

## **QUALITIES AND EFFECTIVE-QUANTITIES OF SLAVES IN NEW ORLEANS**

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### **ABSTRACT**

A hedonic price index and a quality-adjusted quantity index are constructed in order to provide a clearer picture of how slave quality evolved. Controlling for slave quality, slave prices did not rise as much as previously thought. This is due to an increase in slave quality, especially during the earlier 1800s. Properly accounting for the effect of the 1808 prohibition of slave importation, there is evidence of a decline in slave quality. Finally, regressions reveal the puzzling fact that light skinned males sold at a premium, even though they would have been more immune to the local disease environment.

### **INTRODUCTION**

Debate about the profitability of slavery and the necessity of the Civil War has raged since the 1860s. Contemporary debate is characterized by Genovese (1989 [1965]) who claimed that slavery was inefficient and doomed to failure, and Fogel and Engerman (1974), who emphasized the profitability of slavery. Properly answering this question centers on calculating the costs and benefits of slave capital, slave agricultural production, and slave society. In this paper I examine the first of these, focusing on the proper measurement of slave prices and quality. Slave prices depended upon the changing mix of slave qualities. To do investigate this, I employ a technique similar to that of Kotlikoff (1979), but extend his analysis to the issue of changing slave quality. Estimating real wealth in the antebellum South depends to a great extent on the value of slaves. Consequently, having accurate slave values is of particular interest. For example, if real slave prices had been rising due to an increase in quality then estimates of inflation are overstated, and real wealth understated.

In this paper I use hedonic methods to provide a clearer picture of the movement of slave prices that is not due to any changes in slave quality. A byproduct of these procedures is that one can compute quality-adjusted quantities as well as prices. I show that slave prices did not increase as much as the unaltered data indicate. This implies that previous calculations of antebellum inflation and the net wealth of the South need revision. More importantly, I show that the quality of slaves---quality as measured by their purchasers---was decreasing. These factors, coupled with the decreasing prices of cotton and sugar, imply that the future of the slave economy was bleak.

### **THE DATA**

My main data source is The New Orleans Slave Sample, 1804-1862, collected by Fogel and Engerman and used in their 1974 book *Time on the Cross*.

Each bill of sale for a slave in the New Orleans market---there were approximately 135,000 such sales---was notarized and kept in various notarial offices throughout the city, until they were gathered in the New Orleans Notarial Archives in 1867. Each bill of sale contained information about sellers, buyers, means of payment, and more importantly characteristics of the slaves. From these bills, one can observe the gender, skill level, age, occupation, and complexion of the slave, as well as whether they were sold as a part of a family unit. The Fogel and Engerman dataset is a sample of over 5,000 slaves from these bills.

Following Kotlikoff (1979) I exclude those records that contain slaves sold in batches, because they list identical prices for each slave in the group. These prices are average prices and therefore do not indicate which slaves or which characteristics were more valued. I have almost 3000 observations of slave prices (out of the original 5000) covering the years 1804-1862. This is an average of 51 slave sales per year, 13 per quarter, or 4 per month.

I deflate all prices by an index representing the average price of commodities in the New Orleans area. Compiling and cross-checking data from 45 different periodicals, Cole (1938) produced a price index for New Orleans wholesale prices for the years 1800-1861. The range of goods for which the report prices is extensive; one hundred different commodities' prices were recorded, ranging from different grades of cotton and sugar, to molasses, lumber, pork, corn, furs, beef, cheese, gin, etc. Because of the ongoing War of 1812 (which lasted into 1815 in New Orleans), I do not have data on agricultural prices for the years 1812-14. For the purposes of my study, I use Cole's weighted all-commodity series as a measure of the general price level for the Louisiana region.

## **AGGREGATION AND THE HETEROGENEITY PROBLEM**

Movements in slave prices can easily be described by taking averages in each period. These numbers are easy to interpret. For example, of the sample of 23 slaves sold in period 1, the average price was \$373, 30% of the slaves were male, and the average age was 17 years. Dividing the average slave prices by the 1804 average price and multiplying by 100 yields the simple (naïve) index of relative slave prices.

There are serious problems with such an aggregation procedure, because you run the risk of aggregating over heterogeneous product, so to speak. Each individual is unique, so each slave sale represents a change in quality. When slave prices and qualities are changing, how much of the increase in price is due to inflation, and how much to changes in the qualities of the slaves? This heterogeneity problem is addressed using hedonic regression techniques. A hedonic regression is fancy terminology for any regression of the price of a good onto its characteristics.

The price of a slave depends on his characteristics. Throughout I will make use of regressions of the logarithm of slave prices on a set of slave characteristics and (sometimes) time dummy variables. In his groundbreaking 1979 study of slave prices, Kotlikoff used the set of slave characteristics described in Table 1 below, to which I add a series of geographic variables.

Several of these variables deserve further elaboration. The variable MTHCRED indicates how many months of credit were offered to the buyer for purchasing a slave. There are several ways that interest can be reported. For example, when you buy a product, you can either agree to the purchase price of, say \$1,000, plus ten percent interest payable at the end of the year. Or, you may report the

purchase price as \$1,100 payable at the end of the year. Thus, increases in the length of credit should increase the reported price.

The variable GUAR relates to Louisiana's "redhibition" laws. Under these laws, a buyer could sue for a refund the purchase price of the slave, if he could establish that, at the moment the slave was bought, the slave suffered from physical

**TABLE 1  
SLAVE CHARACTERISTICS**

<b>Variable</b>	<b>Description</b>
Age	Continuous variable indicating age.
Mthcred	Months of credit extended. MTHCRED takes on the value zero if an interest rate was explicitly mentioned in the invoice.
Month	Month dummies.
Male	Dummy for male slave
Color	Dummies for light colored slaves.
Skill	Dummy for slave artisans.
Sklage1-4	Dummies for artisans aged 15-25, 25-30, 30-40, and 40-60.
Hw-M, -F	Dummies for slaves with house-centered occupations, male and female.
Othocc	Dummy for slaves with an occupation who were neither artisans, nor had worked in a house related activity. These include field hands.
Guar-M, Guar-F	Dummies for guaranteed females and males
K12	Variables indicating the number of children ages
K345	1-2, 3-5, 6-9, and 10 and over sold with their mothers.
K6789	
K10+	
NewOrleans	Slave previously resided in the New Orleans region.
Louisiana	Slave previously resided in Louisiana, but not in New Orleans
NewSouth	Slave previously resided in Alabama, Arkansas, Mississippi, or Texas
SouthEast	Slave previously resided in Florida or Georgia.
BorderStates	Slave previously resided in Kentucky, Missouri, or Tennessee.
OldSouth	Maryland, Virginia, North and South Carolina, Delaware, or D.C.
Unknown	Slave's previous residence is unknown, but known to be outside of Louisiana.

and mental defect. Leprosy, madness, and epilepsy automatically voided any sale. Other diseases warranted less complete reimbursement. Physical maladies, included being "in the habit of running away", "addiction to theft, or having committed a capital offense. These laws did not apply, however, if a slave was explicitly sold without guarantee. Therefore, the variable GUAR is constructed to take on the value 1 if the slave was fully guaranteed and 0 if the slave was explicitly exempted from guarantee.

The geographic variables indicate the geographic origin of the slave; i.e. the previous place of residence of the slave. This is important for at least two reasons. First, different geographic regions support different diseases, and often immunity to these diseases may be acquired. Importing a slave from a different disease

environment therefore may carry additional risks. Second, some researchers such as Greenwald and Glasspiegel (1983) have argued that the decision to export a slave to the New Orleans market was influenced by adverse selection and different agricultural productivities.

The slave characteristics for which Fogel and Engerman have data is admittedly limited. It would seem that slave heights and weights, for example, should be considered in any investigation of slave prices. Since well-fed slaves of large stature would tend to be more productive, they should command a higher price. Margo and Steckel (1982) estimated a regression of the log of slave price on skin color, an age polynomial, height, weight, and a height-weight interaction. They found that a one pound increase in weight corresponds to a 2% increase in a slave's price. They also found that height was statistically insignificant, and that the height-weight interaction was statistically significant but economically negligible. Since Margo and Steckel find height to be insignificant, even when occupation is not included, this implies that not including height in the present study is not very costly. Since occupation was not included in their regressions--and occupation, height, and weight should be positively correlated--the effect is to falsely inflate the importance of height and weight. Slave labor was largely allocated according to physical ability, suggesting that larger, stronger slaves would become field hands, while smaller, weaker slaves would tend to become domestics (Metzer 1975). As the  $R^2$  on Margo and Steckel's regressions was only 0.20, weight offers little explanatory power. Therefore very little explanatory power is lost by not including the information on weight that is not correlated with occupation. That is, by including occupation, it is likely that we have captured most of the effects that weight would have had, with the remaining independent effect of height and weight being negligible. That said, it must at least be admitted that had height and weight data been available, they would have been included in the present analysis.

Which characteristics should be included in the hedonic regression? Theory does not provide much of an answer--it is an empirical matter. However, Griliches (1971, p.5) warns against including "variables which are not direct characteristics of the commodity (or a transformation of them) but an outcome of the market experiment". For this reason, I do not include sugar and cotton prices in my regressions below.

Having the correct functional form of the hedonic price regression is crucial, but it cannot be determined on theoretical grounds. Its form is an empirical question. The choice of functional forms has been studied by Halvorsen and Pollakowski (1981), Early and Sinclair (1983), and Cropper, Deck, and McConnell (1988), with no clear results. Researchers commonly experiment with various functional forms, most commonly linear, log-linear, and log-log. In what follows, I use a log-linear form.

### **HEDONIC QUALITY ADJUSTMENT**

The problems associated with computing price indices when facing changing product characteristics are well known by governmental statistical agencies. For example, the Boskin Commission, in 1996, showed that estimates of inflation that did not take into account changing product characteristics, may be overstated by 0.6% per year (Gordon 2000). In response, The Bureau of Labor Statistics computes the CPI using hedonic models for many consumer durables. As of 2001, 18 percent of GDP is deflated using hedonic price indexes (Moulton, 2001).

The matched models approach to constructing an hedonic price index relies on a price collector to select comparable (or matching) models in each period and compare their prices. This is the method that the BLS uses to compute components of the CPI. This method minimizes the problem of changing product characteristics. If the models are not strictly comparable, and are of higher quality in the later periods, there will be an upward bias. Explicit adjustment is made for quality change when a new model is introduced or an old model is discontinued. If one model of television, for example, is discontinued and replaced with a new better one, the price of the new one may be marked down using the values of its new characteristics. The regression provides an adjustment factor so that the two televisions are considered comparable (Silver, 1999).

The application of the matched models approach to my dataset is the following:

1. Regress price (or log of price) on slave characteristics using all of the observations. This provides an estimate of the value of each slave's characteristics.
2. Then, posit a "baseline model" of slave. This might be a slave of the researcher's imagination: a 21 year old, male, un-skilled field hand (90% of slaves recorded), who was guaranteed and sold for cash rather than credit (over 70%), for example. Alternatively it could have been the characteristics of the average slave in period 1, or any other normalization for that matter. I chose the preceding baseline because it corresponds to more to the typical slave, and as such, requires making adjustments to fewer slave records. This is, however, mostly a matter of aesthetics as the choice of baseline model is largely irrelevant; the salient feature is that any baseline is provided.
3. The third step is to mark up or down every slave's price by the value of their deviation from the baseline slave.

This procedure is used in the rent and housing portions of CPI calculations (Moulton, 2001).

Let's take a simple example. Say we estimated the hedonic regression to be:

$$PRICE_i = 100 + 50MALE_i + 30AGE_i \quad (1)$$

Say we had a 21 year old female slave who sold for \$1,000, and an 18 year old male slave who sold for \$1,600. Adjust the price of the slaves as follows:

$$PRICE_i^{new} = PRICE_i^{observed} + 50(1 - MALE_i) + 30(21 - AGE_i) \quad (2)$$

The first slave was a female. Since males are more valued than females according to the regression results, then this represents a quality decline in the slave model. So the price of the first slave should be marked up by \$50 so that her quality-adjusted price is \$1050. The second slave is 3 years younger than the baseline slave. This is also a quality reduction so that his price should be adjusted upward by  $3 \times \$30 = \$90$ ; his quality adjusted sales price is now \$1690. Our first step is to regress the log of slave price on characteristics. The coefficient estimates are reported in Table 2.

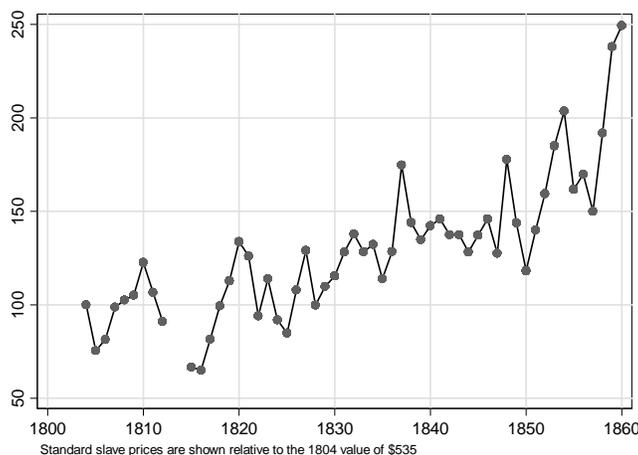
Using the coefficients from Table 2, I adjust the observed price of each slave up or down by the value of their deviation from the standard slave. Thus, we derive prices of slaves of comparable quality---“quality-adjusted” or “standardized” prices. A simple quality-adjusted price index is constructed by taking the average quality-adjusted price in each period, dividing it by the adjusted prices in the base period, and multiplying by 100. This is illustrated in Figure 1.

**TABLE 2**  
**LOG OF SLAVE PRICES DECOMPOSED**

<b>Variable</b>	<b>Coeff- icient</b>	<b>P-value</b>	<b>Mean</b>	<b>Variable</b>	<b>Coeff- icient</b>	<b>P-value</b>	<b>Mean</b>
Male	0.084	0.06	0.47	January	0.215	0.00	0.11
Color×M	0.098	0.00	0.10	February	0.160	0.00	0.09
Color×F	0.111	0.00	0.13	March	0.200	0.00	0.11
Guar×M	0.253	0.00	0.39	April	0.218	0.00	0.11
Guar×F	0.226	0.00	0.45	May	0.144	0.00	0.11
K12	0.171	0.25	0.01	June	0.110	0.03	0.08
K345	0.270	0.17	0.01	July	0.110	0.03	0.07
K6789	0.126	0.16	0.01	August	0.087	0.10	0.06
K10plus	0.270	0.03	0.01	September			0.12
Mthcred	0.010	0.00	2.21	October	0.124	0.02	0.07
Hw-M	0.035	0.63	0.01	November	0.130	0.01	0.06
Hw-F	0.045	0.28	0.05	December	0.158	0.00	0.07
Othocc	-0.038	0.69	0.01	NewOrleans			0.74
Sklage1	0.425	0.00	0.01	Louisiana	-0.287	0.00	0.01
Sklage2	0.465	0.00	0.00	NewSouth	0.000	0.99	0.05
Sklage 3	0.428	0.00	0.00	Southeast	-0.109	0.11	0.02
Sklage 4	0.240	0.23	0.00	BorderStates	-0.104	0.01	0.05
Age	-0.039	0.00	24.02	OldSouth	-0.017	0.58	0.09
Age <sup>2</sup>	-0.205	0.00		Unknown	0.242	0.00	0.04
Age <sup>3</sup>	0.100	0.00		Constant	5.876	0.00	

Note: The age polynomial is an orthogonal polynomial.

**FIGURE 1  
HEDONIC SLAVE PRICE INDEXES**



Real slave prices rose to 250% times their 1804 prices by 1860. This is not as large an increase as simple averaging (300%) would have us believe. The difference might not seem economically significant at first, until it is remembered that slaves were extremely expensive. And in light of estimates that economies of scale were not realized until at least 15 slaves were purchased (Field, 1988), the difference between 2.5 and 3 was steep for the average slave buyer.<sup>1</sup> In any case, the focus of this paper is on the issue of slave quality; the quality-adjusted price index is simply a stepping stone toward answering the slave quality question. The coefficient estimates from the hedonic regression, however, raise some interesting questions about the pricing of slave qualities; these are addressed in the next section.

#### **COMMENTS ON THE COEFFICIENTS**

Kotlikoff (1979) adjusted Fogel and Engerman's (1974) price series for the overall level of prices---i.e. his adjustment from nominal to real---by dividing each observed slave price by "the mean New Orleans price of male field hands between the ages of 21 and 38 in year  $t$ ". While this method eliminates the effects of inflation, it also eliminates other useful time-series information. If real prices were growing at the same rate for all slaves, for example, then Kotlikoff's procedure would yield a time-series for prices that was perfectly flat. For this reason, I deflate observed slave prices by the Cole (1938) price index mentioned previously.

Despite the different method of inflation adjustment, the values of the coefficients above are in line qualitatively with what Kotlikoff reported.

The variables COLOR-F and COLOR-M are dummy variables indicating whether a slave was a light-skinned female or male. Large positive values for these variables indicate that skin color was important in determining slave price. Kotlikoff had estimated that the light-skin premium was 5.3% for females and 2.3% for males.

My estimates are larger: especially when using the Matched Models Method: 11.1% and 9.7% for females and males respectively.

If slaves were purchased solely for their value in agricultural production, or even for the value of their non-agricultural production, then skin color should have been irrelevant. A light skinned female premium indicates that there may have been a consort market for light skinned slaves; they were desired for concubinage rather than production. A light skinned male premium is more difficult to interpret. It has never been alleged that light skinned blacks were purchased extensively for lascivious purposes. Modern racial sensibilities lead us to the conclusion that skin color should not have added value to a slave, especially a male field hand. What then might cause skin color to enter into the decision to purchase a male slave? There are scores of racist reasons that cannot be defended. But, perhaps there are modern medical reasons why slaves of a different color might be valued differently.

Pigmentation might indicate a resistance to disease. Southerners such as Samuel Cartwright, the racist southern doctor, had alleged in a now infamous article in *De Bow's Review*, that light skin in a slave was a mark of frailty. This has often been dismissed out of hand as racist nonsense (most of what Cartwright wrote was just that). And yet, there are differences between the races, medically speaking, and there is ample evidence that blacks were genetically less susceptible to malaria than whites:

At least three hereditary conditions prevalent among blacks in parts of modern African appear to confer immunity to malaria upon their bearers... Approximately 90 percent of West Africans lack Duffy antigens as do about 70 percent of Afro-Americans. This inherited, symptomless, hematologic condition is extremely rare in other racial groups. All evidence points to the conclusion that infection by *P vivax* [malaria] requires the presence of Duffy-positive red blood cells. Since most members of the Negro race do not possess this factor, they are immune to vivax malaria.... Some antebellum blacks had additional protection against malaria resulting from the abnormal genetic hemoglobin conditions, sickle cell disease... and sickle cell trait... People with either of these conditions had milder cases of, and decreased risk of mortality from, the malignant form of malaria, falciparum.... Scientists have evidence that one other genetic condition probably affords some malarial resistance: deficiency of the enzyme glucose-6-phosphate dehydrogenase... (Savitt, 1978, pp.27-28)

The same genetic trait that makes blacks more susceptible to sickle cell anaemia also provides them with a natural immunity to certain forms of malaria. This is not to say that all blacks are immune, just as it does not mean that all blacks acquire sickle cell anaemia. Southern planters were very much concerned with malaria, so any positive association between blackness and healthiness should be manifested in a higher price for darker skinned slaves. And yet, darker skinned slaves sold for less than lighter skinned ones.

It took time to acclimate oneself to the harsh climate and various diseases that thrived in the South. Imported slaves were considered "unseasoned"; they required a "seasoning period" in which to become acclimated. A recently imported slave would be more susceptible to malaria, however,

it was possible to acquire malarial immunity or tolerance... by suffering repeated infections of the disease over a period of several years. For this to occur, one species of plasmodium had to be present constantly in the endemic region so that, with each attack, a person's supply of antibodies was strengthened against future parasitic invasions. Interruption of this process... prohibited the aggregation of sufficient antibodies to resist infection. In truly endemic areas, acquiring immunity this way was a risky affair... It is no wonder, then, that slaves sold from, say, Virginia, where one form of malaria was prevalent, to a Louisiana bayou or South Carolina rice plantation where a different species or strain of plasmodium was endemic, had a high incidence of the disease. Even adult slaves from Africa had to go through a 'seasoning' period because the strains of malarial parasites in this country differed from those in their native lands. (Savitt, 1978, pp. 25-26)

Given planters' concerns with malaria and the ample contemporary discussion of the seasoning of slaves, there should be a noticeable difference in prices from local seasoned slaves, and those newly imported unseasoned slaves. To test this, I performed another regression where I included a dummy variable indicating whether a slave had recently been imported into Louisiana. The coefficient on the variable was insignificant at all reasonable levels. The change in the coefficient estimates was negligible. It is curious that there was no detectable difference in the prices of seasoned and unseasoned slaves.

Since light skinned slaves reminded white slaveowners of themselves, perhaps they projected their own self-perceived superior qualities onto those slaves that looked more like them. Light skinned slaves may have been thought to be more intelligent, gentle, cultured, and so forth. And yet this association of light-skinned slaves with the qualities of their light-skinned owners could also have worked to price lightness more cheaply. Since white slave owners found the heat oppressive, it was natural to think their lighter-skinned slaves---geneologically farther removed from Africa---as having a similar intolerance to heat. A southern doctor, P. Tidyman, writing in 1826, echoed this belief:

The colour of the skin in the negro gives him a decided advantage over the white, by enabling him to endure the scorching heat of the sun with less suffering; whilst he is protected by the very nature of his constitution from the unhealthiness of hot climates, which are so inimical to the whites... negroes are seen working with cheerfulness and alacrity, when the white labourer would become languid and sink from the effects of a torrid sun. (Bankole, 1998, p74)

Thus we are faced with a multitude of reasons why lighter skinned males should have been less valued.

The paradoxical fact that light skin was more highly valued is a possible indication that slave pricing was not as rationally production-centered as Fogel and Engerman (1974) would have us believe. Fogel and Engerman devoted four pages to combating the proposition that slaves were a prestige good. The following passage is indicative of their position:

It should be remembered that the proponents of the thesis that slaves were held widely for reasons of conspicuous consumption never provided conclusive proof of their contention... Yet surely

prestige attaches to the ownership of most assets of great value which bring high rates of return to their owners. To show that the ownership of slaves and prestige were positively correlated does not settle the issue of causality... The demonstration that an investment in slaves was highly profitable... undermines the case for conspicuous consumption... The point at issue is not whether the slavocracy valued its power, lifestyle, and patriarchal commitments, but whether the pursuit of these objectives generally conflicted with... the pursuit of profit. (Fogel and Engerman, 1974, p.71-73)

But the fact that lighter skinned slaves, even males, sold for more than darker slaves is evidence of conspicuous consumption. Buyers were willing to pay more for a slave that had a higher risk of dying and was no more productive than a darker skinned slave. Since there is no output-related reason for this premium, it indicates that lighter skinned slaves were a prestige good. In this case, the slavocracy's penchant for light skin really did conflict with their pursuit of agricultural profit.

The question of skin pigmentation is intimately related to the practice of "seasoning." As mentioned before, seasoning refers to the acclimatization of a slave to the local disease environment. Some immunities to disease are genetic, pointing to the importance of skin-pigmentation discussed above. Other immunities to disease are acquired. When this is the case, the location from which the slave was imported can make a big difference. If the slave comes from the same disease environment then he is already seasoned, and thus resistant to disease. Controlling for this possibility is therefore important, and we have done this.

Controlling for geographical location is important for a completely different reason though. Several authors have noted that in the New Orleans slave sale records the average price for slaves from the New South differ significantly from the average price of slaves from the Old South. Several explanations have been raised. Greenwald and Glasspiegel (1983) make an adverse selection argument that incorporates the fact that slaves came from areas with different agricultural productivities. Pritchett and Freudenberger (1992), Pritchett and Chamberlain (1993), and Pritchett (1997) argue that transportation costs are key—if you are transporting slaves from further away the trader would select higher quality slaves to offset the higher costs of transport. Therefore, controlling for these location effects while simultaneously controlling for slave characteristics is important. The regression results indicate that, even after controlling for many different slave characteristics, location effects are important. Perhaps they indicate that the slave is already comfortable with the climate, or with the agricultural product to be produced.

#### **WERE SLAVES IMPROVING IN QUALITY?**

Were slaves improving in quality? By this, I do not mean whether slaves were more literate, or even whether they were healthier. Quality is in the eye of the beholder; a slave's quality was in the eyes of their purchasers. Therefore, I constrain myself to those characteristics that were recorded in the notarized bills of sale comprising the Fogel and Engerman dataset.

A relatively informal check of quality change in the New Orleans sample is to examine what the proportion of skill (or guarantee, or color, etc...) was in each yearly basket. Taking simple yearly averages, I then regress each characteristic separately on

time. The estimated coefficient, if positive, will indicate that the characteristic in question is increasing over time. The results are reported in Table 3.

**TABLE 3  
WERE SLAVES IMPROVING?**

Variable	Coefficient	P-value	Variable	Coefficient	P-value
MALE	-0.0010052	0.195	OTHOCC	-0.0000877	0.615
COLOR	0.0033028	0.000	SKILL	0.0002982	0.202
COLOR×F	0.0025673	0.000	AGE	8.79E-02	0.000
COLOR×M	0.000748	0.048	SKLAGE1	1.31E-05	0.914
GUAR	-0.0015406	0.228	SKLAGE2	1.40E-04	0.007
GUAR×F	0.0005962	0.382	SKLAGE3	0.000137	0.496
GUAR×M	-0.0025605	0.002	SKLAGE4	-8.22E-06	0.802
MTHCRED	-0.0203624	0.145	K12	-0.0000475	0.743
HW	0.0004668	0.420	K345	1.93E-06	0.988
HW×F	0.0006511	0.222	K6789	0.0000173	0.899
HW×M	-0.0001797	0.182	K10PLUS	0.0001172	0.135

Note: P-values were calculated using autocorrelation and heteroskedasticity robust standard errors.

Over time, guaranteed males were less frequently observed in the market. Being a guaranteed male was a positively valued characteristic, so this is seen as a quality decline. On the other hand, light skinned slaves were becoming more common. Since light skin was viewed as a positive characteristic in the slave market, this is seen as a quality increase. We are faced with a situation where some variables indicate increasing quality, and others indicate the opposite. The question becomes how to weight these different qualities. Hedonics answers this question. The characteristics are weighted by the prices that were estimated by the hedonic regressions.

### QUALITY-ADJUSTED QUANTITIES

The Direct and Matched-Models Methods allow one to compute the price of a standardized slave,  $\hat{P}$  (details will follow). From this, and the observed sales price  $P$  and quantity  $Q$ , one is able to calculate the standardized quantity---or quality-adjusted quantity  $\hat{Q}$ ---of each slave using the following “expenditure” method.

For each slave I equate his standardized expenditure ( $\hat{P}_i \hat{Q}_i$ ) to his observed expenditure ( $P_i Q_i$ ),

$$\hat{P}_i \hat{Q}_i = P_i Q_i \tag{3}$$

The standardized price will be computed below. Fogel and Engerman did not sample each period at the same intensity, sampling some years at 2.5% and others at 5%.

Depending on the period, each slave record counts as either 20 slaves or 40 slaves. Lets say that in the year in question, each slave receipt counts as 20. Then

$$\begin{aligned}\hat{P}_i \hat{Q}_i &= P_i 20 \\ \hat{Q}_i &= 20P_i / \hat{P}_i\end{aligned}\tag{4}$$

Lets return briefly to the example. Again, a 21 year old female sold for \$1000, an 18 year old male sold for \$1600, and prices were adjusted using the formula

$$PRICE_i^{new} = PRICE_i^{observed} + 50(1 - MALE_i) + 30(21 - AGE_i).\tag{5}$$

The standardized price for the first slave was \$1050, and for the second was \$1690. Using the expenditure approach, the first record represents, not 20 slaves, but

$$\hat{Q} = (20 \times 1000) / 1050 = 19.05.\tag{6}$$

That is, since she was a female, she was of lower quality, and was only 95%=1000/1050 of a standard slave.

Each slave counts as  $\hat{Q}_i$  effective units of “slave”. I sum up these effective quantities of each slave in a year to determine the effective (i.e. standardized) yearly quantity of slaves sold.

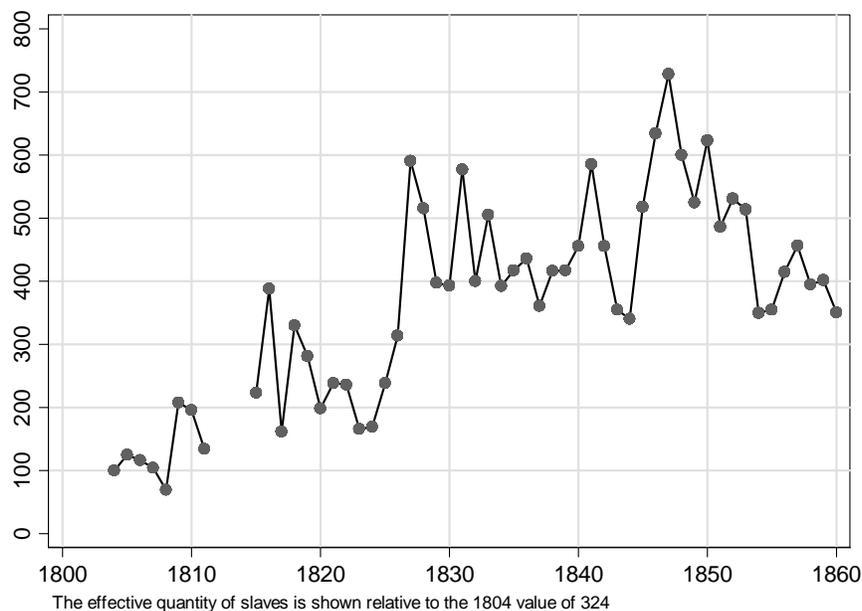
This method of estimating “effective” slaves is a modern analogue to the antebellum practice of rating slaves as a number of hands:

Most masters had systems of rating such slaves as fractional hands. Children often began as “quarter hands” and advanced to “half hands,” “three-quarter hands,” and then “full hands.” As mature slaves grew older they started down this scale... Seldom were many more than half of a master's slaves listed in his records as field-hands, and always some of the hands were classified as fractional. (Stamp, 1956, p.57)

From this standardized price series I back out the corresponding quantity series using the previously described “expenditure approach”. The effective number of slaves sold yearly, relative to the 1804 estimate, is shown in Figure 2.

Each point in Figure 2 is a sum of all the fractional hands of slaves in a given year. Dividing this number  $\hat{Q}$  through by the actual number of slaves Q, will reveal whether the increase in the number of hands is due to having more slaves or better hands. The effective quantity of slaves sold in each year is shown relative to the 1804 value of 211 in Figure 2.

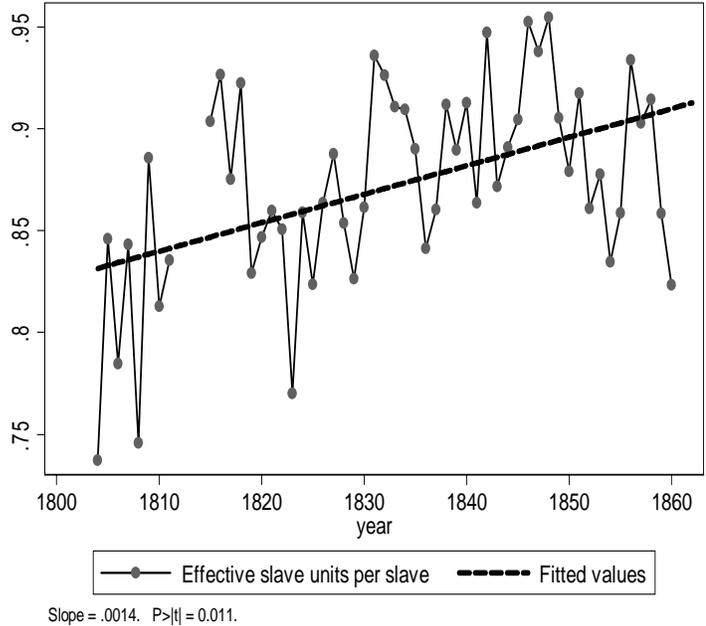
FIGURE 2  
EFFECTIVE SLAVE QUANTITY INDEXES



Dividing this quantity by the observed number of slaves ensures that the increase in effective units of slave is not due to the fact that we have more slaves. If this ratio is increasing then the effective number of slaves is increasing. Regressing  $\hat{Q}_t / Q_t$  on a constant and time, gives an estimated slope of 0.0014. This is illustrated in Figure 3. Using autocorrelation and heteroskedasticity-robust standard errors, the slope is significantly different from zero at the 0.04 level. Thus we can say that slaves show some evidence that they were increasing in quality.

However, this result is more apparent than real. Slaves imported from Africa would be more likely to be darker skinned. They would also be less acclimated, and would not speak the language (neither French nor English). Since the slave trade was closed in 1808 in the United States, earlier samples of slaves would contain more imported slaves and so would automatically of lower “quality”. This effect should be of diminishing importance over time as increasingly higher proportions of slaves became native-born. According to Fogel and Engerman (1974, p.23) almost 20% of the slave population in the United States as of 1800 was foreign born; by 1810 this number had risen to slightly above 20%, after which it declined steadily until by 1860 almost 0% of the slave population was foreign born. That is, over time there were fewer imported slaves---slaves of lower quality. Is the appearance of improvement in slave quality the result of this ban in slave importation? One way to examine this question is to see if this apparent increase in slave quality is robust to starting periods. It is not. Once the effects of importation are taken into account by removing the influence of earlier periods, there is no evidence that slaves were improving in quality.

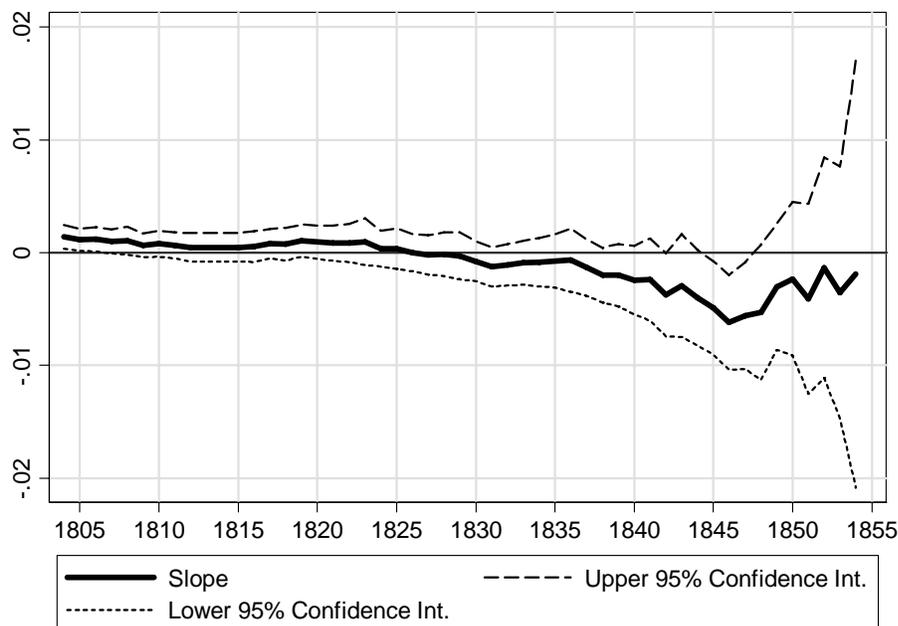
**FIGURE 3**  
**WERE SLAVES IMPROVING?**



I calculate the estimated slopes and 95% confidence intervals for a series of regressions, each regression beginning in increasingly later years. Thus, I calculate the slope for a regression for 1804-1860, and plot this value (0.0054) under 1804. I then proceed to estimate the slope coefficient for years 1805-1860 and plot the new slope coefficient (0.0044) under 1805. This second slope is significant only at the 90% level. The regression for 1806-1860 has a slope coefficient which is even closer to zero, and is not significant at the 90% level. This procedure was repeated, each time beginning at later years, with the results illustrated in Figure 4.

Again, once the effects of the earliest years are removed, there is no evidence of improvement in slave quality. Of course, as the sample size decreases, the width of the confidence interval grows, so that it becomes increasingly difficult to detect whether the estimated slopes differ from zero. It is interesting to note, however, that the estimated slopes tend to drop and become negative over time, lending support to the idea that slaves were of diminishing quality. That is, there is reason to believe that third generation slaves were actually of lower quality than second generation slaves.

**FIGURE 4**  
**WERE SLAVES IMPROVING? THE EFFECT OF STARTING DATE**



## CONCLUSION

Proper appraisal of the efficiency of slavery depends vitally on proper estimation of slave valuations. The hedonic regression raises some interesting questions about the pricing of slave qualities. Dark-skinned slaves had certain immunities which should have made them more valuable, however it seems they were sold at a discount. The reason for this is unclear and deserves further study.

In this paper, I have shown that slave prices were increasing at a rate that is appreciably lower than was previously thought: prices were 2 1/2 times greater than they were at the beginning of the 1800s. This is due to an apparent increase in slave quality, especially during the early 1800s. Further, I have shown that once the effects of the prohibition of slave importation in 1808 are taken into account, there is evidence of a decline in slave quality. Between 1830 and 1860 slave quality seems to have been on a steady decline. Fewer male slaves were being guaranteed. The combination of increasing slave price and decreasing quality indicate that slavery's days may have been numbered.

### ENDNOTES

<sup>1</sup> While this paper presents only the Matched Models approach, previous versions of the paper also employed the Direct Method, along the lines proposed by Zvi Griliches in the 1960s. The Direct Method relies on a regression of price on characteristics, much like the Matched Models method, but is augmented by a series of time-dummy variables. Exponentiating the estimated coefficients of the time-dummy variables gives the desired price index. The conclusions of this paper did not depend upon the choice of method; results were indistinguishable.

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