kindly made available data on the relative price of slaves which they collected from estate appraisal records. The net migration estimates reported in the appendix were made in collaboration with John Lyons and were part of a larger study conducted by the author, John Lyons, and Richard Roehl. Research assistance was ably provided by Lynnae Wolin and Bruce Vermeulen. The advice and criticism from many of the participants of the conference has encouraged me to revise and, I trust, improve on the original draft. I am particularly indebted to Stanley Engerman, Herbert Klein, Eugene Genovese, Robert Fogel, and C. Van Woodward for suggestions. Financial support was provided by the Computer Center and the Institute of International Studies, both at the University of California, Berkeley. A Ford Foundation Faculty Fellowship enabled the author to devote more time than he might otherwise to this study.

the competitive system made human gestures which were incompatible with maximum economic efficiency a luxury only a few could afford.

It is this competitive mechanism which is used to explain a seeming paradox which arises when comparing the American slave system with those of other places and other times. The blacks in the American South seem to have been better cared for in terms of food, living conditions, and medical attention than slaves in other systems. Yet, the American slave unlike his counterparts in most other countries was stripped of his humanity. He was thought of as subhuman and therefore not deserving of common human dignities. In this respect the American slave seems to have been the most cruelly treated of all. This duality of treatment arose because of the competitiveness of the ante-bellum American economy. It was the market system which adjusted the price of the slave to equal the present discounted value of his future expected labor, and it was this system which guaranteed good physical treatment. The slaveowner was repaid for his care by the high resale value of his property.

For this market to work, however, slaveowners had to be prepared to buy and sell slaves whenever their price fell out of line with their expected value. This meant, among other things, that considerations of the slave's wishes in the matter were out of the question. Husband and wife were separated, and even children were sold separately from their mothers when economics dictated the profitability of such action. If this market in human capital was to work efficiently and smoothly, the

goods traded had to be divorced from their humanity.¹ Only when the black man became regarded as subhuman could the white man treat him as a simple physical asset without troubling his conscience.

A natural implication of this view of the American slave system is that some slaveholders would find it profitable to practice "slave breeding," for the same economic reasons that led some nineteenth-century Southern farmers to practice mule breeding. Since the market value of a young adult field hand undoubtedly exceeded the costs of raising him from childhood, there would be those slaveholders who would see the opportunity to specialize in raising slaves for sale, and many others who would supplement their income from agriculture by the sale of slaves not needed for their labor on the farm.² According to this approach to

¹It should be pointed out that these statements need only apply to the marginal transactors. There can be (and there was in the antebellum South) a sizable number of slaveowners who refuse to participate in the market for slaves and who respect some measure of their slaves' dignity. However, it is in the nature of the economics of such a situation that these individuals will not be able to make the adjustments necessary to conduct their plantations at maximum economic efficiency. Such slaveowners will pay a price for their principles--a lower rate of return on their capital than they could otherwise earn.

²That slave breeding is an implication of an economic model in which slaves are treated by their owners as capital assets was clear to contemporary economists. The most famous discussion is that of John Elliott Cairnes, *The Slave Power: Its Character, Career, and Probable Designs: Being an Attempt to Explain the Real Issues Involved in the American Contest* (London: Parker, Son, and Bourn, 1862). This point was also important to the economic analysis of American slavery by Alfred H. Conrad and John R. Meyer, "The Economics of Slavery in the Antebellum South," *Journal of Political Economy* (April 1958), reprinted in Alfred H. Conrad and John R. Meyer, *The Economics of Slavery and Other Studies in Econometric History* (Chicago: Aldine, 1964). The page references in this article are to the book. Among other points, they concluded that "breeding returns were necessary . . . to make the plantation operations on the poorer lands as profitable as alternative contemporary economic activities in the United States." P. 82.

American slavery, these slaveowners could disregard the questions of the morality and the humanity of such a callous treatment of sexual relations, and of marriage and family ties precisely because they were able to view the slave as simply another form of property, no different in kind than the horses and asses owned by the mule breeder.

Many observers of the American South have commented on this aspect of the economics of slavery, and have presented supporting evidence for the existence of slave breeding from plantation records, diaries, the autobiographies of slaves and ex-slaves, records of slave auctions, and the observation of contemporary travelers.³ This direct evidence, however, is rather limited, perhaps because of the natural reticence that contemporaries would have had in recording details of such practices.⁴ As a result, there is still room for debate about the extent and nature of slave breeding. It appears that those writers who accept the relevance of the theoretical model which treats slaves as capital assets have found the evidence sufficient to conclude that the slaveowner

³Several of the more important commentaries on slave breeding, but by no means an exhaustive list, include Frederic Bancroft, "The Importance of Slave-Rearing," Chapter IV of *Slave-Trading in the Old South* (Baltimore: Furst, 1931); Lewis C. Gray, *History of Agriculture in the Southern United States to 1860*, II (Washington: Carnegie Institute of Washington, 1933), pp. 661-663; and Kenneth M. Stampp, *The Peculiar Institution, Slavery in the Ante-Bellum South* (New York: Knopf, 1956), pp. 245-251.

⁴Kenneth Stampp, for example, has noted that "evidence of systematic slave breeding is scarce indeed, not only because it is unlikely that many engaged in it but also because written records of such activities would seldom be kept." *The Peculiar Institution*, p. 245. Slaveowners frequently denied the charge made by the antislavery movement that breeding was common.

systematically interfered with the sexual life of his slaves.⁵ Other writers, who have not accepted the slave-asset model or who have applied it cautiously, have denied that breeding was extensively practiced. They suggest that while some owners were forced by economic necessity to sell those slaves who were not needed for plantation work when they reached maturity, nevertheless the slaveowners accepted whatever natural increase their slaves presented to them.⁶

One of the implications of the approach which argues that slaves were treated as capital assets and that plantation decisions were made on solely economic grounds, is that arrangements to increase fertility would have been most frequently practiced on the poor lands of the border states and along the Atlantic coast. In these areas the economic returns to agriculture, given the price of slaves and the land-labor ratios observed, were below those obtainable elsewhere in the South.⁷ If the

⁵See, for example, Conrad and Meyer.

⁶This debate over the existence of slave breeding is only a portion of a much wider dispute over the applicability of the competitive market model to the slave economy. For a collection of the more important papers in this debate including Stanley Engerman's review of it see Hugh G. J. Aitken, editor, *Did Slavery Pay? Readings in the Economics of Black Slavery in the United States* (Boston: Houghton Mifflin, 1971).

⁷This is precisely the argument of Conrad and Meyer. In an article on the profitability of slavery, I computed the rate of return implied by the observed agricultural yields, land-labor ratios, and the price of slaves. I found that if only average female fertility is forthcoming, the older areas with poor soils would yield rates of return in the neighborhood of 3.6 to 4.0 percent in 1859. While the highly fertile alluvial soils yielded returns on the average of between 7.1 and 8.7 percent. Richard Sutch, "The Profitability of Ante Bellum Slavery--Revisited," *Southern Economic Journal* (April 1965), Table VIII, p. 376, reprinted in Aitken, p. 240.

slaveowners in these regions were to obtain more typical rates of return on their investment, they would have had to resort to slave breeding to augment their income. The slaveowners in the west where the soils were more fertile could, given the price of slaves and the observed land-labor ratios, on the other hand, earn normal rates of return without resorting to breeding. Presumably, the typical planter in a southwestern state would have preferred to see his female slaves working in the field than to have them indisposed with pregnancy or occupied with children. This suggests that the border states and eastern coastal states would be exporting slaves while the western states would be importing them.

There is conclusive evidence of this regional pattern of slave migration in the Census returns which report much higher rates of population increase in the western slave states than in the eastern or border states. In Table 1 I present the percentage change in population between 1850 and 1860 in each slave state. There is no question that the states with poorer soil were providing slaves for the rapidly growing western regions.

It is possible to infer the magnitude of the migration flows as well as the age and sex distribution of the slaves who were exported across state boundaries, from the Census returns. The appendix to this article details the methodology I have employed to make such estimates. Table 2 presents my estimate of net slave exportation and importation as a percentage of the potential population for each slave state based on these calculations. The estimates suggest that the major exporting

TABLE 1
 DECENNIAL GROWTH RATES OF THE SLAVE AND FREE POPULATIONS
 AND THE NUMBER OF SLAVE OWNERS BY STATES
 1850-1860

	Decennial Rate of Growth		
	Slave Population (percent)	Free Population (percent)	Slave Owners (percent)
Texas	213.9	172.8	182.4
Arkansas	135.9	99.2	91.4
Florida	57.1	63.5	46.4
Mississippi	40.9	19.6	33.9
Louisiana	35.5	37.8	6.6
Missouri	31.5	79.5	26.8
Alabama	26.9	23.4	15.1
ALL SLAVE STATES	23.4	29.2	13.7
Georgia	21.1	13.5	6.8
Tennessee	15.1	9.3	8.8
North Carolina	14.7	13.8	22.5
Kentucky	6.9	20.6	0.7
South Carolina	4.5	6.2	4.3
Virginia	3.9	16.5	- 5.3
Maryland	- 3.5	21.8	-14.1
District of Columbia	-13.6	26.7	-16.8
Delaware	-21.5	23.7	-27.5

Computed from data in the following sources:

United States Census Office (J. D. B. DeBow, Superintendent)
The Seventh Census of the United States: 1850 (Washington,
 Armstrong, 1853), pp. xlii-xliv.

United States Census Office (Joseph C. G. Kennedy, Superintendent),
Population of the United States in 1860 . . . The Eighth Census
 (Washington: Government Printing Office, 1864), pp. 592-597.

United States Census Office (Joseph C. G. Kennedy, Superintendent),
Agriculture of the United States in 1860 . . . The Eighth Census
 (Washington: Government Printing Office, 1864), pp. 224, 247-248.

TABLE 2
THE ESTIMATED RATE OF SLAVE EXPORTATIONS AND IMPORTATIONS
BY STATE, 1850-1860

Exporting States	Exportation Rate ^a (Percent)	Importing States	Importation Rate ^a (Percent)
Delaware	32.6	Texas	130.7
District of Columbia	20.1	Arkansas	79.3
Maryland	19.7	Florida	27.4
Kentucky	15.8	Louisiana	17.4
South Carolina	13.4	Mississippi	12.7
Virginia	12.0	Alabama	3.8
Tennessee	10.3	Missouri	0.1
North Carolina	7.3		
Georgia	2.4		
Average	10.8	Average	19.6

^aDefined as the estimated number of exports or imports as a percentage of the estimated number of slaves who would have resided in the state in 1860 had no migration taken place.

Computed from data presented in the appendix.

states were the border states: Delaware, District of Columbia, Maryland, and Kentucky. South Carolina, Virginia, Tennessee, and North Carolina were also exporting substantial portions of their potential slave populations. The major receiving states were Texas, Arkansas, and Florida. Louisiana and Mississippi were also expanding their slave stocks significantly through importation.

Whether this migration was produced by the exportation of slaves by professional slave traders or by the movement of entire plantations is another issue which has been considerably debated. The fact that only three of the states and the District of Columbia show a decline in the number of slaveholders according to Table 1, and that even in these states the rate of slave exportation exceeded the decline in slaveholdings, suggests that a substantial number of slaves transported across state boundaries left their home plantations, their former masters, and perhaps their families behind them.

The estimates of the export flows by age and sex for the selling states are given in Table 3.⁸ The estimates of the net imports into the buying states (excluding Missouri) are presented in Table 4. The tables indicate that over one-quarter of a million slaves were exported from the eight selling states to the six buying states during the last decade

⁸Henceforth, I use the terms exporting states and selling states interchangeably. Likewise, the term buying state will be used to refer to the importing states. The division made in Table 2 is used to define the two groups. However, Missouri is frequently excluded from consideration since on balance it showed very little net importation.

TABLE 3

NET EXPORTS OF SLAVES FROM SELLING STATES BY AGE AND SEX, 1850-1860

Age in 1860	Delaware, Maryland, District of Columbia, and Virginia		North and South Carolina		Kentucky and Tennessee		Georgia		Total Selling States	
	M	F	M	F	M	F	M	F	M	F
Under 10	6582	8444	5342	4131	11955	11009	866	-186	24745	23398
10-14	4076	4403	5607	5807	2991	2809	1119	322	13793	13341
15-19	6257	7068	6584	7871	3954	4625	758	649	17553	20213
20-29	15974	15962	14044	11768	11057	11102	2941	2128	44016	40960
30-39	6212	4889	4916	4553	6103	4021	1395	883	18626	14346
40-49	2642	1856	2738	2724	2068	1520	123	30	7571	6130
50-59	1969	1359	-704	-595	-318	161	681	584	1628	1509
60 and over	2071	1141	2135	2208	1028	994	-559	-325	4675	4018
Age unknown	238	186	6216	5933	32	25	92	43	6578	6187
Total	46021	45308	46878	44400	38870	36266	7416	4128	139185	130102
	91,329		91,278		75,136		11,544		269,287	

Based on data presented in the Appendix.

TABLE 4

NET IMPORTS OF SLAVES INTO BUYING STATES BY AGE AND SEX, 1850-1860

Age in 1860	Texas and Arkansas		Mississippi and Louisiana		Florida		Alabama		Total Buying States	
	M	F	M	F	M	F	M	F	M	F
Under 10	13130	12983	7930	5476	1571	1359	2518	3466	25149	23284
10-14	10489	10390	2030	1093	832	903	-93	156	13258	12542
15-19	10494	11179	5135	6600	815	779	568	1333	17012	19891
20-29	18939	18009	20879	19224	1788	1602	2868	2874	44474	41709
30-39	9736	9220	7841	3868	837	969	1247	806	19661	14590
40-49	5016	5171	1891	-222	555	497	-9	344	7453	5790
50-59	2349	2147	-352	-580	299	278	-659	-298	1637	1547
60 and over	2027	1971	1938	1391	142	170	490	348	4597	3880
Age unknown	212	225	6546	5921	-122	79	-3	3	6633	6228
Total	72392	71295	53838	42771	6717	6363	6927	9032	139874	129461
	143,687		96,609		13,080		15,959		269,335	

Based on data presented in the Appendix.

of slavery, nearly one slave out of every fifteen. These slaves represented over 12 percent of the value of the potential slave population had no migration been allowed. A conservative estimate of their sale prices values these slaves at \$200 million, or approximately \$20 million per year.⁹

In Table 5 the interstate flows are presented as a percentage of their respective cohorts. The pattern of exports across the age categories reveals that slaves between 15 and 39 in 1860 were exported out of the selling states at a much higher rate than slave children or the elderly. This implies that the slaves were not primarily exported in family units complete with their children and their parents. Rather it appears that a substantial exportation of young adults without children or parents took place.

The sexual distribution of exported slaves is also suggestive. We would expect the slave breeder who did not respect the custom of monogamous sexual relations for his slaves to sell more men than women. Consistent, then, with the suggestion that the exporting states had a greater tendency to breed slaves than the buying states is the fact that 7 percent more males than females were exported. Males were in excess among exports by 14.3 percent in the age class 20 to 49. Among those

⁹These figures are based on the relative prices of slaves by age and sex compiled by Robert Fogel and Stanley Engerman and an assumed value of \$1,000 for an average male between 20 and 29 years of age. Since Fogel and Engerman estimate that the average price in Louisiana of a male of this age in 1850 was \$1,079.63 and the average price of a prime male field hand over the decade 1851-1860 has been estimated by Conrad and Meyer to be \$1,424.00 (p. 76), I feel the estimate given is a lower bound.

TABLE 5
 EXPORTATION AND IMPORTATION RATES BY AGE AND SEX COHORTS,
 1850-1860

Age in 1860	Exports of Selling States as a Percentage of Their 1850 Population Surviving to 1860		Imports of Buying States as a Percentage of Their 1850 Population Surviving to 1860	
	Male	Female	Male	Female
Under 10	6.4	6.0	12.3	11.1
10-14	7.6	7.7	14.3	14.9
15-19	12.1	13.4	24.8	28.0
20-29	18.7	18.0	40.7	39.4
30-39	13.8	10.5	25.6	18.9
40-49	9.0	7.2	14.0	11.4
50-59	3.3	3.2	5.8	6.1
60 and over	9.9	8.4	23.0	21.2

Based on data presented in the Appendix.

slaves who were 20 to 29 in 1850 and 30 to 39 ten years later, 29.8 percent more males than females were exported.

The evidence on slave migration is ample to conclude that a substantial interstate trade in human beings took place and that eastern and border state planters sold slaves to this trade. However, from this evidence alone, we can deduce nothing about the nature of the slave breeding operation. Was it merely the practice of selling-off the surplus slaves, or did the slaveowner interfere in the conjugal and sexual life of his slaves in order to increase the number of children born?

It is in this latter sense that the term "slave breeding" is properly applied.¹⁰ Some historians object to the use of this term. They suggest that it is dehumanizing and carries with it the implication that "barnyard" techniques were employed. That the term is dehumanizing is granted. However, that is precisely the point. It would have been dehumanizing to encourage increased fertility by any technique, whether it consisted solely of rewards offered for childbearing or was carried to the extreme of forced matings. If the slaveholder did interfere in the sexual life of his slaves, it was because he was willing to dehumanize them for the sake of his own profit.

¹⁰I believe this is the sense in which Conrad and Meyer have used the term. In any case, the assumptions they employed to compute the rate of return to breeding imply such enormously high birth rates that positive mechanisms to promote fertility would seem to have been required to achieve them. N. G. Butlin, *Ante-Bellum Slavery, A Critique of a Debate* (Canberra: Australian National University, 1971), pp. 32 and 40.

The techniques employed in this article to examine the extent and nature of slave breeding are indirect. They are based on the limited demographic data contained in the Federal Census Returns of 1850 and 1860. They can tell us very little about the devices employed to encourage fertility. The issue of whether the "barnyard" implications are warranted cannot be determined from the census data I have chosen to examine. In any case, it is not my intention that the term should carry such implications. I use it to cover all practices which were intended to increase the number of children born over and above the numbers otherwise obtainable.

Despite the richness of the information available in the Censuses of 1850 and 1860 on the free population, only limited data were collected on the slave population. The slave schedules list only the owner's name and county of residence and the sex, age, and color (black or mulatto) of each slave owned. The slaves were not grouped into families nor were their names given. Yet the age-sex distributions alone allow us to compute a crude index of fertility by taking the ratio of slave children under one year of age to the number of women of childbearing age. In Table 6 we present these ratios for both census years for each of the slave states.¹¹ The states are ordered in the Table by the percentage of their slave population which was exported during the decade as reported in Table 2.

¹¹For most purposes I have combined the two states of Maryland and Delaware with the District of Columbia because of their small size and the urban nature of the District.

TABLE 6
 THE INFANT-WOMAN RATIO FOR THE SLAVE POPULATION
 1850-1860

State	Number of Children Under One per Thousand Women of Childbearing Age ^a		
	1850	1860	Average
Maryland, Delaware and the District of Columbia	162	160	161
Kentucky	182	200	191
South Carolina	137	163	150
Virginia	152	178	165
Tennessee	175	189	182
North Carolina	178	178	178
Georgia	145	174	159
Average: selling states	157	177	167
Missouri	180	188	184
Alabama	134	162	148
Mississippi	129	151	140
Louisiana	102	132	117
Florida	130	160	145
Arkansas	134	163	148
Texas	132	170	151
Average: buying states ^b	124	153	139

^aThe definition of the period of childbearing is somewhat arbitrary. I have adopted the practice of counting all women between the ages of twenty and thirty-nine and one-half of the women between fifteen and nineteen.

^bExcluding Missouri.

Computed from data in the following sources:

United States Census Office (J.D.B. DeBow, Superintendent), *The Seventh Census of the United States: 1850* Washington: Armstrong, 1853), pp. xlii-xliv.

United States Census Office (Joseph C. G. Kennedy, Superintendent), *Population of the United States in 1860 . . . The Eighth Census* (Washington: Government Printing Office, 1864), pp. 594-595.

An examination of the table will reveal that there is a tendency for the selling states to have a higher "fertility" ratio than the buying states. In 1850 the only buying state with a fertility ratio higher than South Carolina, the least fertile of the selling states, was Arkansas. After ten years this pattern apparently had not changed. The states with the lowest ratios of infants to women (Louisiana, Mississippi, and Florida) were among the buying states. At the same time the selling states such as Virginia, Kentucky, North Carolina, and Tennessee have fertility ratios which rank relatively high.¹²

It would be a mistake, however, to place too much reliance on comparisons of the ratio of infants to women. This ratio does not measure fertility accurately because of two important defects. The numerator of the ratio includes only those infants alive at the date of the census, thus differential rates of infant mortality will distort the measure. Moreover, there is considerable evidence that the census has consistently underenumerated the number of infants relative to other age groups.¹³ To the extent that the degree of such underenumeration was

¹²Spearman's coefficient of rank correlation between the ranking of the average fertility presented in Table 6 and the ranking of each state by its rate of slave exportation is .633.

¹³The introduction to the Census volume of 1850 stated: "In many counties the assistant marshals have adopted one year as the lowest designation of age; and, therefore, the [children *under* one year of age] as published in those counties; show disproportionately small. This was often the case with slaves." United States Census Office, J. D. B. DeBow, Superintendent, *The Seventh Census of the United States: 1850* (Washington: Armstrong, 1853), p. xxxix, footnote. This tendency of the enumerators would, of course, also exaggerate the number of children reported as between one and four years of age. But there is other evidence that the total number of slave children under five was also consistently

not uniform across the states, the "fertility" ratios in Table 6 cannot be compared with each other.

In an attempt to partially correct for these biases the ratio of infants to women was also computed for the *white* population.¹⁴ Since differences between the states in infant mortality and census under-reporting can be reasonably supposed to affect the white population in the same manner as they affect the black population, the ratios for the whites can be used to standardize the slave data. Accordingly, the average white fertility ratio was divided into the slave ratio for each state to produce an index of relative fertility. Table 7 presents the results. North Carolina has the highest magnitude of this index. This should be interpreted as follows: of all the slave states North Carolina exhibits the highest fertility of its slave population relative to the fertility of its white population. Slave fertility in North Carolina was, in fact, 8.5 percent higher than white fertility. Arkansas stands last in an ordering of this index implying that in that state slave fertility was relatively the lowest, only 69.5 percent of the white's

underestimated. The number of male slaves aged 10 to 14 reported in the Census of 1860 was 276,928 while this same cohort was measured in 1850 when they were under five as containing only 267,088. The difference cannot be explained by immigration since importation of slaves was illegal at this time and the illegal importation of slaves or the enslavement of free persons was comparatively negligible. The data are from *The Seventh Census*, p. xliv and United States Census Office, Joseph C. G. Kennedy, Superintendent, *Population of the United States in 1860 . . . The Eighth Census* (Washington: Government Printing Office, 1863), pp. 594-595.

¹⁴This includes "civilized Indians" but excludes the free Colored.

TABLE 7
AN INDEX OF RELATIVE SLAVE FERTILITY, 1850-1860

State	Average of the 1850 and 1860 Infant-Women Ratios		Index of Relative Slave Fertility
	Slave	White	
Maryland, Delaware and the District of Columbia	161	156	1.032
Kentucky	191	194	.985
South Carolina	150	150	1.000
Virginia	165	166	.994
Tennessee	182	185	.984
North Carolina	178	164	1.085
Georgia	159	186	.855
Selling states	167	174	.960
Missouri	184	203	.906
Alabama	148	185	.800
Mississippi	140	185	.757
Louisiana	117	149	.785
Florida	145	190	.763
Arkansas	148	213	.695
Texas	151	212	.712
Buying states ^a	139	186	.747

^aExcluding Missouri.

fertility. The seven selling states are among the eight states with the highest fertility.¹⁵

On the basis of the published data it seems safe to conclude that the selling states exhibited a significantly higher rate of slave births than did the states with the more fertile soil in the southwest. This conclusion is supported by an examination of individual cotton plantations. The manuscript returns of the Assistant Marshals who enumerated the population for the Census of 1860 have been retained by the National Archives.¹⁶ The manuscript returns of the 1860 Census of Agriculture for most states have also been preserved in state archives or university libraries. These agricultural returns for the Southern states have been collected by the University of North Carolina Library.¹⁷

¹⁵The Spearman coefficient of rank correlation between the ordering of the fertility index in Table 7 and the rank of each state by its rate of slave exportation is .899. It might be objected that this index of relative fertility will still be biased if the infant mortality among slaves relative to whites was higher in the buying states than in the selling states. However, careful examination of the mortality data reported by race in the 1850 Census revealed that infant slave mortality was actually *higher* in the selling states than the buying states. Alabama and Texas were the only two importing states with high infant slave mortality relative to the healthiest of the selling states, South Carolina. This result was also confirmed by standardizing the slave infant mortality ratios by the infant mortality ratios for the free population. If the fertility ratios reported in Table 7 were to be corrected for infant mortality, the distinction between the buying states and the selling states would be exaggerated, not diminished.

¹⁶Katherine H. Davidson and Charlotte M. Ashby, United States General Services Administration, The National Archives, *Records of the Bureau of the Census* (Washington: Government Printing Office, 1964).

¹⁷Samuel M. Boone, "Agricultural and Manufacturing Census Records of Fifteen Southern States for the Years 1850, 1860, 1870 and 1880" (Chapel Hill: University of North Carolina Library, 1966).

The enumeration schedules list each free inhabitant, each farm, and each slaveholding separately. For each slaveholding the manuscripts provide a complete age and sex distribution of the slaves owned. While it is not possible to match the slave children with their parents from these schedules, they can nevertheless be employed to estimate fertility ratios for individual plantations. These estimates will have several important advantages over those based on the aggregate data. With the more detailed age data (compared to the broad age classes of the published tabulations) one can more precisely estimate the population at risk of pregnancy. Moreover, by restricting the analysis to the slaveholdings owned by farmers or planters the results will be based only upon agricultural slave population. This will have an important impact on the fertility measures since many of the nonagricultural slaves were held as domestic servants by owners who had only one slave.

For the purposes of an unrelated series of studies, William Parker and Robert Gallman have drawn a sample of 5,230 farms from the manuscript agricultural returns of the 413 counties which produced at least 1,000 bales of cotton in 1859. The sample consists of approximately 1.67 percent of the farms in those counties.¹⁸ Of the 5,230

¹⁸See William N. Parker, editor, *The Structure of the Cotton Economy of the Antebellum South* (Berkeley: Agricultural History Society, 1970), particularly the articles by Robert Gallman; James Foust and D. E. Swan; and Gavin Wright for more details on this sample. Also see James Donald Foust, "The Yeoman Farmer and Westward Expansion of U.S. Cotton Production," unpublished Ph.D. dissertation, University of North Carolina at Chapel Hill, 1967, for an extensive discussion of the sampling procedure employed.

farms, 2,588 were operated by slaveowners, who together reported owning 40,576 slaves. The distribution of these farms by state is given in Table 8.

The Parker-Gallman sample does not include or underrepresents the border states because it is restricted to the cotton-growing region of the South. While these border states may have sheltered substantial slave breeding operations, this sample is nevertheless suited to test the Conrad and Meyer assertion that slave breeding was prevalent among *cotton planters* of the Old South. Moreover, to the extent that the non-cotton areas of the South were the chief breeding areas, the use of the Parker-Gallman sample builds a degree of conservatism into the data.

In the Parker-Gallman study the age and sex distribution of the slaveholdings associated with each plantation was collected from the slave schedules and condensed into 36 age-sex classes. Children under five were divided into infants under six months old and all others. The age brackets thereafter are in five-year increments up to age 79 (that is 5-9, 10-14, 15-19, . . . , 75-79). There is also an open class of those 80 and over.

Rather than use the number of infants as our measure of fertility, I have chosen to use the total number of children 14 years and under. This assumes that children under 15 were rarely sold separately. While there is considerable evidence that children were separated from their parents for sale,¹⁹ it is probable that this practice was not frequent.²⁰

¹⁹Bancroft, pp. 208-214.

²⁰Ulrich Bonnell Phillips, *American Negro Slavery: A Survey of the Supply, Employment and Control of Negro Labor as Determined by the*

TABLE 8

DISTRIBUTION OF SLAVEHOLDINGS AND SLAVES BY STATE:
PARKER-GALLMAN SAMPLE OF COTTON FARMS 1880

State	Slaveholdings	Slaves
Virginia	26	540
North Carolina	202	2,091
South Carolina	328	5,942
Georgia	492	7,460
Tennessee	<u>207</u>	<u>2,380</u>
Subtotal: selling states	1,255	18,413
Florida	32	451
Alabama	424	6,477
Mississippi	377	6,509
Arkansas	127	1,395
Louisiana	136	4,293
Texas	<u>237</u>	<u>3,038</u>
Subtotal: buying states	1,333	22,163
Total:	2,588	40,576

Note: The four cotton counties in Missouri were excluded from the original Parker-Gallman sample because of the unavailability of the Agricultural Census manuscripts for that state.

The reasons for this were both moral and economic. The optimal time to sell a slave was apparently between the ages of 16 and 21.²¹

The advantage of using the broad definition of children is that this measure is less likely to be distorted by underreporting than the number of infants and it allows us to look at fifteen years of fertility experience rather than the first six months of 1860. A disadvantage of this measure, on the other hand, is that it may blur the distinction between the regions. Since women with children were frequently sold and transported from one region to another, a woman who was under the influence of a high-fertility slave region may have been moved with her children to a low-fertility region and this transfer would push the observed fertility ratios together.

The number of children on each plantation is compared with the number of women times the number of years each woman was in the child-bearing age span of 15 through 44 during the previous fifteen years. In addition each year of fertility experience was converted to a prime-fertility-year equivalent by multiplying it by the relative chance of

Plantation Regime (New York and London: 1918), p. 369; and Bancroft, p. 214. According to Stamp, a Louisiana State law prohibited the sale or importation of children under ten without their mothers, p. 252.

²¹If each slaveholder had access to other factors of production (land, capital, work animals, etc.) at prices equal to their marginal product in perfectly divisible amounts, it would make no difference to the present value of a newborn slave at what age he would be sold. The present value of his future expected net product on the home plantation could be made to equal his present sale price through appropriate additions of land and capital. However, since this availability of complementary factors was not present (particularly in the case of land) a plantation with excess slaves would have found it optimal to sell a slave when he reached physical maturity.

conception associated with that age, compared with the years of peak fertility (ages 20 to 24).

The reproductive potential at each age was estimated using the pre-1942 fertility experience of the women of the Cocos-Keeling Islands born between 1873 and 1927. These women experienced the highest gross reproduction rate ever recorded for any population (4.17). It is widely believed that their age-specified fertility patterns approach a biological maximum. The Cocos Islands society was characterized by especially early marriage (16 was the most popular age for women at their first marriage) and frequent pre-marital conceptions. Health standards were high, venereal disease absent, nursing periods were short, and birth control unknown. There was apparently no economic pressure to restrain population growth.²²

In Table 9 the Cocos Islands fertility data are used to produce an index of potential fertility. This index was the one used to weight each year of fertility experience during the preceding fifteen years for the women in each cohort. The result is a measure of the average number of years of prime-fertility equivalents experienced by women in each cohort.

²²T. E. Smith, "The Cocos-Keeling Islands: A Demographic Laboratory," *Population Studies* (July 1960). I have chosen to use the Cocos Islands fertility pattern rather than that of the Huiterite women, a group also characterized by high fertility, because the Huiterites rarely married before the age of twenty and premarital conception was very infrequent. Thus the marital fertility rates before the age of twenty are extremely high (marriage usually followed a premarital conception in order to legitimize the birth) while the rates defined to include all women below that age are extremely low.

TABLE 9
WEIGHTING FACTORS FOR EACH COHORT OF WOMEN

Age Cohort	Average Number of Live Births per 1000 Women	Cocos Islands ^a	Index of Potential Fertility (age 20-24=1)	Average Number of Years of Fertility per Woman During Preceding 15 Years	Average Number of Prime Fertility Equivalent Years per Woman During Preceding 15 Years ^b
10-14	1.64		.000	0	0.00
15-19	139.12		.509	3	1.53
20-24	371.46		1.000	8	5.55
25-29	360.02		.970	13	10.45
30-34	311.72		.839	15	13.38
35-39	282.54		.761	15	13.32
40-44	139.26		.375	15	11.06
45-49	15.6		.000	12	7.36
50-54	0.0		.000	7	3.40
55-59	0.0		.000	2	.75

^aSource: T. E. Smith, Table 8, p. 109.

^bThe value of this weighting factor is computed for the j th cohort by the formula $3F_j + 5(F_{j-1} + F_{j-2}) + 2F_{j-3}$ where F_j is the potential fertility index for the j th cohort.

TABLE 11
 THE RATIO OF SLAVE WOMEN TO MEN, 15 TO 39
 1850 AND 1860

State	1850	1860	Average
Maryland, Delaware and the District of Columbia	.986	.984	.985
Kentucky	.976	.977	.977
South Carolina	1.075	1.074	1.075
Virginia	.944	.953	.949
Tennessee	1.012	1.029	1.021
North Carolina	.998	.986	.992
Georgia	1.042	1.034	1.038
Average: selling states	1.007	1.008	1.007
Missouri	.987	.978	.983
Alabama	1.004	1.005	1.005
Mississippi	1.015	1.003	1.009
Louisiana	.943	.938	.941
Florida	.994	.970	.982
Arkansas	.986	.971	.979
Texas	1.057	1.010	1.034
Average: buying states ^a	.993	.986	.990

^aExcluding Missouri.

was apparently true that on farms with only one slave, males dominated as the preferred sex. This is illustrated by the Parker-Gallman sample. The total number of slave women, 15 to 44 years of age, included in the sample was almost exactly equal to the total number of men. The women-per-man ratio was 1.010 (1.042 for the selling states and 0.986 for the buying states). However, when we exclude the farms without any women, the average ratio becomes 1.232. Significantly, this tendency of farms to have a surplus of women was most pronounced in the selling states where the excess of women over men reached 300 per 1,000. In the buying states the surplus was 200 per 1,000, still a surprising figure.

These abnormally high ratios of women to men seem to be related to slave breeding. Table 12 presents the ratio of children to adults cross classified by the ratio of women to men. Since children represent the "output" of a slave-breeding operation and the number of adults represents the "inputs" it can be seen that over a wide range of sex ratios the "productivity" could be increased by increasing the number of women to men.

There was a limitation to the extent the sex ratio could be distorted to increase productivity, however. As the ratio of women to men increased the fertility of the women decreased, as is indicated in Table 12. This was probably the result of an increased risk of venereal disease coupled with a type of passive resistance on the part of the slaves to the disruption or absence of a stable family life implied by the shortage of men.

TABLE 12
 PRODUCTIVITY AND FERTILITY RATES ON FARMS WITH FIVE OR MORE WOMEN
 PARKER-GALLMAN SAMPLE, 1860

Sex Ratio	Ratio of Children, 0-14, to Adults, 15-44		Number of Children per Thousand Years of Prime Fertility Experience		Number of Farms with Five or More Women	
	Selling States	Buying States	Selling States	Buying States	Selling States	Buying States
R > 3.0 ^a	1.37	0.85	233.6	122.4	19	11
2.0 < R ≤ 3.0	1.36	1.09	245.1	222.2	22	18
1.5 < R ≤ 2.0	1.27	1.07	275.1	229.2	42	42
1.1 < R ≤ 1.5	1.14	0.97	248.1	233.3	66	86
1.0 ≤ R ≤ 1.1	1.01	0.88	232.6	209.6	36	44
R < 1.0	0.99	0.81	276.0	239.8	63	132

^aIncludes farms with no men.

The unequal sex distributions on the slave plantations suggest that a substantial portion of the slaveowners were overtly practicing slave breeding. Consider the implications of assuming that the sex distributions *do not* imply the practices of polygamy or promiscuity.

In Table 13 we have recomputed the fertility rates presented in Table 10 under the new assumption that only married slave women had children and that the maximum number of married couples existed on each plantation. The maximum number of couples is equal to the number of women or the number of men, whichever is less. Since we do not know which of the women on those plantations with surplus women would have been married, in such cases we assume that each married woman had the average number of prime-fertility years of experience of all the women in the holding. Any farm without men was omitted from the computation.

The fertility ratios in the eastern selling states computed in this manner seem unbelievably high. For the selling-state farms as a group, average "marital" fertility would have to have been 441 per thousand at ages 20 through 24, which exceeds the measured fertility of the 20- to 24-year-old Cocos Islands women by 70 per thousand and approaches even the extremes of individual experience. A woman would have to have nearly ten surviving children by the time she was 44 to equal 441 live children per thousand married prime-fertility equivalent years of experience observed as average on the selling-state farms in the Parker-Gallman sample. The average for South Carolina is 492 per thousand, 120 per thousand above the Cocos Islands standard. It seems safe to conclude that a substantial portion of slave women in these states conceived children by men to whom they were not married.

TABLE 13

RATIO OF CHILDREN TO COUPLES ON SLAVE FARMS,
PARKER-GALLMAN SAMPLE, 1860

	Number of Children, 0-14, per 1000 "Married" Women- Years of Prime Fertility Experience
South Carolina	491.7
Tennessee	439.0
North Carolina	431.6
Georgia	415.3
Selling states (includes Virginia)	440.9
Arkansas	383.8
Mississippi	357.0
Alabama	343.0
Texas	340.5
Louisiana	284.2
Buying states (includes Florida)	339.7
All states	381.2

As a final test of the hypothesis that breeding farms existed in the ante-bellum South a search was made of the Parker-Gallman sample for examples of farms with a disproportionate number of women and large numbers of children. Lest we unjustly charge one of the Parker-Gallman slave owners, we have adopted a restrictive definition of a breeding farm. The first criterion employed was that the farm must have a ratio of women to men in the 15-44 age group so large as to occur less than 10 percent of the time by chance *if* the men and women were distributed randomly.²⁷ This is an extremely conservative criterion since it assumes that there was no tendency for slaves to be bought and owned in family units. If slaves are frequently coupled, nearly equal sex distributions ought to be observed much more frequently than would be the case with a random distribution. Actually, only 87 farms (3.4 percent) of the 2,588 slaveholdings sampled had such extreme sex distributions. From this

²⁷The Parker-Gallman sample records 9,185 women between 15 and 44 and 9,098 men. If these males and females were distributed randomly to each of the plantations, the expected sex distribution on a plantation of any given size would be given by a hypergeometric distribution. However, since the number of slaves is large the binomial distribution provides an extremely close approximation. The binomial theorem tells us that the probability that exactly x of the slaves on a plantation with n slaves between the ages of 15 and 44 will be female is:

$$P\binom{x}{n} = \frac{n!}{x!(n-x)!} (.5024)^x (.4976)^{n-x}$$

where .5024 is the fraction of slaves mentioned in the Parker-Gallman sample who are women, and .4976 is the fraction who are men. The expected number of women on a plantation with n adults is $.5024n$ with a standard deviation of approximately $[n/4]^{1/2}$. Note that the criteria I have adopted automatically excludes any farm with less than four men and women.

list of 87 farms we deleted those on which the number of children was low enough to be explained solely by the maximum number of couples; that is, the number of men. To give men over 44 the benefit of the doubt we included *all* men 15 years old and over. The procedure established was to compute the number of children under 15 per 1,000 years of prime fertility experience represented by the women on the plantation and then to multiply this fertility measure times the ratio of women, 15-44, to men 15 and over. This gives us a "marital fertility rate," assuming every man over 15 was married. If this "marital" fertility rate was less than 375 per thousand, the farm was deleted.²⁸ Forty farms were excluded on this ground, leaving 47. Table 14 lists each of the 47 suspect breeding farms.

These 47 farms had a total of 439 women--nearly 5 percent of all the women included in the Parker-Gallman sample. Fourteen of the 47 were located in South Carolina, 29 altogether in the selling states, and 18 in the buying states (six in Alabama). The women on the 29 selling-state breeding farms accounted for 7.3 percent of the total number of women in the selling states who were included in the Parker-Gallman sample.

In addition to the 47 farms listed in Table 14 there were 527 farms (20.4 percent of the slaveholders in the sample) which had three or fewer men and a ratio of women to men larger than two. The majority of these farms (436, or 16.8 percent of the sample) had no men at all.

²⁸The peak fertility experience of the Cocos Islands women was 371.46 per thousand for the 20-24 year old cohort.

TABLE 14

SUSPECTED BREEDING FARMS FOUND IN THE
PARKER-GALLMAN SAMPLE, 1860

State and County	Women 15-44	Men 15-44	Children 0-14
North Carolina			
Johnson	5	1	10
Pitt	11	4	23
Wake	38	28	120
South Carolina			
Abbeville	6	1	13
Abbeville	11	5	30
Abbeville	5	1	9
Colleton	18	6	28
Darlington	14	6	39
Darlington	5	1	12
Edgefield	14	7	26
Edgefield	5	1	17
Fairfield	9	4	11
Greenville	5	1	5
Marion	16	1	20
Union	11	5	31
Union	10	5	46
Williamsburgh	14	4	39
Georgia			
Clark	4	0	10
Crawford	18	6	22
Harris	6	0	8
Jones	5	1	13
Lowndes	9	2	16
Macon	4	0	6
Muscogee	5	1	5
Oglethorpe	9	3	18
Tennessee			
Carroll	7	2	15
Fayette	12	5	22
Fayette	6	1	11
Giles	7	2	12
Florida			
Hamilton	16	7	32

TABLE 14--Continued

State and County	Women 15-44	Men 15-44	Children 0-14
Alabama			
Barbour	14	8	44
Dekalb	4	0	11
Jackson	5	1	5
Limestone	8	3	11
Marengo	5	0	4
Wilcox	6	1	10
Mississippi			
Holmes	4	0	7
Holmes	11	6	23
Marshall	13	5	29
Rankin	8	3	16
Arkansas			
Ashley	4	0	2
Drew	22	2	27
Phillips	7	2	7
Sevier	4	0	8
Louisiana			
Claiborne	5	1	5
Texas			
Grimes	10	5	19
Harrison	4	0	5
Totals			
Selling states	289	104	637
Buying states	150	44	265
Total	439	148	902

All of these farms are distributed in Table 15 by the number of women and children. Seventy-six percent of them had children present. While it is certain that some of these farms represent cases of slave widows with their children, it is not likely that a large fraction of them can be explained in this way.

None of the evidence presented in this article is direct; all of it is circumstantial. However, the case provided by this circumstantial evidence is strong enough to conclude that many slaveowners in the American South systematically bred slaves for sale. These slave breeders were concentrated in the border states and in the states along the Atlantic coast. They held disproportionately large numbers of women in the childbearing age group. They fostered polygamy and promiscuity among their slaves. The products of this breeding operation were sold or transported to the southwestern slave states, predominately as young adults. There is little possibility that this practice was innocent--it appears to have been the logical outcome of a system which treated slaves as assets; a system that stripped men of their humanity so that the market for their labor could operate efficiently and so that the profits of their exploiters could be maximized.

TABLE 15

NUMBER OF SLAVE CHILDREN RESIDING ON FARMS WITH SELECTED
SEX RATIOS, PARKER-GALLMAN SAMPLE, 1860

Number of Children	Number of Farms With							
	No Men and			One Man and		Two Men and		Three Men and Seven Women
	One Woman	Two Women	Three Women	Three Women	Four Women	Five Women	Six Women	
0	112	9	--	2	1	--	--	--
1	83	12	2	4	--	--	--	--
2	44	17	1	3	--	--	--	--
3	55	11	2	5	1	--	1	--
4	23	6	4	9	2	1	--	--
5	14	4	2	10	1	--	--	--
6	6	9	1	4	3	2	--	1
7	4	2	3	5	2	--	--	--
8	2	3	--	2	6	2	--	--
9	1	1	1	4	2	1	1	--
10	--	1	--	3	--	--	--	--
11	--	--	1	2	--	--	--	1
12	--	--	--	--	--	2	--	--
13	--	--	--	--	--	2	--	1
14	--	--	--	--	--	--	--	--
15	--	--	--	--	1	1	--	1
16	--	--	--	--	--	--	--	--
17	--	--	--	--	--	1	--	--
Total	344	75	17	53	19	13	2	4

estimate of the population which would be expected in each region at the end of the decade had there been no migration by the application of survival rates to each age-sex-race cohort enumerated at the beginning of the decade. The difference between the expected population and the enumerated population of each cohort at the end of the decade is an estimate of the net out-migration from the region between the two censuses.

The survival rate technique begins with the simple identity:

$$(1) \quad P_0 + B - D + M \equiv P_1$$

which says that the aggregate population of a region at the beginning of the period (P_0) plus the number of births within the time period (B) less the number of deaths (D) plus the *net* in-migration (M) must equal the aggregate population at the end of the period (P_1). For every age-sex-race cohort there is a similar identity. For example, for slave females 10 to 20 years old at the beginning of the period the formula becomes:

$$(2) \quad P_0 - D + M \equiv P_1.$$

The age-sex tabulations for the slave population provide the information on P_0 and P_1 . If data on births and deaths of slaves were available, these identities could be used to compute an age and sex breakdown of the net migration. Unfortunately, neither of the censuses provide sufficiently reliable statistics on the number of births

and deaths.³ However, sufficient information on mortality and fertility rates of slaves is available to allow an estimation of these numbers.

First, it is helpful to rewrite equation (2) as follows:

$$(3) \quad P_0 - D_n + M_p - D_{mb} - D_{ma} = P_1.$$

Here, P_0 and P_1 are defined as before: D_n refers to the number of those nonmigrants in the region who die during the period; M_p denotes the total number of *potential* migrants into the region at the beginning of the period (the number of people who would have migrated had no one died during the period); D_{mb} is the number of the potential migrants who died *before* they migrated into the region in question; and D_{ma} is the number of potential migrants who died during the period but *after* arriving in the region. The net migration is the number of potential migrants less those who died before migrating ($M = M_p - D_{mb}$). I assume that the number of deaths in any given cohort between the two census dates can be obtained by applying the appropriate mortality rate to the original cohort population. Symbolically this can be written as:

³"The Tables of the Census which undertake to give the total number of Births, Marriages, and Deaths in the year preceding the first of June, 1850, can be said to have very little value. Nothing short of a registration system in the States will give these data with even approximate truth; and, where such a system has been established, difficulties have continually occurred, requiring a very long period of time to be removed. Against all reasonings, the facts have proved that people will not, or cannot, remember and report to the Census taker the number of such events, and the particulars of them, which have happened in the period of a whole year to eighteen months prior to the time of his calling." United States Census Office, *The Seventh Census of the United States: 1850*, p. xxxiv.

$$(4) \quad D_n = dP_o$$

where d is the rate of mortality of individuals belonging to the age, sex, and race cohort in question. Substitution of equation (4) into equation (3) produces:

$$(5) \quad (1-d)P_o + M - D_{ma} = P_1.$$

In this formulation the term $(1-d)$ is a survival ratio--the fraction of the given cohort which survives the period from the first census to the second. The equation is more conveniently written in terms of the survival ratio, s , as follows:

$$(6) \quad sP_o + M - D_{ma} = P_1.$$

To compute M one must estimate D_{ma} . Applying the same survival rate to the potential migrants as was applied to the nonmigrants one can estimate the sum of D_{mb} and D_{ma} :⁴

$$(7) \quad (1-s) M_p = D_{mb} + D_{ma}.$$

⁴There are at least two objections to this assumption. (1) Migrants are likely to be hardier people than nonmigrants (even in the same age-sex cohort). (2) Migration is a dangerous and health destroying process, thus migrants are exposed to greater risks of death. It will be observed that these two effects work in opposite directions. The assumption made can be thought of as requiring that these two factors exactly cancel.

It is next assumed that D_{mb} equals D_{ma} . If the total number of potential migrants within a period were distributed uniformly throughout the census decade, one would expect more to have died after moving than before since the probability of dying generally rises with age. On the other hand, the morbidity preceding death may deter migration in a sizable number of cases. This will have an opposite effect: death will overtake more of the potential migrants before they move than after. I assume these two effects roughly cancel leaving an equal chance of dying before as after moving for a member of the potential migrant group. With this assumption equation (7) can be solved for D_{ma} in terms of M :

$$(8) \quad D_{ma} = \frac{(1-s)}{(1+s)} M.$$

Substituting this last expression into equation (6) and solving for M yields⁵

$$(9) \quad M = \frac{(1+s)}{2s} (P_1 - sP_0).$$

Equation (9) was used to estimate the net slave migration into each state by age and sex.⁶ With the exception of the survival ratios, all

⁵This equation is identical to one suggested by Siegel and Hamilton, although their derivation was based on a different argument. Jacob S. Siegel and C. Horace Hamilton, p. 491.

⁶The equation does not apply to the cohorts born during the intercensal period. Estimating these flows requires estimates of fertility by region. A technique for including these cohorts in the calculations is discussed below.

the information required is available in the age classification tables of the published censuses.

The real difficulty in estimating net migration lies in obtaining accurate estimates of the survival ratios by age, sex, and region. Accurate estimates are particularly important because of the sensitivity of the results to small changes in the survival ratio. Appendix Table 1 illustrates this fact by presenting the estimated net exports between 1850 and 1860 from Virginia of female slaves who were between 30 and 39 years of age in 1860 for several assumed survival ratios. As can be seen, a substantial change in the rate of out-migration can be produced by small changes in the survival rate.

C. H. Hamilton has demonstrated that the appropriate survival rate for use in migration calculations is the "census survival rate" computed directly from the census tabulations. Estimates based on life tables will compound and transmit any errors in the reporting of ages to the migration estimates.⁷ The census survival rate is simply a measure of the decline (or increase) of each age-sex cohort between successive

⁷C. Horace Hamilton, "Rural-Urban Migration in the Tennessee Valley"; C. Horace Hamilton, "Practical and Mathematical Considerations in the Formulation and Selection of Migration Rates," *Demography* (1965); and C. Horace Hamilton, "Effect of Census Errors on the Measurement of Net Migration," *Demography* (1966). It can be established that censuses generally underenumerate the number of children under five years of age relative to other age groups. Thus it is frequently found that a census will report more persons 10 to 15 years of age at one census than it reported as under five years of age ten years previously. A life table would yield an estimate of the survival ratio for this cohort of less than one and thereby attribute the improved enumeration of this age cohort in every region to net migration--greatly exaggerating the true migration flows.

APPENDIX TABLE 1

AN ILLUSTRATION OF THE SENSITIVITY OF NET MIGRATION ESTIMATES TO THE SURVIVAL RATIO^a

Survival Rate	Net Out-Migration	Rate of Out-migration ^b
.75	1914	6.9
.76	2328	8.3
.77	2735	9.6
.78	3148	10.9
.79	3534	12.1
.80	3925	13.3
.81	4312	14.4

^aThis illustration is based on female slaves 20 to 29 years old in 1850 and 30 to 39 years old in 1860 in the State of Virginia. The number enumerated in this cohort in 1850 was 36,974 and in 1860, 26,090. The survival rate employed for this cohort in the calculations below was .780. United States Census Office, *The Seventh Census*, p. xlv; and United States Census Office, *The Eighth Census*, pp. 594-595.

^bDefined as a percentage of the expected population in 1860 on the assumption of no migration.

censuses for a closed population. In the case of a population which was not affected by immigration or emigration the national survival ratio for each cohort can be computed directly from the age tabulations of the total population. While the United States experienced considerable immigration during the decade of the 1850's, over two and one-half million between the two Censuses, almost all of the arrivals were white. Of the few blacks who did immigrate, it can be safely concluded that they joined the "free Colored" population rather than the slave population.⁸ Blacks, nevertheless, could pass out of the slave population into either the free Colored population or foreign countries through manumission or successful escape. The available evidence, however, indicates that such departures were rare,⁹ and to the extent that they did take place it is

⁸The raw immigration data was published yearly by the United States Department of State. The data were not classified by race. However, if we judge race by national origin we find that during the decade only 134 immigrating passengers arrived from African countries and only 10,437 from the West Indies. See Sutch, Roehl, Lyons, and Boskin, Table C-2, p. 78. The birthplaces of the slave population were not collected in the Federal Censuses of either 1850 or 1860. However, the nativity of the entire population was collected in 1870 and tabulated separately by race. In that year only 9,645 blacks (less than two per thousand) were born in foreign countries. United States Census Office, *The Statistics of the Population of the United States . . . Ninth Census* (Washington: Government Printing Office, 1872), Table VI, p. 336. The illegal importation of slaves into the United States was undoubtedly negligible during this period. See Philip D. Curtin, *The Atlantic Slave Trade: A Census* (Madison: University of Wisconsin, 1969), pp. 73-75.

⁹In the year preceding the 1850 Census 1,467 slaves were freed by their owners and 1,011 escaped and were fugitive at the time of Census. United States Census Office (J. D. B. DeBow, Superintendent), *Statistical View of the United States* (Washington: Tucker, 1854), p. 64.

entirely appropriate for our purposes to consider them as equivalent to a slave death. They would be so treated by the slaveowner. No adjustments were made to the slave population for the purpose of estimating the survival rates.

Appendix Table 2 presents the Census survival ratios for the slave population based on the Census data. The distortions in the age distributions caused by misreporting or underenumeration are apparent in the survival ratios shown. No true survival ratio could exceed one, and the higher survival ratios for the males in the 40-49 year old 1860 cohort than for the 30-39 1860 cohort is very unlikely to reflect a true mortality reversal. Rather, these peculiarities reflect a systematic underenumeration of young children and of age heaping in the 20-29 year old cohort. However, to the extent that the degree of underenumeration and age heaping at each age is uniform across the states under study, use of the census survival ratios will automatically correct for this bias while the use of life table survival ratios would introduce serious errors.¹⁰

Equation (9) was used to estimate the migration for each cohort born before the 1850 Census. A complete estimate of migration must also include the migration of those slaves born within the decade. This cohort required a different technique, based on an equation for the net migration of children:

¹⁰Daniel O. Price, "Examination of Two Sources of Error in the Estimation of Net Internal Migration," *Journal of the American Statistical Association* (September 1955), pp. 691-693.

$$(10) \quad M = P_1 - (B-D).$$

Here M is the migration of children under ten of a given sex, P_1 is the number of children in that cohort enumerated in the region at the end of the decade, B is the number of births in the region during the intercensal period, and D is the number of deaths occurring to members of this age-sex cohort.

The absence of reliable data on the number of births prevents the use of the survival rate technique to estimate the quantity $(B-D)$, the number of children born in the region and surviving until the end of the decade. Instead, I computed this number by estimating slave fertility ratios for each state which were then used to distribute all slave children under ten years of age at the end of the census decade to a state of birth. This procedure does not permit an estimate of the number of children who migrated and then died before the end of the decade. There is therefore a tendency to understate the migration flows in this cohort relative to the other cohorts.

The state fertility ratios were estimated by taking the weighted average of the ratio of infants under one year of age to women of childbearing age at both the initial and terminal censuses.¹¹ These fertility ratios were then converted to an index by dividing each state's ratio by the appropriate national ratio computed in the same manner.

¹¹Women of childbearing age were defined as one-half the women 15 to 19 years old plus all women 20 to 39 years old.

In order to distribute the slave children to their region of birth a census-decade fertility ratio for the nation as a whole was computed as the ratio of all slave children under ten years of age to the average of women who were 15 to 39 at the first census and women who were 20 to 39 a decade later. This definition has the property that it includes all of the women who were 15 to 29 at the first census (and hence 25 to 39 at the second census) and in addition it counts with a weight of one-half those women who were 30 to 39 at the first census (40 to 49 at the second) and those women who were 10 to 14 at the first census (20 to 24 at the second).

This ratio of children to women (1.0110 for males and 1.0279 for females) was multiplied by the state fertility index previously mentioned to obtain a state fertility ratio. This ratio was then multiplied by the average number of women of childbearing age in the state during the decade, computed in the same manner as that cohort was for the nation. Appendix Table 3 presents the distribution of slave children under ten in 1860 to their state of birth.

Appendix Table 4 presents the net importation of slaves into each of the slave states by age and sex. The ages given in the table are the ages of each cohort in 1860. Appendix Table 5 presents the importations as a percentage of the number of individuals in the given cohort who would have resided in the region at the end of the decade had no migration taken place; that is, the population of the cohort at the first census times the appropriate survival ratio.

APPENDIX TABLE 3

DISTRIBUTION OF SLAVE CHILDREN UNDER TEN IN 1860
TO THEIR STATE OF BIRTH

State	Average Number of Women of Childbearing Age	Weighted Average State Fertility Ratio		Distribution of Children to State of Birth	
		Male	Female	Male	Female
Delaware	379	.727	1.016	275	385
Maryland	14633	1.101	1.063	16116	15547
District of Columbia	773	.550	.614	425	475
Virginia	74893	1.047	1.080	78442	80921
North Carolina	48247	1.168	1.157	56347	55827
South Carolina	67995	.943	.985	64144	66945
Georgia	72752	1.030	1.031	74986	74982
Florida	8488	.950	.949	8069	8052
Alabama	67415	.959	.963	64668	64919
Mississippi	65271	.895	.929	58377	60647
Louisiana	53465	.740	.785	39544	41990
Texas	19933	1.035	1.027	20642	20472
Arkansas	13671	.966	1.017	13201	13896
Tennessee	43122	1.176	1.187	50723	51203
Kentucky	35160	1.230	1.246	43258	43800
Missouri	16602	1.218	1.179	20229	19580

APPENDIX TABLE 4

NET IMPORTATION (+) OR EXPORTATION (-) OF SLAVES BY AGE, SEX, AND STATE: 1850-1860

Age in 1860	Delaware		Maryland		District of Columbia		Virginia	
	Male	Female	Male	Female	Male	Female	Male	Female
	Under 10	-2	-119	-2739	-2342	-72	-114	-3769
10 to 14	-30	-28	-1014	-1016	8	100	-3040	-3459
15 to 19	-49	-21	-704	-1058	44	28	-5460	-6017
20 to 29	-228	-125	-3378	-3135	-213	-248	-12155	-12454
30 to 39	-132	-103	-2168	-1508	-81	-130	-3831	-3148
40 to 49	-28	-19	-702	-648	-22	-14	-1890	-1175
50 to 59	-6	-4	-327	-368	-13	15	-1623	-1002
60 to 69	-2	-4	-202	-149	-10	-14	-711	-226
70 to 79	-2	5	-95	-80	0	0	-169	131
80 and over	1	-3	-138	-101	2	-7	-745	-693
Age unknown	0	0	-4	-9	0	0	-234	-177
Total	-478	-421	-11471	-10414	-445	-384	-33627	-34089
Aggregate	-899	-829	-21885	-67716				
Age in 1860	North Carolina		South Carolina		Georgia		Florida	
	Male	Female	Male	Female	Male	Female	Male	Female
	Under 10	-1977	-570	-3365	-3561	-866	186	1571
10 to 14	-1342	-1505	-4265	-4302	-1119	-322	832	903
15 to 19	-3259	-4198	-3325	-3673	-758	-649	815	779
20 to 29	-5228	-4748	-8816	-7020	-2941	-2128	1788	1602
30 to 39	-1930	-1856	-2986	-2697	-1395	-883	837	696
40 to 49	-1016	-969	-1722	-1755	-123	-30	555	497
50 to 59	1485	1610	-781	-1015	-681	-584	299	278
60 to 69	-731	-496	-1058	-1126	402	458	-15	14
70 to 79	317	195	-282	-428	-109	-325	52	93
80 and over	-72	-70	-309	-283	266	192	105	63
Age unknown	-20	-32	-6196	-5901	-92	-43	-122	79
Total	-13773	-12639	-33105	-31761	-7416	-4128	6717	6363
Aggregate	-26412	-11544	-64866	13080				

APPENDIX TABLE 4--Continued

Age in 1860	Alabama		Mississippi		Louisiana		Texas	
	Male	Female	Male	Female	Male	Female	Male	Female
Under 10	2518	3466	4673	4093	3257	1383	8915	9443
10 to 14	-93	156	1232	873	798	220	7252	7301
15 to 19	568	1333	2578	3483	2557	3117	7071	7469
20 to 29	2868	2874	8363	8919	12516	10305	11911	11584
30 to 39	1247	806	2304	872	5537	2996	6618	6358
40 to 49	-9	344	117	-592	1774	370	3364	3504
50 to 59	-659	-298	-493	-601	141	21	1702	1525
60 to 69	630	354	1311	933	173	91	766	676
70 to 79	-230	-230	-212	-144	216	186	310	371
80 and over	90	224	215	179	235	146	223	205
Age unknown	-3	3	4967	4740	1579	1181	211	225
Total	6927	9032	25055	22755	28783	20016	48343	48661
Aggregate	15959		47810		48799		97004	
Age in 1860	Arkansas		Tennessee		Kentucky		Missouri	
	Male	Female	Male	Female	Male	Female	Male	Female
Under 10	4215	3540	-5527	-4541	-6428	-6468	-407	122
10 to 14	3237	3089	-1220	-901	-1771	-1908	531	800
15 to 19	3423	3710	-1932	-2129	-2022	-2496	542	324
20 to 29	7028	6425	-4915	-4139	-6142	-6963	-451	-745
30 to 39	3118	2862	-2768	-1868	-3335	-2153	-1024	-244
40 to 49	1652	1667	-1118	-973	-950	-547	119	339
50 to 59	647	622	845	561	-527	-722	-7	-29
60 to 69	568	505	-666	-572	-415	-435	-23	23
70 to 79	93	80	13	5	50	66	62	91
80 and over	67	134	-13	-25	3	-33	84	98
Age unknown	1	0	-11	-5	-21	-20	-51	-35
Total	24049	22634	-17312	-14587	-21558	-21679	-625	744
Aggregate	46683		-31899		-43237		119	

APPENDIX TABLE 5

NET IMPORTATION OF SLAVES AS A PERCENTAGE OF THE 1850 COHORT SURVIVING TO 1860: 1850-1860

Age in 1860	Delaware		Maryland		District of Columbia		Virginia	
	Male	Female	Male	Female	Male	Female	Male	Female
	Under 10	-.61	-26.10	-15.22	-13.49	-14.09	-20.00	-4.46
10 to 14	-15.90	-16.09	-13.58	-14.73	3.96	45.97	-7.76	-9.29
15 to 19	-23.85	-12.39	-11.07	-16.55	-22.96	10.24	-16.76	-18.11
20 to 29	-60.23	-41.81	-30.01	-30.49	-53.49	-43.36	-22.89	-25.22
30 to 39	-82.58	-54.32	-35.53	-25.97	-44.95	-39.20	-12.71	-10.91
40 to 49	-52.03	-29.02	-20.47	-18.48	-21.57	-7.33	-9.25	-6.22
50 to 59	-26.48	-13.57	-15.15	-18.32	-19.55	12.03	-12.06	-8.35
60 to 69	-14.12	-25.45	-14.81	-11.27	-25.67	-15.19	-8.27	-2.92
70 to 79	-61.72	105.71	-19.76	-15.83	0.00	0.00	-5.48	4.36
80 and over	41.81	-78.21	-50.24	-32.47	34.43	-43.45	-50.29	-36.29
Age unknown	0.00	0.00	-46.23	-55.60	0.00	0.00	-55.20	-53.34
Total	-35.28	-29.91	-20.16	-19.14	-25.96	-15.88	-11.72	-12.19
Aggregate	-32.55		-19.66		-20.06		-11.95	

Age in 1860	North Carolina		South Carolina		Georgia		Florida	
	Male	Female	Male	Female	Male	Female	Male	Female
	Under 10	-3.39	-.99	-4.85	-4.92	-1.15	.25	21.78
10 to 14	-4.99	-5.96	-13.07	-13.50	-3.30	-1.01	24.29	27.72
15 to 19	-15.12	-18.73	-13.33	-13.71	-2.84	-2.37	30.62	28.46
20 to 29	-16.08	-15.36	-21.75	-17.35	-6.76	-4.93	44.69	40.82
30 to 39	-10.68	-10.11	-12.48	-10.33	-5.45	-3.27	28.63	24.23
40 to 49	-9.24	-8.93	-10.42	-9.82	-.80	-.19	30.35	27.58
50 to 59	24.06	27.22	-8.13	-10.20	-7.70	-6.55	30.44	30.27
60 to 69	-15.15	-10.97	-17.03	-18.01	8.62	9.77	-2.37	2.46
70 to 79	21.52	12.58	-12.83	-18.09	-5.87	-16.63	27.08	54.48
80 and over	-9.21	-6.96	-31.67	-25.04	37.04	22.86	137.81	79.73
Age unknown	-28.90	-28.24	-55.60	-55.96	-39.38	-31.25	-35.25	0.00
Total	-7.58	-7.07	-13.91	-12.92	-3.13	-1.74	27.66	27.04
Aggregate	-7.33		-13.41		-2.43		27.36	

APPENDIX TABLE 5--Continued

Age in 1860	Alabama		Mississippi		Louisiana		Texas	
	Male	Female	Male	Female	Male	Female	Male	Female
Under 10	3.96	5.43	8.42	7.10	8.66	3.46	72.92	77.89
10 to 14	-.30	.54	4.52	3.32	4.63	1.31	136.85	148.37
15 to 19	2.40	5.45	12.04	15.83	18.66	21.81	176.18	174.14
20 to 29	7.62	7.87	25.13	27.89	56.04	47.17	182.08	177.45
30 to 39	5.22	3.31	10.22	3.72	28.19	16.02	157.16	143.38
40 to 49	-.06	2.26	.78	-4.00	10.91	2.58	133.78	130.36
50 to 59	-7.89	-3.69	-6.75	-8.83	1.52	.29	133.07	118.48
60 to 69	13.97	8.22	38.13	29.75	4.10	2.62	120.43	114.14
70 to 79	-15.05	-15.50	-16.67	-11.80	17.59	18.11	205.19	259.89
80 and over	16.80	40.25	50.54	41.37	49.34	33.95	413.09	358.67
Age unknown	-34.67	0.00	452.04	492.18	2607.16	4864.29	221.70	198.58
Total	3.30	4.35	13.29	12.06	20.26	14.49	130.59	130.89
Aggregate		3.82		12.67		17.42		130.74

Age in 1860	Arkansas		Tennessee		Kentucky		Missouri	
	Male	Female	Male	Female	Male	Female	Male	Female
Under 10	46.21	36.87	-10.50	-8.55	-13.66	-13.57	-2.01	.62
10 to 14	77.76	76.22	-5.58	-4.30	-9.50	-10.64	6.58	10.32
15 to 19	106.75	109.87	-11.24	-11.71	-13.09	-15.58	8.30	4.97
20 to 29	128.33	124.73	-17.26	-14.98	-24.59	-28.80	-4.25	-7.31
30 to 39	83.88	78.31	-16.91	-11.37	-23.24	-15.65	-15.75	-3.91
40 to 49	81.37	81.89	-12.24	-10.42	-11.46	-6.73	3.80	10.12
50 to 59	62.56	63.87	17.65	11.50	-11.06	-14.72	-.42	-1.52
60 to 69	122.81	121.87	-21.27	-17.92	-15.65	-15.28	-2.86	2.49
70 to 79	60.74	54.88	1.57	.54	6.79	7.23	28.61	33.49
80 and over	156.88	284.01	-3.57	-5.15	.97	-6.54	103.74	80.09
Age unknown	0.00	0.00	-42.38	-30.89	-30.34	-30.89	-53.59	-54.06
Total	81.78	76.82	-11.18	-9.40	-15.70	-15.84	-1.08	1.31
Aggregate		79.30		-10.29		-15.77		.10