Slavery, Inequality, and Economic Development in the Americas: An Examination of the Engerman-Sokoloff Hypothesis

Nathan Nunn

Harvard University

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Abstract

Recent research argues that among former New World colonies a nation's past dependence on slave labor was important for its subsequent economic development (Engerman and Sokoloff, 1997, 2002). It is argued that specialization in plantation agriculture, with its use of slave labor, caused economic inequality, which concentrated power in the hands of a small elite, adversely affecting the development of domestic institutions needed for sustained economic growth. I test for these relationships looking across former New World economies and across states and counties within the U.S. The data shows that slave use is negatively correlated with subsequent economic development. However, there is no evidence that this relationship is driven by large scale plantation slavery, or that the relationship works through slavery's effect on economic inequality.

*Department of Economics, Harvard University and NBER.

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1 Introduction

In a series of influential papers (Engerman and Sokoloff, 1997, 2002, 2006; Sokoloff and Engerman, 2000), economic historians Stanley Engerman and Kenneth Sokoloff argue that the different development experiences of the countries in the Americas can be explained by initial differences in factor endowments, which resulted in differences in the use of production based on slave labor. The authors argue that reliance on slavery resulted in extreme economic inequality, and this in turn hampered the evolution of institutions necessary for sustained long-term economic growth. The authors hypothesize that inequality adversely affected the development of important institutions such as voting rights (Engerman and Sokoloff, 2005*b*), taxation (Sokoloff and Zolt, 2007), and the provision of public schooling (Mariscal and Sokoloff, 2000).

In this chapter, I empirically examine two parts of Engerman and Sokoloff's hypothesis: that (1) large scale plantation slavery resulted in economic inequality, and that (2) this resulted in subsequent underdevelopment.[1]

In section 2 of the chapter, I test for the reduced form relationship between large scale plantation slavery and economic underdevelopment. This is done by examining whether there is evidence that countries that relied most heavily on slave use in the late 18th and early 19th centuries are poorer today. I test for this relationship looking across former New World economies, and across counties and states within the U.S. In both settings, I find a significant negative relationship between past slave use and current economic performance. I also examine whether large scale plantation slavery appears to have been particularly damaging for economic development. I do not find any evidence that large scale slavery was more detrimental for growth than other forms of slavery. Instead, the evidence suggests that all forms of slavery were detrimental, and that if any form of slavery was particularly detrimental it was actually small scale non-plantation slavery.

In section 3 of the chapter, I examine whether, consistent with Engerman and Sokoloff's hypotheses, the negative relationship between slavery and income can be explained by slavery causing extreme economic inequality, which adversely affected economic growth. Looking within the U.S., I find that slavery in 1860 is positively correlated with land inequality in the same

[1] I do not examine the first component of their argument, that natural resources, such as soils suitable for plantation agriculture, were an important determinant of slave use in the colonies. The link between geography and slavery, across counties within the United States, has been examined by Lagerlöf (2005). He finds temperature, elevation, and precipitation to all be important determinants of slave use.

year, but I do not find that initial land inequality had any subsequent effect economic development. In addition, I do not find that the effect of slavery on inequality is able to account for the estimated effect of slavery on economic development.

Overall, the results of this chapter support Engerman and Sokoloff's basic assertion that slavery was detrimental for economic development. However, the data do not show that large scale plantation slavery was particularly detrimental for development, and it does not appear that slavery's adverse effect on subsequent economic performance is because of its impact on initial economic inequality.

2 Testing the Reduced-Form Relationship: Plantation Slavery and Economic Development

2.1 Looking within Former New World Countries

To construct measures of the prevalence of slave use in each New World country, I use historic population data from a variety of sources, most often population censuses. These data and their sources are described in detail in the appendix. As my measure of the prevalence of slavery I use the fraction of each country's total population that is in slavery in 1750. It is important to note that I am not using the proportion of the population that is of African descent. Included in the category of slaves are enslaved Africans and Natives Americans, while free Africans are not included. One could also construct estimates of the proportion of a population that was African, but this is a much less precise measure of the variable of interest.

As a measure of economic development I use the natural log of per capita GDP in 2000. The sample includes 29 former New World countries for which slave and free persons population data, and income data are available.

The relationship between current income and the proportion of the population in slavery in 1750 is shown in figure 1. In the raw data one observes weak evidence that slavery may have adversely affected economic development. There is a negative, but statistically insignificant, relationship between past slave use and current income.

I further examine this relationship by estimating the following equation, which also controls for other potentially important determinants of economic development:

$$\ln y_i = \alpha + \beta_S \, S_i/L_i + \gamma \, L_i/A_i + \mathbf{I}'\delta + \varepsilon_i \qquad (1)$$

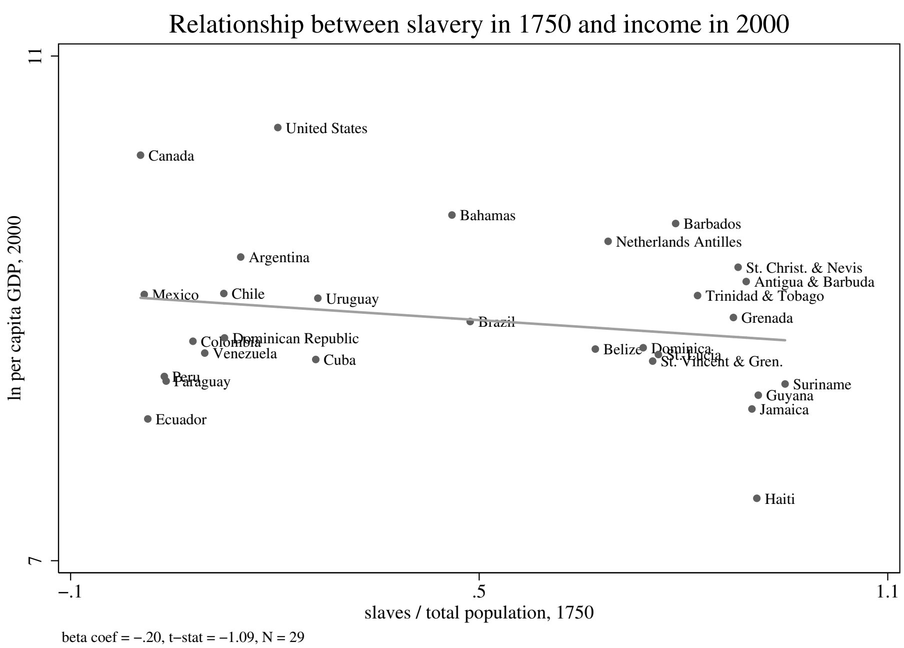

Figure 1: Bivariate plot showing the relationship between the proportion of the population in slavery in 1750 S_i/L_i and the natural log of per capita GDP in 2000 $\ln y_i$.

The subscript i indexes countries, y_i is per capita GDP in 2000, S_i/L_i is the proportion of slaves in the total population in 1750, L_i/A_i is the population density in 1750, and $\mathbf{I}$ denotes colonizer fixed effects for former French, British, Spanish, Portuguese, and Dutch colonies. The fixed effects are included to capture an important part of Engerman and Sokoloff's overall argument. The authors argue that although Spanish colonies did not have large numbers of slaves, they were still characterized by high levels of inequality. Primarily because large native populations survived European contact, the Spanish adopted the native practice of awarding property rights over land, labor, and minerals to a small elite.[2] To capture this Spanish effect, I include a fixed a fixed effect for countries that are former Spanish colonies. I also include fixed effects for the nationalities of the other colonizers, which will capture other differences in colonial strategies that may be important for economic development.

The coefficient of interest in equation (1) is β_S, the estimated relationship between past slave use and current income. A concern when interpreting this coefficient is whether the estimated effect is actually causal. In this setting, the core issue is that initial country characteristics affected the use of slave labor, and that these initial conditions may either persist affecting income today, or they may have affected the past evolution of income through channels other than slave use. It may be that countries with characteristics that were least favorable for economic growth may have been most likely to use slave labor. If this is the case, then this will tend to bias the estimated relationship between slave use and income downwards, and we may falsely conclude that slavery was bad for subsequent economic development even if this is untrue.

Because of the lack of availability of historic data for all countries in the sample, I am unable to control for all of the initial country characteristics that I would like to control for. However, one measure that is available is initial population density (L_i/A_i), which I include as a control in (1). The variable is meant to capture the economic prosperity of each country in 1750, which was in turn determined by a host of factors such as climate, soil quality, and the distance to international markets.[3] The variable will also be positively correlated with the future growth potential of a country at the time. This is because both voluntary and forced migration would have been determined, at least in part, by the expected future profitability

[2] See Engerman and Sokoloff (2005*a*, p. 4) or Sokoloff and Engerman (2000, pp. 221–222) for details.

[3] See Acemoglu *et al.* (2002) for evidence showing that population density is highly correlated with per capita income.

of the colonies. Labor would have migrated to where the current and future returns to labor were the highest.[4]

OLS estimates of equation (1) are reported in table 1. The first column reports estimates of (1) with colonizer fixed effects only, while the second column reports the fully specified estimating equation, also controlling for initial population density. In both specifications the estimated coefficient for S_i/L_i is negative and statistically significant. The magnitudes of the estimated coefficients, as well as being statistically significant, are also economically large. As an example, consider Jamaica, where 90% of its population was in slavery in 1750. Today Jamaica is relatively poor with an average per capita GDP of $3,640 (measured in 2000).[5] According to the estimates of column 2, if Jamaica had relied less on slave production so that the total proportion of slaves in its economy was only 46%, which was the proportion of slaves in the Bahamas at the time, then Jamaica's income would be $11,580, rather than $3,640. This is an increase of well over 200%. An additional way to assess the estimated magnitude of β_S is to calculate standardized beta coefficients. In column 2, the beta coefficient for S_i/L_i is -1.51, which is extremely large. A one standard deviation decrease in S_i/L_i results in an increase in $\ln y_i$ of over 1.5 standard deviations.

The partial correlation plot for S_i/L_i from column 2 is shown in figure 2. Although no single observation appears to be clearly biasing the results, Canada and the United States appear to be particularly important observations. One may be concerned that the estimates may simply be reflecting differences between Canada and the United States, and all of the other New World economies. If so, the estimated relationship between slavery and economic development may be driven by other differences between the two groups, such as climate or the extent of European settlement.

Because of this concern, in the third column of table 1 I re-estimate (1) after omitting Canada and the United States from the sample. As shown, the magnitude of the estimated coefficient for S_i/L_i decreases, but it remains statistically significant. These results show that even ignoring Canada and the United States, one still observes a negative relationship between past slave use and subsequent economic development. This is significant because the evidence presented in Engerman and Sokoloff (1997, 2002, 2006) and Sokoloff and Engerman (2000) generally relies on comparisons between Canada and the United States, and the other less developed countries in the

[4] For more on this point see the discussions in Wright (2006, pp. 29–30) and in Sokoloff and Engerman (2000, p. 220).

[5] Per capita GDP is measured in PPP adjusted dollars. By this measure the per capita GDP of the United States in 2000 was $33,970.

Table 1: Slavery in 1750 and current income across former New World economies.

Dependent variable: $\ln y_i$	(1)	(2)	Omit USA, CAN (3)	Omit USA, CAN, HTI (4)
Fraction slaves, S_i/L_i	-2.31^{***}	-2.63^{***}	-1.43^{*}	-1.43^{*}
	(.47)	(.42)	(.74)	(.74)
Population density, L_i/A_i		$.61^{***}$	$.59^{**}$	$.59^{***}$
		(.21)	(.20)	(.20)
Colonizer fixed effects	Yes	Yes	Yes	Yes
R^2	.53	.66	.53	.37
Number of observations	29	29	27	26

Notes: The table reports OLS estimates of equation (1). The dependent variables is the natural log of per capita GDP in 2000, $\ln y_i$. The unit of observation is a country. Coefficients are reported with standard errors in brackets. ***, **, and * indicate significance at the 1, 5, and 10 percent levels. 'Fraction slaves, S_i/L_i' is the number of slaves in the population divided by the total population, measured in 1750. 'Population density, L_i/A_i' is the total population in 1750 divided by land area. The colonizer fixed effects are for Portugal, England, France, Spain, and the Netherlands.

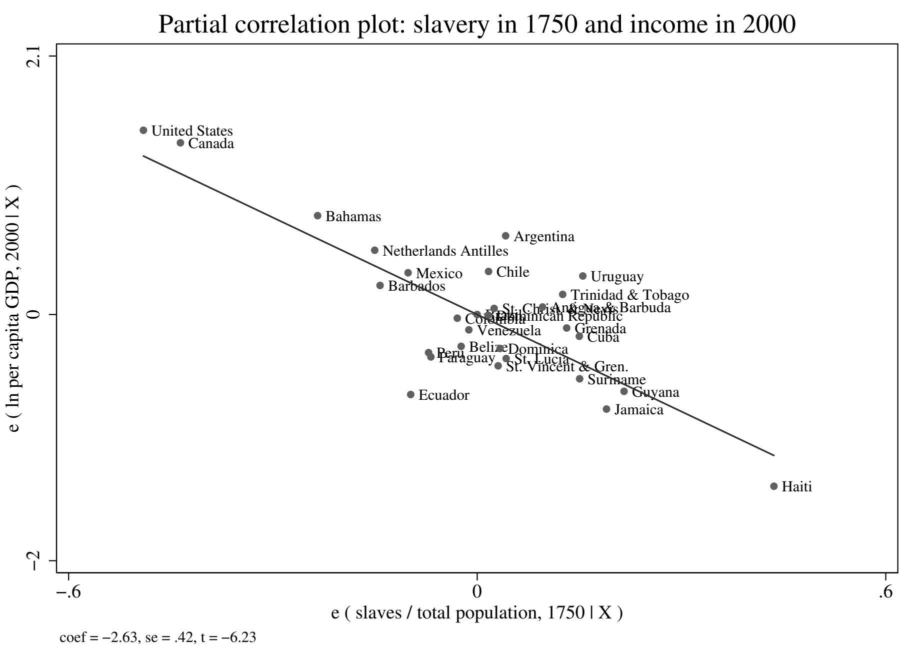

Figure 2: Partial correlation plot showing the relationships between the proportion of slaves in the population in 1750 S_i/L_i and the natural log of per capita GDP in 2000 $\ln y_i$.

Americas. The results here show that even looking within the later group one still observes a link between slavery and economic development. The final column also omits Haiti, which from figure 2 is also a potentially influential observation. The results show that even after dropping all three countries from the sample, one still observes a significant negative relationship between slavery and subsequent income.

Given the admittedly sparse set of control variables in the estimating equation, the results presented here do not prove with certainty that slavery adversely affected subsequent economic development. However, they do provide very suggestive evidence, showing that the patterns that we observe in the data are consistent with the general argument put forth by Engerman and Sokoloff.

2.2 Looking within the British West Indies

In this section, I examine an even smaller sample of 12 countries that were part of the British West Indies. The sample includes: Antigua and Barbuda, Bahamas, Belize, Dominica, Grenada, Guyana, Jamaica, St. Christopher and Nevis, St. Lucia, St. Vincent and the Grenadines, Trinidad and Tobago, and Barbados. Although this is a much more restricted sample, there are a number of benefits to examining this smaller group of countries. First, the data are all from one source, British census records, all of which are recorded and summarized in Higman (1984). Because all data are from slave censuses that were conducted by the British government using the same procedures and administration, the data and information collected are quite reliable, and any biases or errors that may exist will be similar across all countries (Higman, 1984, pp. 6–15). Second, the sample of countries is homogenous in many dimensions. They are all small former British colonies located in the Caribbean. As a result, many of the omitted factors that could potentially bias the estimates of interest, such as differences in culture, geography, or historical experience, are diminished by looking at this more homogenous sample.

The final benefit is that much more information is available for each country. Specifically, information on the size of plantations and on the use of slaves are available. This allows us to consider more deeply the hypotheses in Engerman and Sokoloff's work. To this point, we have examined the relationship between slave use and economic development, finding that, consistent with their analysis, past slave use is associated with current underdevelopment. With the data from Higman we can begin to examine the potential channels behind this relationship. Because the hypothesized channel in Engerman and Sokoloff works through economic inequality, the authors focus almost exclusively on the adverse effect of slavery on large scale plantations. Their argument is that this form of slavery resulted in economic inequality, poor institutions, and economic stagnation.

Using Higman's data on slave use and the size of slave holdings, I examine whether the negative relationship between slave use is driven by large scale plantation slavery rather than other forms of slavery. I do this by allowing the relationship between slavery and income to differ depending on the manner in which the slaves were used. I divide the total number of slaves in each society into two groups, plantations slaves and slaves not working on plantations, and calculate two measures of slavery: the proportion of the population that are slaves working on plantations, denoted S_i^P/L_i, and the proportion of the population that are slaves but do not work on plantations, S_i^{NP}/L_i. The plantation slaves include those working on sugar plantations, coffee plantations, cotton plantations, or in other forms of agriculture. Non-plantation slaves are slaves that are either working in urban areas or slaves working in industry, such as livestock, salt, timber, fishing, and shipping.[6] In the sample, the mean value of S_i^P/L_i is .61 and of S_i^{NP}/L_i is .13. This reflects the fact that in the Caribbean the primary use of slaves was for manual labor on sugar, coffee or cotton plantations. The two slavery measures are negative correlated, with a correlation coefficient of $-.90$. This is a result of the fact that, holding the total number of slaves constant, increasing the number of slaves in one occupation decreases the number in the other.

Using the two measures of slavery, I estimate a less restrictive version of (1), where the two types of slavery are allowed to have different effects on economic development:

$$\ln y_i = \alpha + \beta_P \, S_i^P/L_i + \beta_{NP} \, S_i^{NP}/L_i + \gamma \, L_i/A_i + \varepsilon_i \tag{2}$$

To see that equation (2) is simply a less restrictive version of (1), note that if we restrict the two coefficients to be equal, $\beta_P = \beta_{NP}$, then (2) reduces to (1). The only difference is that in (2) the colonizer fixed effects drop out because all of the countries in the sample are former British colonies.

The slavery data are now from 1830 rather than 1750. Although the total number of slaves and free persons are available for both 1750 and 1830, the number of slaves disaggregated by slave use is only available for

[6]For the later category, a further distinction can be made between urban slaves and those working in industry. The results are qualitatively identical to what is reported here if this further distinction is made. As well, one could alter the category of plantation slaves to not include slaves that worked in 'other forms of agriculture'. Again, the results are similar if this alternative classification is chosen.

1830. Because by 1830 none of the countries in the sample had abolished slavery, the proportion of slaves in 1830 is a good approximation of the use of slaves in the years prior to this date. This can be seen from the fact that the correlation between the proportion of the population in slavery in 1750 and in 1830 within the sample is .74. As well, estimates of (1) are similar whether the 1750 data or the 1830 data are used. These estimates are reported in columns 1 and 2 of table 2.

Estimates of (2) are reported in the third column of table 2. Both slavery variables enter with negative coefficients, and both coefficients are statistically significant. These results confirm the previous negative relationship between slave use and economic development. However, the relative magnitudes of the coefficients do not support Engerman and Sokoloff's focus on the detrimental effects of large scale plantation agriculture. According to the estimated magnitudes, it is not the use of slaves on large scale plantations that has the greatest negative impact on development, but the use of non-plantation slaves.

The partial correlation plots for the two slavery variables are shown in figures 3 and 4. From the plots it is apparent that neither relationship is being driven by a small number of outlying observations. Both relationships appear robust.

Next, I consider an alternative way of cutting the slavery data, and examine whether the effect of slavery differs depending on the size of slave holdings. Higman provides data on the number of slaves that are held on slave holdings with: (1) 10 slaves or less, (2) 11 to 50 slaves, (3) 51 to 100 slaves, (4) 101 to 200 slaves, (5) 201 to 300 slaves, or (6) 301 slaves or more.[7] Because of the small number of observations available, I aggregate the holdings into three categories: (1) small scale holdings of 10 slaves or less, (2) medium scale holdings with 11 to 200 slaves, and (3) large scale holdings with 201 slaves or more. I then calculate of the proportion of the population that are slaves held on small scale holdings S_i^S/L_i, medium scale holdings S_i^M/L_i, and large scale holdings S_i^L/L_i.[8]

These measures provide an additional way of examining Engerman and

[7]Higman (1984, pp. 100–104) provides a detailed discussion of the difficulty of identifying a slave holding in the data. Slave holding are identified from each registration return of the slave censuses. Slave owners that owned multiple plantations may have filled out a different form for each location. Also, if multiple owners owned slaves at one plantation, then these slaves may be identified as being in one slave holding.

[8]The conclusions reported here do not depend on the assumptions made in creating the categories. Alternatively, one could choose different cut-offs for the slave holding categories, or one could choose to create two categories rather than three, and the same conclusions would be obtained.

Table 2: Slavery and income within the British West Indies.

Dependent variable: $\ln y_i$	1750 (1)	1830 (2)	1830 (3)	1830 (4)
Fraction of population that are:				
Slaves, S_i/L_i	-2.42^{***}	-2.24^{**}		
	(.74)	(.93)		
Non-plantation slaves, S_i^{NP}/L_i			-6.55^{**}	
			(2.06)	
Plantation slaves, S_i^{P}/L_i			-3.84^{***}	
			(1.04)	
Slaves on holdings with:				
10 slaves or less, S_i^{S}/L_i				-20.92^{***}
				(3.82)
11 to 200 slaves, S_i^{M}/L_i				-5.32^{***}
				(.95)
201 slaves or more, S_i^{L}/L_i				-8.12^{***}
				(1.30)
Population density, L_i/A_i	$.24^{***}$	$.21^{***}$	$.20^{***}$	$.36^{***}$
	(.06)	(.07)	(.06)	(.03)
F-test of equality (p-value)			.06	.00
R^2	.69	.55	.73	.96
Number of observations	12	12	12	11

Notes: The table reports OLS estimates of equations (1), (2), and (3). The dependent variables is the natural log of per capita GDP in 2000, $\ln y_i$. Coefficients are reported with standard errors in brackets. ***, **, and * indicate significance at the 1, 5, and 10 percent levels. In column 1, all variables are measured in 1750, and in columns 2–4, all variables are measured in 1830. The null hypothesis of the reported F-test is the equality of the coefficients for the slavery variables.

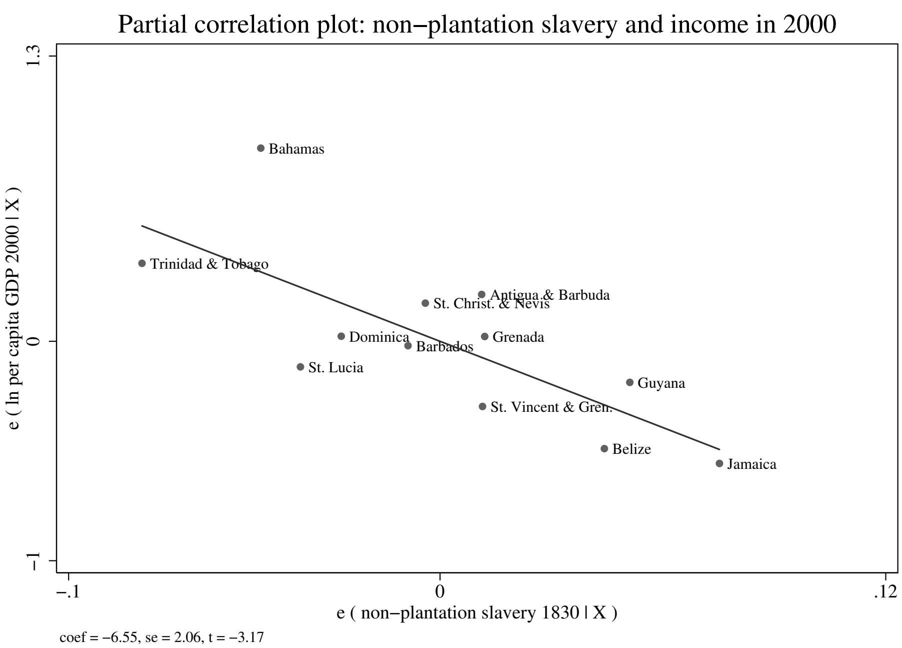

Figure 3: Partial correlation plots showing the relationships between non-plantation slavery S_i^{NP}/L_i, and the natural log of per capita GDP in 2000 $\ln y_i$.

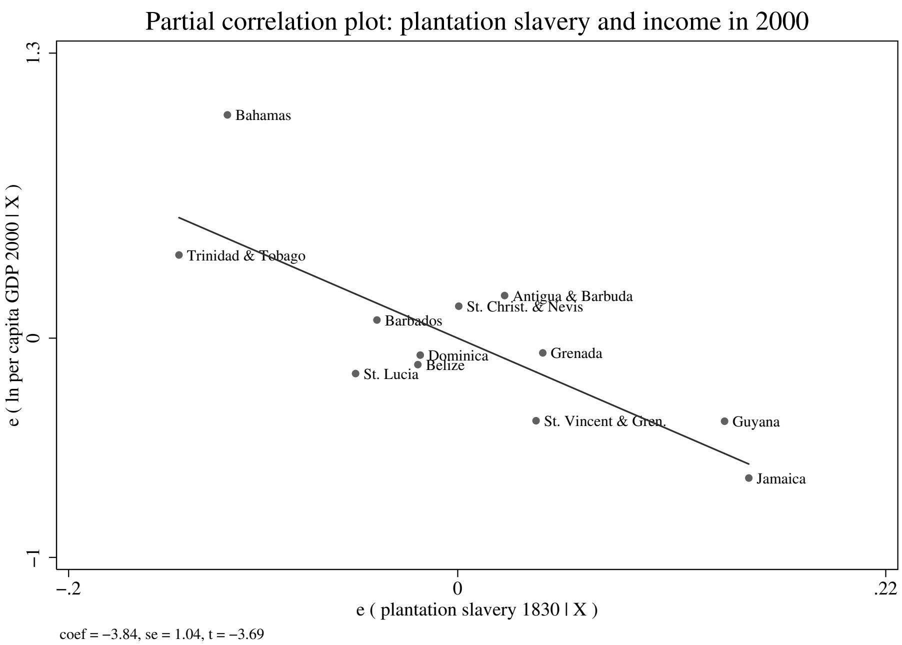

Figure 4: Partial correlation plots showing the relationships between plantation slavery S_i^P/L_i and the natural log of per capita GDP in 2000 $\ln y_i$.

Table 3: Correlations between slave holding size and slave occupation across countries within the British West Indies.

	S_i^S/L_i	S_i^M/L_i	S_i^L/L_i
S_i^P/L_i	−.808	.881	.494
	(.00)	(.00)	(.12)
S_i^{NP}/L_i	.649	−.843	−.232
	(.03)	(.00)	(.49)

Notes: Pairwise correlation coefficient are reported with p-values in brackets. Each correlations is estimated across 11 countries.

Sokoloff's hypothesis that the detrimental impact of slavery arose because it was associated with economic inequality arising because of the existence of large scale slave plantations. Across the countries in the sample, there is a strong positive relationship between the size of slave holdings and the use of slaves on plantations. This can be seen from table 3, which reports the correlation coefficients between the two measures of slave use disaggregated by occupation and the three measures of slave use disaggregated by size of slave holding. A clear pattern is apparent. The fraction of the population that are plantations slaves is negatively correlated with the fraction of the population that are slaves on small scale holdings, and positively correlated with the fraction of the population that are slaves on medium and large scale holdings. These correlations confirm that the size of slave holdings variables provide an alternative indicator of the use of slaves on large scale plantations. The relationship between slave holding size and the use of slaves is also shown in Higman (1984, pp. 104–106), where average slave holding size by slave use is provided for five of the colonies. The largest holdings tended to be on sugar plantations, followed by coffee, and then cotton. The smallest holdings were for slaves working in the livestock industry.

Allowing the effect of slavery to differ by the size of slave holdings, yields the following estimating equation:

$$\ln y_i = \alpha + \beta_S\, S_i^S/L_i + \beta_M\, S_i^M/L_i + \beta_L\, S_i^L/L_i + \gamma\, L_i/A_i + \varepsilon_i \qquad (3)$$

As before, this equation is simply a more flexible version of (1).

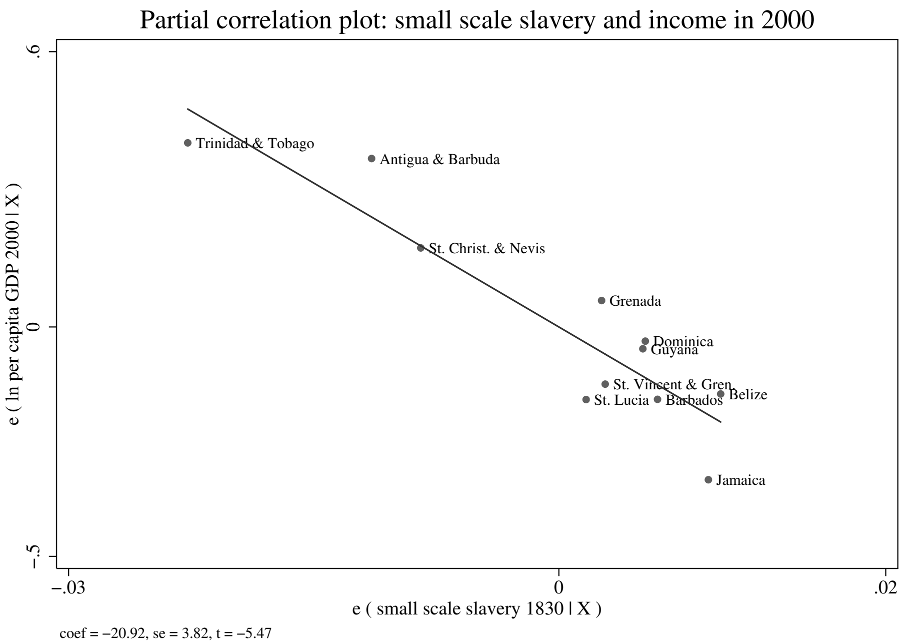

Figure 5: Partial correlation plots showing the relationships between small scale slavery S_i^S/L_i and the natural log of per capita GDP in 2000 $\ln y_i$.

OLS estimates of (3) are reported in column 4 of table 2.[9] The results again support the notion that slave use was detrimental for economic development, but they do not support Engerman and Sokoloff's focus on the negative effects of large scale slave holdings. Contrary to the prediction that large scale slavery should have the largest impact on development, the estimates suggest that it is in fact small scale slavery that has the largest impact. The magnitude of the small scale coefficient is nearly 4 times the magnitude of the medium scale coefficient, and over twice the magnitude of the large scale coefficient. As well, these differences are statistically significant. The null hypothesis of the equality of the coefficients for S_i^S/L_i, S_i^M/L_i, and S_i^S/L_i is rejected at any standard significance level.

The partial correlation plots, reported in figures 5 to 7, show that the relationships between each of the three slavery variables and income appears robust. None of the relationships are driven by outlying observations.

[9]In this regression, the sample size is reduced from 12 to 11 countries because slave holding size data are unavailable for the Bahamas.

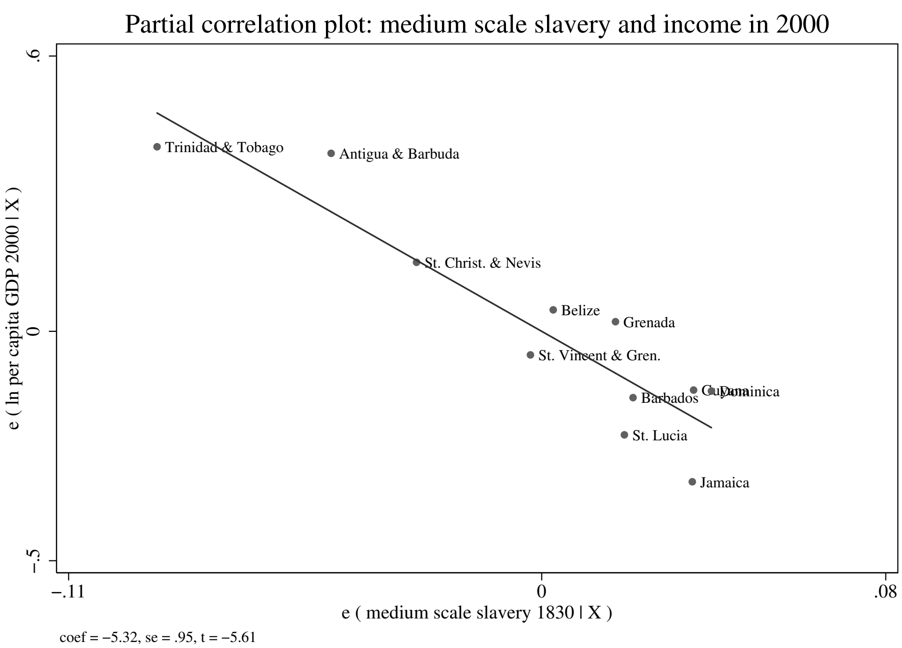

Figure 6: Partial correlation plots showing the relationships between medium scale slavery S_i^M/L_i and the natural log of per capita GDP in 2000 $\ln y_i$.

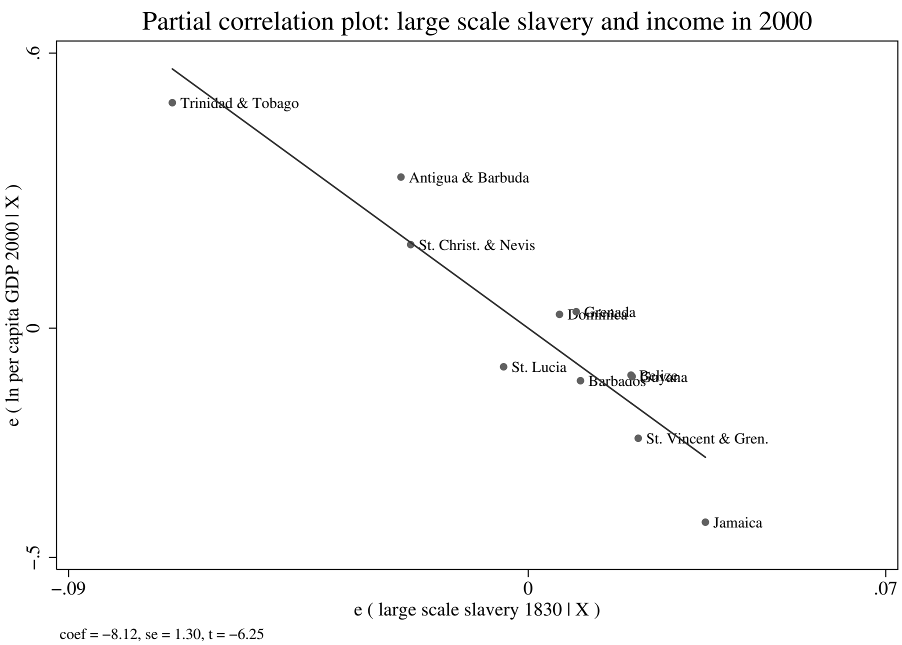

Figure 7: Partial correlation plots showing the relationships between large-scale slavery S_i^L/L_i and the natural log of per capita GDP in 2000 $\ln y_i$.

Overall, these results confirm the previous findings in section 2.1. Looking within the British West Indies, the data provide support for Sokoloff and Engerman's hypothesis that slavery adversely affected subsequent economic development. However, they do not support their emphasis on the adverse effects of large scale plantation slavery. According to the estimates, all forms of slavery appear similarly detrimental for economic development. There is no evidence that large scale plantation slavery was more detrimental than other forms of slavery.

2.3 Looking within the United States

I now turn to a different source of evidence, and compare the relative development of counties and states within the U.S. Using information on the number of slaves and free persons in each county and state in each decade between 1790 and 1860, I again examine Engerman and Sokoloff's assertion that domestic slavery was detrimental for subsequent economic development. Population data for slaves and free persons are taken from the U.S. Decennial Censuses, while income data are from the BEA's *Regional Economic Accounts*.

The cross-state relationship between the proportion of the population in slavery in 1860, the year for which data are available for the largest number of states, and the natural log of per capita income in 2000 is shown in figure 8. The figure shows a clear negative relationship between slave use and subsequent economic performance.

I explore this relationship further in table 4. Each column of the table reports the estimated relationship between slavery in each decade between 1790 and 1860 and log per capita income in 2000, controlling for initial population density measured in the same year as slavery. The top panel of the table reports the relationship between the proportion of the population in slavery and per capita income across U.S. states. The number of observations begins at 17 in 1790 (the first column) and increases each decade to 37 in 1860 (the last column). The reason that the 1790 estimates include 17 states when only 13 states had joined the Union is that census data are also available for West Virginia, Kentucky, Maine, and Vermont. In 1790 West Virginia and Kentucky were part of Virginia, while Maine was a part of Massachusetts. Therefore, data are available for these three areas that later became independent states. As well, data are also available for the Vermont Republic which joined the Union a year later in 1791, becoming the state of Vermont.[10]

[10]Similarly, in 1800 there are 18 observations even though only 16 states had joined the

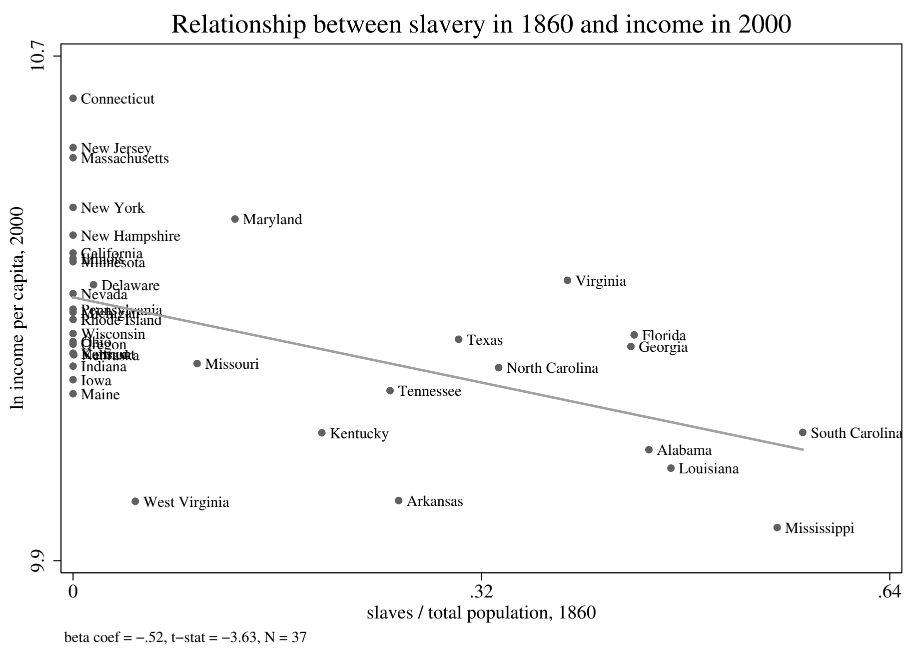

Figure 8: Bivariate plot showing the relationship between the proportion of the population in slavery 1860 S_i/L_i and the natural log of per capita income in 2000 $\ln y_i$.

All of the estimated coefficients for the fraction of population in slavery S_i/L_i are negative. For the three decades prior to 1820 the coefficients are statistically insignificant, while for the five decades after 1810 the coefficients are statistically significant. The insignificance of the results for the first three decades is because three important slave states (Louisiana, Mississippi, and Alabama) did not join the Union until the decade after 1810. This can also be seen in figure 8. If one omits these three states, the negative relationship is weakened substantially.

The magnitudes of the estimated coefficients are large. When controlling for initial population density, the standardized beta coefficients range from $-.09$, for 1790, to $-.41$, for 1860. According to the 1860 estimates, if in 1860 South Carolina had no slavery, rather than 57% of its population in slavery, then its average per capita income in 2000 would have been \$29,400 rather than \$24,300. This is an increase in income of over 20%.

The second panel of table 4 reports the same estimates looking across counties rather than states. As in the state level regressions, the coefficient estimates for S_i/L_i are negative. To be as conservative as possible, I allow for non-independence of counties within a state, and report standard errors clustered at the state level. This tends to at least double the reported standard errors. The coefficient estimates are negative and statistically significant for every year except 1810. Again, the coefficients are also economically large. The beta coefficients range from $-.13$ to $-.23$.

Union by this time. This is because of West Virginia and Maine.

Table 4: Slavery and income across counties and states within the U.S.

Dependent variable: $\ln y_i$	1790	1800	1810	1820	1830	1840	1850	1860
	State level regressions							
Fraction slaves, S_i/L_i	$-.13$	$-.10$	$-.11$	$-.28^{*}$	$-.29^{**}$	$-.27^{**}$	$-.34^{**}$	$-.33^{***}$
	(.24)	(.23)	(.20)	(.15)	(.14)	(.13)	(.13)	(.11)
Population density, L_i/A_i	$.52^{**}$	$.57^{***}$	$.52^{***}$	$.46^{***}$	$.40^{***}$	$.33^{***}$	$.19^{**}$	$.16^{***}$
	(.20)	(.19)	(.17)	(.13)	(.11)	(.10)	(.07)	(.05)
R^2	.38	.43	.44	.53	.53	.48	.42	.43
Number of observations	17	18	19	25	27	30	33	37
	County level regressions							
Fraction slaves, S_i/L_i	$-.28^{**}$	$-.21^{*}$	$-.15$	$-.17^{*}$	$-.19^{**}$	$-.24^{***}$	$-.23^{***}$	$-.22^{***}$
	(.11)	(.12)	(.10)	(.10)	(.09)	(.08)	(.08)	(.07)
Population density, L_i/A_i	$.09^{***}$	$.06^{***}$	$.04^{***}$	$.03^{***}$	$.02^{**}$	$.01^{***}$	$.007^{***}$	$.004^{***}$
	(.01)	(.01)	(.007)	(.006)	(.003)	(.002)	(.001)	(.001)
R^2	.17	.13	.10	.09	.09	.09	.08	.07
Number of observations	283	400	521	739	964	1,273	1,588	2,014

Notes: The dependent variables is the natural log of per capita income in 2000, $\ln y_i$. Coefficients are reported with standard errors in brackets. For the county level estimates the standard errors are clustered at the state level. ***, **, and * indicate significance at the 1, 5, and 10 percent levels. Population density L_i/A_i is measured in the same year as slavery.

The estimated relationship between slave use and subsequent economic performance reported in table 4 are consistent with the recent findings of Mitchener and McLean (2003) and Lagerlöf (2005). Mitchener and McLean (2003) estimate the relationship between slave use and subsequent labor productivity across U.S. states, and find a significant negative relationship between the fraction of the population in slavery in 1860 and average labor productivity in the decades after this date. Lagerlöf (2005), looking across U.S. counties, also documents a negative relationship between past slave use, measured in 1850, and subsequent per capita income measured in 1994.

The 1860 Census also reports the total number of slave holders that hold the following number of slaves: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10–14, 15–19, 20–29, 30–39, 40–49, 50–69, 70–99, 100–199, 200–299, 300–499, 500–999, and 1,000 and over. Because the census only reports information on the size holding of each slave holder and not of each slave (as in the Higman data), I can only calculate the number of slaves held in each size holding when the exact number of slaves per holder is given, which is only for holdings with less than 10 slaves. Therefore, although I can separate small scale holdings (9 slaves or less) from medium or large scale holdings, I am unable to separate slaves held on medium scale holdings (10 to 199 slaves) from those held on large holdings (200 slaves or more).[11]

Using the Census data, I construct two measures of slavery: the proportion of the population that are slaves held on small scale holdings S_i^S/L_i, and the proportion of the population that are slaves held on medium or large scale holdings S_i^{ML}/L_i. As before, I allow the two types of slavery to affect economic development differently:

$$\ln y_i = \alpha + \beta_S \, S_i^S/L_i + \beta_{ML} \, S_i^{ML}/L_i + \gamma \, L_i/A_i + \varepsilon_i \tag{4}$$

The subscript i indexes either counties or states, and as before $\ln y_i$ and L_i/A_i denote log income in 2000 and initial population density.

Table 5 reports the estimates of (4). The first column reports estimates where a state is the unit of observation. The coefficients for S_i^S/L_i and S_i^{ML}/L_i are both negative, but neither is statistically significant. Their insignificance appears to be the result of multi-collinearity. The correlation between S_i^S/L_i and S_i^{ML}/L_i is .87. Although neither coefficient is individually significant, jointly the two coefficients are significant. An F-test of their joint significance is able to reject the null hypothesis that both coefficients

[11] Note that because of these same data limitations, the definition of small scale is slightly different than in section 2.2. Here the definition of small scale is 9 slaves or less, while the definition in section 2.2 was 10 slaves or less.

are jointly equal to zero at the 2 percent level. This can also be seen from the R^2, which increases from .28 to .43, when the two variables are included in the estimating equation.

Turning to the point estimates, I find that contrary to Engerman and Sokoloff's hypothesis, there is no evidence that large scale slavery is more detrimental for development than small scale slavery. Although these point estimates do not support Engerman and Sokoloff's focus on large scale plantation slavery, it is possible that the data are not sufficiently rich to identify the more harmful effects of medium/large scale slavery relative to small scale slavery. For this reason, I also examine county level data, which provides finer variation that can help to better identify the differential effects of slavery. At the county level the collinearity between S_i^S/L_i and S_i^{ML}/L_i is .65, which is lower than the correlation at the state level.

Column 2 reports county level estimates. Again, the results do not provide a clear indication that large scale slavery had a worse impact on economic development relative to other forms of slavery. The estimated coefficients for both S_i^S/L_i and S_i^{ML}/L_i are negative. Looking at the magnitudes, small scale slavery is estimated to be slightly worse for economic development than large scale slavery, although the difference between the two coefficients is not statistically different from zero. Looking at the statistical significance of the coefficients, it is only medium/large scale slavery that is statistically different from zero. Therefore, the results appear mixed and differ depending on whether one considers the magnitudes of the estimated coefficients or their statistical significance. As before, the evidence does not clearly indicate that large scale plantation slavery was more detrimental for economic development than other forms of slavery.

Overall, the results of this section show that, either looking across New World economies, or across counties and states within the U.S., there is a negative relationship between past slave use and current economic development. However, the results do not provide support for the view that large scale plantation agriculture was particularly detrimental. All forms of slavery – smaller scale non-plantation forms of slavery and large scale plantation slavery – appear to have had similarly detrimental effects on economic development.

Table 5: Slavery and income within the United States.

Dependent variable: $\ln y_i$	State level regressions (1)	County level regressions (2)
Fraction of the population that are slaves:		
on holdings with 9 slaves or less, S_i^S/L_i	$-.41$	$-.24$
	(.99)	(.25)
on holdings with 10 slaves or more, S_i^{ML}/L_i	$-.31$	$-.22^{***}$
	(.26)	(.06)
Population density, L_i/A_i	$.16^{***}$	$.004^{***}$
	(.05)	(.0006)
F-test of equality (p-value)	.93	.94
R^2	.43	.07
Number of observations	37	2,014

Notes: The dependent variables is the natural log of per capita income in 2000, $\ln y_i$. Coefficients are reported with standard errors in brackets. ***, **, and * indicate significance at the 1, 5, and 10 percent levels. For the county level estimates the standard errors are clustered at the state level. In column 1 the unit of observation is a U.S. state and in column 2 the unit of observations is a U.S. county. The slavery and populations density variables are measured in 1860.

3 Testing Specific Channels of Causality

I now turn to the specific channels of causality underlying the negative relationship between slavery and economic development. Recall, that Engerman and Sokoloff's argument is that plantation slavery resulted in increased economic inequality, which resulted in subsequent economic underdevelopment. This chain of causality is illustrated in diagram 1.

Plantation Slavery	$\Longrightarrow$	Economic Inequality	$\Longrightarrow$	Economic Underdevelopment

Diagram 1: Testing the channels of causality in Engerman and Sokoloff's hypothesis.

In the previous section, I simultaneously examined both parts of their argument, testing for a reduced form relationship between slavery and economic development. In this section, using data on the distribution of land holdings from the 1860 U.S. Census, I examine Engerman and Sokoloff's argument that slavery was detrimental because of its effect on initial economic inequality. That is, I examine separately both hypothesized relationships from diagram 1: (i) that plantation slavery resulted in increased economic inequality, and (ii) that inequality resulted in economic underdevelopment. The first hypothesis is examined in the section 3.1, and the second is examined in section 3.2.

3.1 Testing Relationship 1: Plantation Slavery $\Rightarrow$ Economic Inequality

The 1860 U.S. Census provides data on the number of farms, in each county and state, that are in each of the following seven size categories: (1) 9 acres or less, (2) 10 to 19 acres, (3) 20 to 49 acres, (4) 50 to 99 acres, (5) 100 to 499 acres, (6) 500 to 999 acres, and (7) 1,000 acres or more. I use this information to construct, for each county and state, the Gini coefficient of land inequality in 1860. Full details of the construction are provided in the appendix.

I examine whether the data support Engerman and Sokoloff's view that slavery resulted in increased economic inequality by first considering the unconditional relationship between the proportion of the population in slavery

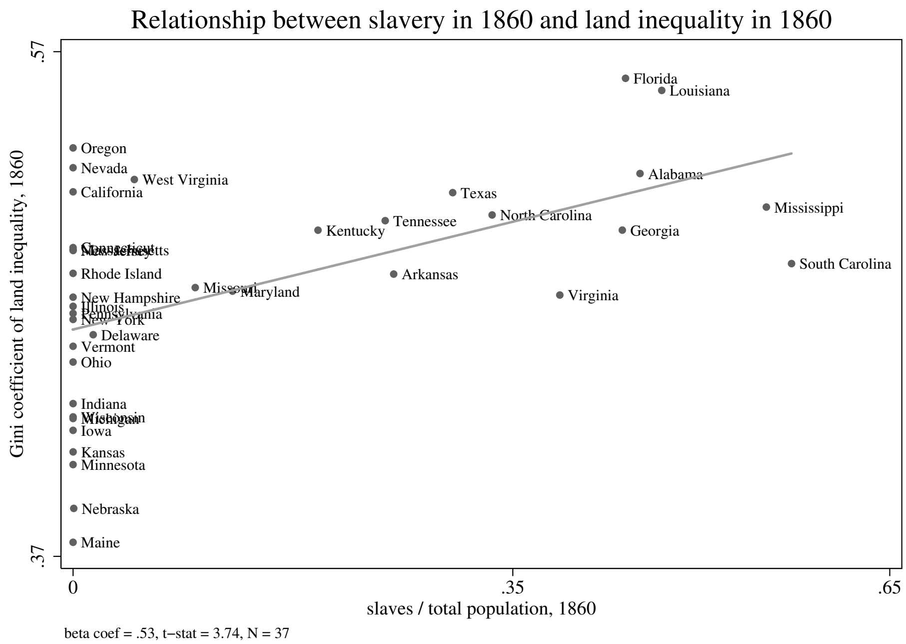

Figure 9: Bivariate plot showing the relationship between the proportion of the population in slavery in 1860 and the Gini coefficient of land inequality in 1860.

in 1860 and land inequality in 1860. Figure 9 shows this relationship across states. Consistent with their view, one observes a positive statistically significant relationship between slavery and inequality.

The relationship is examined further in table 6. Column 1 reports the bivariate relationship between slavery and inequality shown in figure 9. In column 2, I control for population density in 1860, which, as before, is meant to proxy for initial prosperity. Because it is unclear whether we expect to find a relationship between population density and land inequality, and if so, whether we expected it to be positive or negative,[12] I report estimates both without and with controls for initial population density. The even numbered columns report estimates controlling for population density, while the odd number columns do not control for population density. In column 2, the

[12]The empirical evidence of the relationship between income and inequality across countries in the 20th century is very mixed. Some studies find a positive relationship (e.g., Forbes, 2000), others find a negative relationship (e.g., Easterly, 2007), and others find both (e.g., Barro, 2000).

Table 6: Slavery and land inequality within the United States.

Dependent variable: land inequality	State level regressions		County level regressions	
	(1)	(2)	(3)	(4)
Fraction slaves, S_i/L_i	.12***	.13***	.09***	.09***
	(.03)	(.03)	(.03)	(.03)
Population density, L_i/A_i		.02		−.0005***
		(.02)		(.0002)
R^2	.29	.32	.07	.07
Number of observations	37	37	1,933	1,933

Notes: The dependent variables is the Gini coefficient of land inequality in 1860. Coefficients are reported with standard errors in brackets. For the county level estimates the standard errors are clustered at the state level. ***, **, and * indicate significance at the 1, 5, and 10 percent levels. In columns 1 and 2 the unit of observation is a U.S. state, and in columns 3 and 4 the unit of observations is a U.S. county.

estimated coefficient for S_i/L_i is positive and highly significant, confirming the result from column 1.[13] Columns 3 and 4 provide the same estimates at the county level.[14] Both coefficients are positive and statistically significant, showing that at the county level we also observe a positive relationship between slavery and land inequality in 1860. The estimated magnitudes are also very large. The beta coefficient for the state level estimates is .59 (column 2), while the beta coefficient for the county level estimates is .26 (column 4).

These results are consistent with the first relationship in diagram 1: that slavery caused increased economic inequality. In 1860, the states and counties with the largest proportion of slaves in their population also had the most unequal distribution of land holdings.

[13] As before, one can disaggregate slaves into those held on small scale holdings and those held on medium or large scale holdings. Doing this one finds that the relationship between slavery and land inequality is not driven by large scale slavery, but by small scale slavery. Echoing the findings earlier in the paper, these results show that although slavery may have resulted in economic inequality, it is not a result of the particularly detrimental effects of large scale plantation slavery.

[14] Because farm size data are unavailable at the county level for Nebraska and Nevada, there are now only 1,933 observations in the county level regressions.

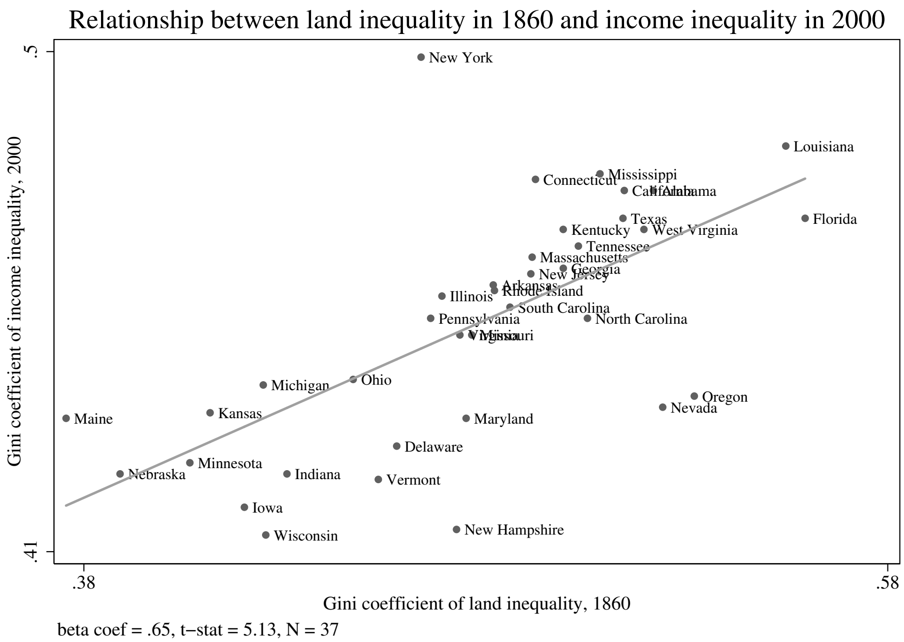

Figure 10: Bivariate plot showing the relationship between the Gini coefficient of land inequality in 1860 and the Gini coefficient of income inequality in 2000.

Within the United States economic inequality is very persistent even in the long-run. This can be seen from figure 10, which shows the cross-state relationship between the Gini coefficient of land inequality in 1860 and the Gini coefficient of income inequality in 2000. The relationship between the two measures of inequality is remarkably strong.

Because of the persistence of economic inequality, there a strong relationship between past slave use and current economic inequality. This is shown in figure 11, where a clear positive relationship between slavery in 1860 and current income inequality is apparent. Although not reported here, this result is robust to controlling for initial population density. This suggests that within the U.S. not only did slavery result in economic underdevelopment (as was shown in section 2.3), but it also resulted in increased economic inequality.[15]

[15] A related finding has been documented by Lagerlöf (2005), who shows that across U.S. counties the current income differential between blacks and whites is positively correlated with the proportion of the population in slavery in 1850.

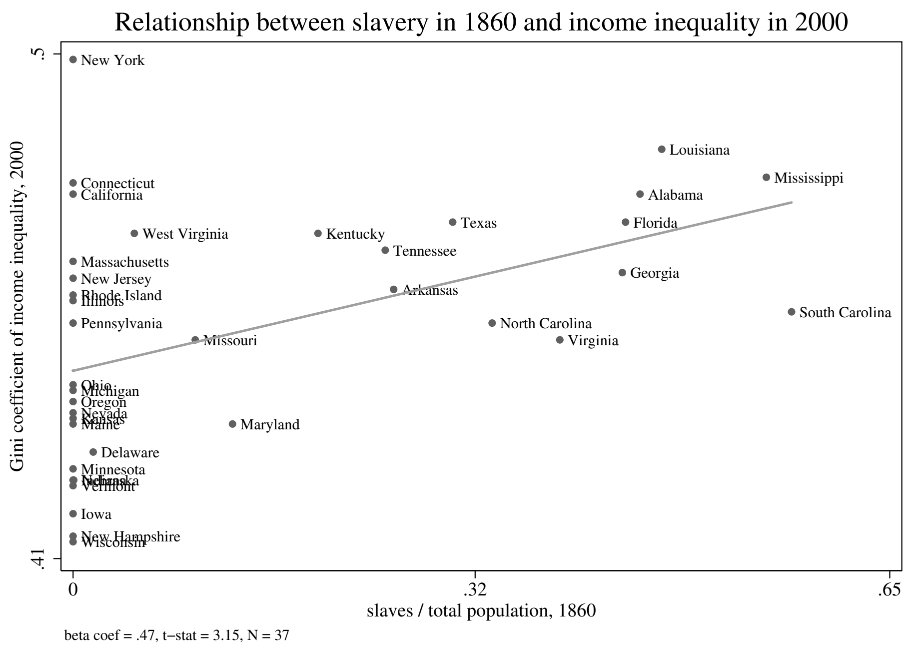

Figure 11: Bivariate plot showing the relationship between the proportion of the population in slavery in 1860 and the Gini coefficient of income inequality in 2000.

3.2 Testing Relationship 2: Economic Inequality ⇒ Economic Development

The second part of Engerman and Sokoloff's hypothesis is that the economic inequality that arose because of slavery resulted in economic underdevelopment. They argue that inequality resulted in domestic institutions that advantaged the elites, rather than providing the foundation necessary for sustained economic growth. In columns 1 and 4 of table 7, I empirically test for a relationship between initial economic inequality and subsequent economic development. The columns report the estimated relationship between the Gini coefficient of land inequality in 1860 and income in 2000, controlling for initial population density. Column 1 reports estimates at the state level, while column 4 reports estimates at the county level. In both specifications, the estimated coefficient for land inequality is negative, but statistically insignificant. Although the sign of the coefficient is consistent with inequality adversely affecting development, its insignificance shows that statistically its estimated effect is not different from zero.

There is also a second testable prediction that follows from Sokoloff and Engerman's argument. According to their hypothesis, the estimated relationship between slavery and economic development (which was reported in table 4) should be accounted for by the relationship between initial inequality and economic development. The remaining columns in table 7 test this prediction of their theory. Columns 2 and 5, revisit the estimated relationship between slavery and economic development previously reported in table 4. Column 2 simply reproduces the 1860 state level estimates, and column 5 re-estimates the county-level regressions, using a slightly smaller sample of counties for which land inequality data are also available. Because farm size data are missing for the counties of Nebraska and Nevada, they are not included in the sample. This results in a reduction in the sample size from 2,014 to 1,933 counties. As shown, one still finds a negative relationship between slavery and income among this smaller sample of counties.

Columns 3 and 6 test whether the estimated relationships between slavery and income in columns 2 and 5 can be accounted for by the relationship between land inequality and income. This is done by including both the Gini coefficient of land inequality and the fraction of slaves in the population as explanatory variables in the estimating equation. If slavery affects income only through its effect on initial economic inequality, then controlling for inequality should significantly reduce the estimated relationship between slavery and income. The results show that this is not the case. At both the state and the county levels, including the land inequality measure actually increases the magnitude of the estimated coefficient for S_i/L_i, rather than decreasing it. At the state level, the estimated effect increases from $-.33$ to $-.39$, and at the county level, the effect increases from $-.23$ to $-.24$. The results, therefore, do not support Engerman and Sokoloff's argument that slavery adversely affecte economic development because it resulted in initial inequality.

The results in table 7 show clearly that land inequality in 1860 is uncorrelated with income in 2000. These results are particularly interesting given that others have found evidence that early land inequality had adverse effects on outcomes measured in the early 1900s. Ramcharan (2006) finds a negative relationship between early land inequality and per capita education expenditures in 1930, and Acemoglu *et al.* (2007) document a negative relationship between land inequality in 1860 and school enrollment in 1950. The estimates from table 7 suggest that the effects documented by Ramcharan (2006) and Acemoglu *et al.* (2007) died out by the end of the 20th century. This is not surprising given that beginning in the 1940s, average incomes in the Southern states began to catch-up to the Northern states (Wright, 1987), and given the fact that the black-white education gap and the black-white wage gap have both decreased significantly since 1940 (Smith and Welch, 1989).

Table 7: Slavery, land inequality, and income within the United States.

Dependent variable: $\ln y_i$	State level regressions			County level regressions		
	(1)	(2)	(3)	(4)	(5)	(6)
Gini coefficient of land inequality	$-.46$		.45	$-.11$		.07
	(.51)		(.55)	(.11)		(.11)
Fraction slaves, S_i/L_i		$-.33^{***}$	$-.39^{***}$		$-.23^{***}$	$-.24^{***}$
		(.11)	(.13)		(.07)	(.07)
Population density: L_i/A_i	$.21^{***}$	$.16^{***}$	$.15^{***}$	$.004^{***}$	$.004^{***}$	$.004^{***}$
	(.06)	(.05)	(.05)	(.0006)	(.0006)	(.0006)
R^2	.30	.43	.45	.03	.08	.08
Number of observations	37	37	37	1,933	1,933	1,933

Notes: The dependent variables is the natural log of per capita income in 2000, $\ln y_i$. Coefficients are reported with standard errors in brackets. For the county level estimates the standard errors are clustered at the state level. ***, **, and * indicate significance at the 1, 5, and 10 percent levels. In columns 1–3 the unit of observation is a U.S. state, and in columns 4–6 the unit of observations is a U.S. county.

The results of section 3 are best summarized by returning to diagram 1. There is evidence of the first relationship in the diagram. Slavery in 1860 is associated with greater land inequality in the same year. This was shown in table 6. Further, as a result of the persistence of economic inequality, there is also a strong positive relationship between slavery and current income inequality. However, I do not find evidence for the second relationship in diagram 1. The results of table 7 show that land inequality in 1860 is not correlated with income in 2000. They also show that the positive relationship between slavery and inequality is unable to explain the negative relationship between slavery and economic development. Instead, the data suggest that slavery had two distinct impacts. First, slavery resulted in lower long-term economic growth, and second, slavery resulted in greater initial inequality, which has persisted until today. These two effects appear to be unrelated. Contrary to Engerman and Sokoloff's hypothesis, slavery was not detrimental for economic development because it increased initial economic inequality.

Although these results take us a step towards better understanding the long-term impacts of slavery in the Americas, an important question remains. If the relationship between past slave use and current income is not through the channel hypothesized by Engerman and Sokoloff, then what explains the relationship? One possibility, which is highlighted by Acemoglu *et al.*'s (2007) chapter in this book, is that what may have been important for long-term economic development was political inequality, not economic inequality. The authors, looking within Cundinamarca Colombia, show that economic and political inequality are not always strongly correlated, and that they can diverge in significant ways. When examining the relationship between inequality and economic development, they find that one reaches very different conclusions depending on whether one looks at economic inequality or political inequality. It is possible that the results reported here would be very different if political inequality, rather than economic inequality, was examined.

A second possibility follows from Wright (2006), who argues that slavery's long-term effects are best understood by comparing its property rights institutions to those that arise from a production system based on free labor. Because slavery provided slave owners with property rights over labor, which allowed them to relocate labor as necessary, the slave states did not have a strong incentive to provide the public goods and institutions necessary to attract migrants (Wright, 2006, pp. 70–77). This channel is similar to Engerman and Sokoloff's, but is different in a subtle yet important way. It is not economic inequality that caused the subsequent development of poor institutions. Rather, it was slavery itself. Through the purchase and sale of slaves, involuntary migration could substitute for voluntary migration, and therefore, the growth promoting domestic institutions needed to attract free labor were not developed.

4 Conclusions

This chapter has examined the core predictions that arise from a series of influential papers written by Stanley Engerman and Kenneth Sokoloff (e.g., Engerman and Sokoloff, 1997, 2002, 2006; Sokoloff and Engerman, 2000). Examining the relationship between past slave use and current economic performance, I find evidence consistent with their general hypothesis that slavery was detrimental for economic development. Looking either across countries within the Americas, or across states and counties within the U.S., one finds a strong significant negative relationship between past slave use and current income. However, contrary to the focus of their argument, the data do not show that large scale plantation slavery was more harmful for growth than other forms of slavery. Instead, the evidence suggests that all forms of slavery were equally detrimental.

Turning to their hypothesized channels of causality, I examined whether the relationship between slavery and income can be explained by slavery's effect on initial economic inequality. Looking within the U.S., I found that, consistent with their hypothesis, slave use in 1860 is positively correlated with land inequality in the same year. Because of the persistence of inequality overtime, past slave use is also positively correlated with current income inequality. Thus, the data suggest that slavery had a long-term effect on inequality as well as income. However, after examining the relationship between slave use, initial inequality, and current income, I found that slavery's effect on initial economic inequality is unable to account for any of the estimated relationship between slavery and economic development. Contrary to their hypothesis, slavery's adverse effect on economic development does not appear to be because of its effect on initial economic inequality.

A Data Appendix

Data on country level per capita GDP in 2000 are from World Bank (2006). For countries with missing income data, when possible converted income data from the Penn World Tables or Maddison (2003) were used. For both series, data are measured in PPP adjusted dollars. State and county level per capita income in 2000 are from the BEA's *Regional Economic Accounts*. The county level data are from Table CA1-3 located at www.bea.gov/regional/reis/, and the state level data are from Table SA1-3 at www.bea.gov/regional/spi/.

Population density is measured in hundreds of persons per square kilometer in the cross-country regressions, and hundreds of persons per square mile in the county and state level regressions. Country level land area data are from Harvard's *Center for International Development's Geography Database* located at www.ksg.harvard.edu/CID/ciddata/Geog/physfact_rev.dta. Land area for U.S. states and counties are from U.S. Bureau of the Census (2006).

The country level slave and free populations data used in section 2.1 are from a variety of sources. All data are from 1750 or the closest available year. Figures for Barbados, Saint Christopher and Nevis, Antigua and Barbuda, Jamaica, Cuba, Dominica, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, Grenada, Guyana, Belize, Bahamas, Haiti, Suriname, Netherlands Antilles, and the Dominican Republic are from Engerman and Higman (1997). All figures are for 1750. Data for Canada are from the *1784 Census of Canada*. Data for the United States are for 1774 and are from Jones (1980). Brazilian data are for 1798 and are taken from Simonsen (1978, pp. 54–57). Chilean data are from 1777 and are from Sater (1974). The figures for Colombia are for 1778 and are from McFarlane (1993). Data for Ecuador are for 1800 and are from Restrepo (1827, p. 14). Mexican data are for 1742 and are from Aguirre Beltran (1940, pp. 220–223). Peruvian data are for 1795 and are from Rugendas (1940). Data from Paraguay are for 1782 and are from Acevedo (1996, pp. 200–206). Venezuelan data are for 1800 and are taken from Figueroa (1983, p. 58). Data for Uruguay are for the city of Montevideo in 1800, and are taken from Williams (1987). Data for Argentina are for the city of Buenos Aires in 1810, and are from Rout Jr. (1976, pp. 91, 95) and Johnson *et al.* (1980).

Slave and free populations data for counties and states within the U.S. are from the 1790 to 1860 Decennial Censuses of the United States. The data have been digitized and can be accessed at: http://fisher.lib.virginia.edu/collections/stats/histcensus/. The data on the size of slave holdings, and the size of farms in 1860 are also from this source.

The Gini coefficient of income inequality for each state in 2000 is from the U.S. Census Bureau. I approximate income inequality in 2000 using inequality in 1999, which is the closest year for which the inequality measures are available. The data were accessed from Table S4 available at: www.census.gov/hhes/www/income/histinc/state/state4.html

The Gini coefficient of land inequality is calculated using information about the size of each farm in the 1860 Census. The number of farms in each county is available for the following farm sizes: (1) 9 acres or less, (2) 10 to 19 acres, (3) 20 to 49 acres, (4) 50 to 99 acres, (5) 100 to 499 acres, (6) 500 to 999 acres, and (7) 1,000 acres or more. Because for each category I do not know the mean farm size, I use the median size of the category. For the category 1,000 acres or more, I use 1,000 acres. The Gini coefficients are calculated using the Stata program *ineqdec0* written by Stephen P. Jenkins. The formula for calculating the Gini coefficient is:

$$1 + (1/n) - \frac{2\sum_{i=1}^{n}(n-i+1)a_i}{n\sum_{i=1}^{n} a_i}$$

where n is the number of farms, a_i is farm size, and i denotes the rank, where farms are ranked in ascending order of a_i.

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