Peer to Peer:

Lifetime Learning and the Evolution of the Gender Literacy Gap

by

William Troost

The University of British Columbia

Abstract

After emancipation, Southern blacks had extremely low levels of literacy due to strict restrictions on the education of slaves. While many economists have detailed the racial gap in educational outcomes after emancipation, few have examined the gender differences in the educational outcomes of blacks. While blacks quickly pursued new educational opportunities, young black women especially took advantage. By 1870 the literacy rates of black females under the age of twenty were significantly higher than their male cohorts. However, by 1880 the situation reversed- as males of this birth cohort had rates of literacy over six percentage points higher than females the same age. This reversal in the gender literacy gap was a result of a sharp increase in literacy rates of males in these birth cohorts. While males continued to attain literacy throughout their lifetime, females did not experience such a rapid rise and subsequently fell behind. Using a difference in differences framework I find mixed evidence that the reversal of the gender gap is due to literacy attainment through labor market interactions.

In the Unites States prior to the American Civil War, slaves and free blacks in the South were legally denied access to education. As a result, Southern blacks had extremely low levels of literacy at the point of emancipation. Although many economists have detailed the large differences in the educational outcomes of blacks and whites during the 19th Century, few have examined the differences in educational outcomes between male and female blacks. While many blacks vigorously pursued their new educational opportunities at the conclusion of the Civil War, young black women especially took advantage of these new opportunities. By 1870, black females under the age of twenty had rates of literacy that were significantly higher than their male counterparts.

Although black females born between the years of 1860 and 1850 had higher rates of literacy in 1870, the situation quickly changed. By 1880, males in this birth cohort had rates of literacy over six percentage points higher than their female counterparts. What caused this reversal in the gender literacy gap? This paper details the rapid change in the gender educational gap during this time period. Utilizing a difference in differences framework I examine the reasons why this tremendous reversal occurred. Results from these estimates indicate that higher rates of labor market participation on the part of males led to a reversal of the gender literacy gap.

Data Sources

The main reason why scholarship has not detailed the existence and reasons for the dynamic nature of the gender literacy gap is due to a lack of adequate data on educational

outcomes. Published census volumes actually provide county data on the number of black males and black females who can't read for three different age-groups: 10-14 year olds, 15-20 years old, and 21 years and older. However, population data in these same volumes is grossly inadequate to produce accurate race-specific literacy rates for each sex at the county level. The census bureau tabulated the total number of blacks residing in a county, as well as, the total number of males and females 5-18 years old and 21 years and older with no distinction by race. Although data in published census volumes is inadequate, recently available individual-level census data makes this examination possible.

Data on educational outcomes used in this study is derived from the Integrated Public Use Micro-Samples of the 1870 & 1880 Censuses.[1] This is individual data and includes two key educational variables- whether the individual could read and whether the individual attended school. Reading proficiency was self-reported for adults and reported by the head of the household for children. Likewise, school attendance was reported by the head of household for children and indicates whether the individual attended school in the past year. This data is used to detail educational outcomes for black males and females in 1870 and 1880.

In addition to information on literacy, this individual data includes a litany of personal and familial characteristics, such as family wealth and urban residence. This individual-level data is used to construct county data that is unavailable in published census volumes- including gender-specific literacy rates, average wealth, and the percentage of blacks in a county living in an urban area. Besides individual data, this

[1] Steven Ruggles, Matthew Sobek, Trent Alexander, Catherine A. Fitch, Ronald Goeken, Patricia Kelly Hall, Miriam King, and Chad Ronnander. *Integrated Public Use Microdata Series: Version 3.0* [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor], 2004.

analysis is supplemented with county level data from the Population, Agricultural and Manufacturing Censuses of 1870 and 1880.[2]

The Existence and Evolution of the Gender Literacy Gap

Prior to the Civil War sharp restrictions were placed on the educational efforts of Southern blacks. A series of slave rebellions in the early 19th Century and testimonies of runaway slaves stoked fear that literacy among the black population could undermine the system of slavery in the United States. The Nat Turner Rebellion of 1831 is illustrative of these worries. Nat Turner was a literate slave who believed that he "was ordained for some great purpose in the hands of the almighty".[3] Nat Turner and a small group of slaves began killing white slave owners and their families in the middle of the night. As they killed slave owners many of their liberated slaves joined the group. In all, 55 whites were killed in the mere forty eight hours the rebellion lasted. The incident created great panic among the white and slaveholding populations. These fears reached a point where "by 1835 every southern state had a law prohibiting the schooling of slaves".[4] In many states the punishments for teaching a person of color was quite severe and restrictions were extended to the free colored population. In Alabama if a white individual were to teach a slave or free black to read or write they were subject to be fined no less than $100

[2] Haines, Michael R., and the Inter-university Consortium for Political and Social Research, Historical, Demographic, Economic, and Social Data: The United States, 1790-2000 [Computer file], ICPSR02896-v2. Hamilton, NY: Colgate University/Ann Arbor: MI: Inter-university Consortium for Political and Social Research [distributor], 2005-04-29.
[3] Gray, Thomas and Nat Turner, *The Confessions of Nat Turner*, Pg. 9.
[4] Smith, James P., "Race and Human Capital", pp. 688.

and be imprisoned for at least three months.[5] Evidence of the effectiveness of these laws is seen in the low level of literacy among the slave population. On the eve of emancipation Cornelius estimates that only ten percent of slaves were literate.[6]

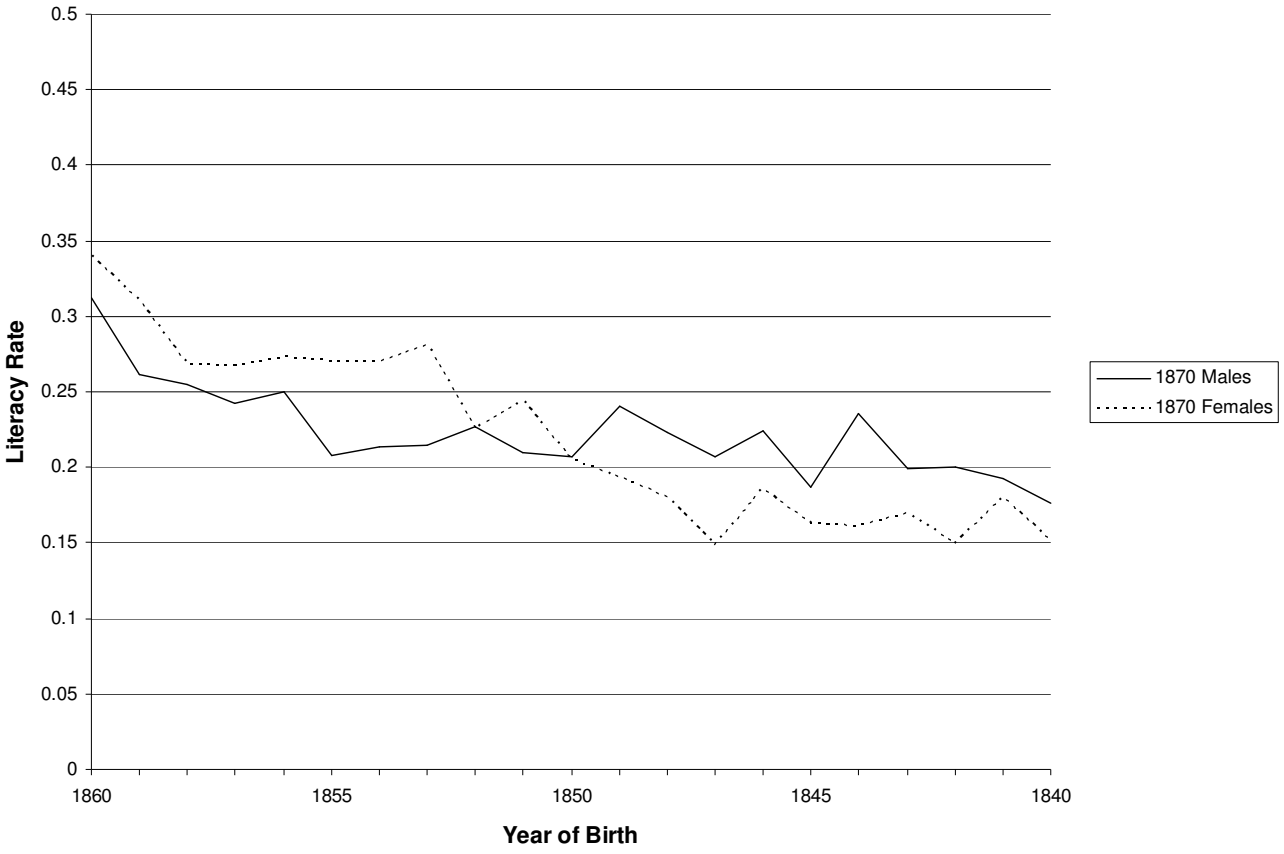
In the aftermath of the Civil War the Bureau of Refugees, Freedmen and Abandoned Lands with aid from Northern Aid organizations worked to establish schools for blacks across the South. Blacks vigorously pursued these new educational opportunities- especially younger individuals. Evidence of this enthusiasm is evidenced by the rapid increase in literacy seen among Southern blacks. From emancipation to 1870 the literacy rate of 10-15 year old blacks more than doubled, from an estimated 11.8 percent to a reported 25.5 percent. While all blacks vigorously pursued their new educational opportunities, young black women especially took advantage of these new opportunities. Records of the Freedmen's Bureau on school enrollment show that in four years there were only four months where females made up less than fifty percent of the student body.[7] By 1870, black females under the age of twenty had rates of literacy that were significantly higher than their male cohorts.

Figure One displays the literacy rates of black males and females living in the South. There are two things that jump out from this figure. First, black females between the ages of ten 10-20 years old had literacy rates that were greater than their male counterparts. Secondly, there are significant differences in the age-profile of literacy between the sexes. While the literacy rates of black females have a steep age-gradient, the age-gradient for black males is fairly flat. Whereas black females had higher rates of

[5] Williams, Heather A., *Self Taught*, Pg. 203.
[6] Cornelius, Janet Duitsman. *'When I can Read My Title Clear'*.
[7] National Archives, "Records of the Education Division of the Bureau of Refugees, Freedmen, and Abandoned Lands 1865-1871", Microcopy No. 803

literacy at younger ages, among blacks 21 years and older males had significantly higher rates of literacy.

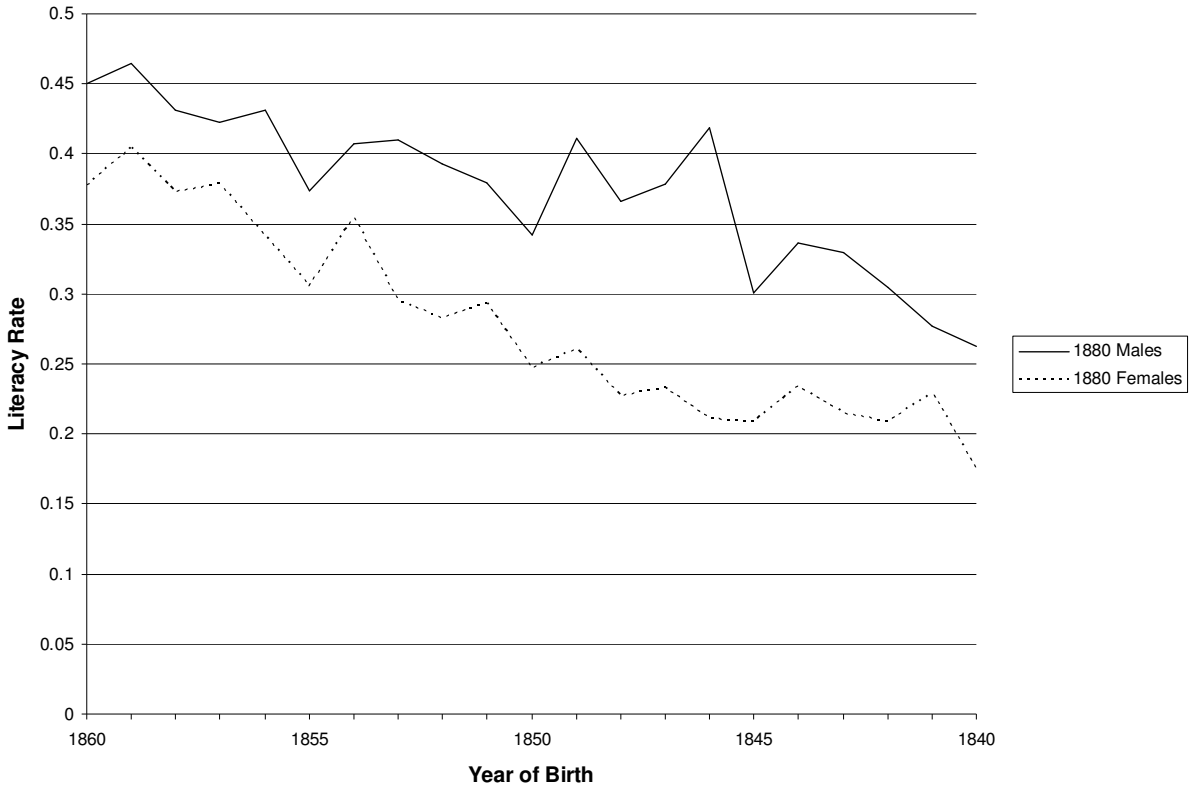
Figure 1- Literacy Rates of Southern Blacks in 1870



Although black females born between the years of 1850 and 1860 had higher rates of literacy in 1870, by 1880 the situation had completely changed. Figure 2 displays the literacy rates of males and females born between 1860 and 1840. Even though males born between 1850 and 1860 had rates of literacy 2.3 percentage points lower than their female counterparts in 1870, by 1880 they had rates of literacy nearly eight percentage

points higher than their female counterparts. In total the change in the gender literacy gap was a stunning 10.3 percentage points.

Figure 2- Literacy Rates of Southern Blacks in 1880



What was responsible for this reversal in the gender literacy gap? As individuals in this birth cohort became older an increasing percentage of males reported themselves as being literate. While the reported literacy rates of females increased a modest 6.5 percentage points between the 1870 and 1880 Censuses; the reported literacy rates of males increased by a staggering 16.6 percentage points during this time period. The magnitude of this increase is tremendous- as many in this cohort were considered older than school aged even at the beginning of this time period. Males in the 1854 birth cohort

were sixteen years old in 1870. Despite their advanced age, the reported increase in the male literacy rate from 1870 to 1880 was nearly double the estimated increase from emancipation to 1870.

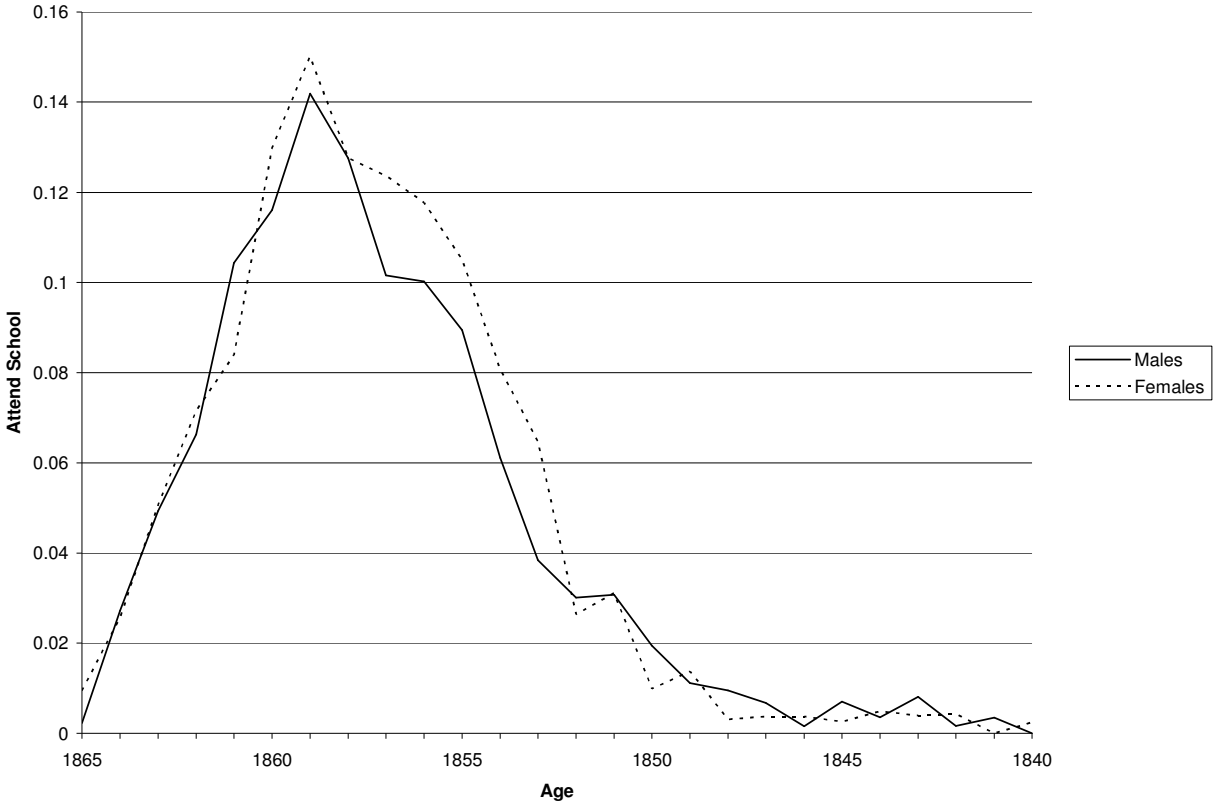
Reasons for the Reversal of the Gender Literacy Gap

Scholars have speculated on why the literacy rates of birth cohorts increase over time. Margo and Collins identify three possible reasons why literacy rates of a birth cohort may increase from one census to another: literacy attainment during adulthood, educational creep, and mortality bias.[8] The young age of this cohort largely excludes the possibility that mortality bias can explain such a significant change in relative literacy rates. First, due to the young age of this cohort during this time period mortality rates were extremely low. Secondly, it is incredibly implausible that this factor would affect females and males in a differential manner with regards to education.

The likely cause of this stunning reversal is delayed literacy acquisition on the part of males. Many males may have elected to forego school attendance as children due to superior job opportunities. Later in life these males might have attained literacy through day or night schools. To investigate whether later in life school attendance is a plausible explanation for the reversal of the gender literacy gap one can examine the school attendance rates of male and female blacks during this time period. Figure 3 displays school attendance rates for blacks in 1870.

[8] Collins, William J. and Robert A. Margo, "Historical Perspectives on Racial Differences in Schooling in the United States", NBER Working Paper 9770, June 2003.

Figure 3- Black School Attendance in 1870



The figure shows that black females had higher rates of school attendance than their male counterparts between the ages of ten and eighteen years old. Among blacks over eighteen years old the literacy rates of males are slightly higher than those of females. However, the rates of attendance for individual over eighteen years old are very low. The school attendance rate for males 18-30 years old was 0.87 percent, while the rate for females in the same cohort was 0.67 percent. The higher rates of school attendance for younger females and the miniscule differences in school attendance between older males and females makes it seem incredibly implausible that school attendance led to differential patterns of literacy acquisition.

Another possible way in which older males could have acquired literacy was through peer learning and self-help. Blacks had a long history of literacy acquisition through these means. Due to the illegality of slave education, blacks prior to the Civil War had to learn how to read and write from their peers in often clandestine meetings. Frederick Douglass in his autobiography discusses how after gaining literacy he taught other slaves on the plantation how to read and write in a clandestine Sabbath school.[9] Once freed, blacks treated interactions with literate individuals as an educational opportunity. Reports from the battlefields express an unbelievable enthusiasm for learning on the part of the freedmen. In the Union Army colored regiments continually requested spelling books and teachers to help them in their academic endeavors.[10] This form of peer learning likely didn't stop after the war and individuals would be able to learn from friends and co-workers in their new roles as freedmen.

This form of literacy acquisition would be consistent with the patterns seen in figures one and two. One way to obtain literacy is through attendance in day schools largely during childhood. Black females took advantage of these opportunities at a greater rate than their male counterparts and evidence of this is seen in the higher rates of literacy for females 10-20 years old. As these individuals aged they could obtain literacy via the second channel of peer learning. Black males had higher labor force participation rates as many black females assumed traditional family roles. This likely led an unequal exposure to this second method of learning. These factors could explain both the age-gradient seen in 1870 and the huge reversal of the gender literacy gap by 1880.

---

[9] Douglass, Frederick, *Narrative of the Life of Frederick Douglass: An American Slave*, Oxford: Oxford University Press, 1999, pg. 59.

[10] Williams, Heather A., *Self-Taught: African American Education in Slavery and Freedom*, pg. 45-50.

Empirical Analysis of the Change in the Gender Literacy Gap

To further investigate this rapid reversal I employ a difference in differences framework to estimate the correlates that led to a change in the gender literacy gap. The level of analysis is at the county level. Utilizing the Integrated Public Use Micro-Sample of the 1870 and 1880 Census I construct county literacy rates for both males and females in each census year. The dependent variable in each regression is the change in the gender literacy gap from 1870 to 1880 and is represented in equation one.

$$(1)\ \Delta \text{Gender Gap} = (\%\ \text{MaleLit}_{1880} - \%\ \text{FemaleLit}_{1880}) - (\%\ \text{MaleLit}_{1870} - \%\ \text{FemaleLit}_{1870})$$

If in fact differential peer interaction led to the divergence of later in life learning one would look for factors that would increase peer learning opportunities for males and decrease similar opportunities for women. The independent variables used in this analysis can be classified into three categories: those that would lead to increased labor market interactions for males, those characteristics that would increase the labor market interactions of females, and wealth which would make it possible for females in black families to assume traditional gender roles and have a decreased attachment to the labor market. Equation two displays the general equation that is estimated in the regressions.

$$(2)\ \Delta \text{Gender Gap}_C = B_0 + B_1\text{MaleLFP} + B_2\text{FemaleLFP} + B_3\text{Wealth} + B_4\text{State}_S + E_C)$$

The first variable used as a measure of the labor force interaction of males is the percentage of farms in a county that were at least one hundred acres in size. In counties with a higher percentage of large farms a greater proportion of farm workers would be hired as wage laborers or employed with others in the squad system. This would have likely led to more interaction. In contrast, counties made up of smaller farms would have a higher percentage of yeoman farms where the family would function as a self-contained unit without as much peer learning opportunities. The other two variables used to proxy for peer interaction is the percentage of the population employed in manufacturing and the percentage of the black population living in urban areas. Manufacturing employment would bring individuals into contact with a large number of fellow employees so an individual who wanted to acquire literacy would be able to find a literate co-worker to assist in the process. Finally, the percentage of blacks living in an urban area acts as a proxy for increased daily interaction that would increase learning opportunities.

There are three measures used to proxy for female labor force participation. The first variable used is the percentage of manufacturing output in a county attributed to home manufacture. The largest output of home manufacture was thread for textile production, work disproportionately done by females. These females would have been more likely to interact with others in the sale of their output and meet with others on how to improve production techniques. The second variable used is the percentage of manufacturing workers in a county who were female. The final variable used to proxy for female peer interaction is the value of cotton production divided by the value of total farm output. In cotton production female labor was higher valued than in other agricultural products.

The largest impediments to the assumption of traditional gender roles and reliance on a single income was a lack of adequate income and wealth. The two measures of wealth that I use to approximate the ability of individual families to afford this lifestyle are: the value of farm implements per capita in a county and the average wealth that black families had in the county in 1870.

Table one displays the results from the estimation of equation two using a sample of counties that had at least one black of each gender born between 1850 and 1860 in both the 1870 and 1880 Census. Surprisingly all the variables in column one with the exception of the constant term are statistically insignificant. The R-squared is a miniscule 0.0098 which indicates the model has little explanatory power. These results indicate that factors associated with an increase in the labor force interactions of black males and females had little impact on the evolution of the gender literacy gap. In column two I include another term- the gender literacy gap in 1870. This variable is included to account for the possibility that males catch-up to their female counterparts and vice-versa. This variable is statistically significant and very large in magnitude. However, caution should be taken in the interpretation of this result as it is possible the small sample size in many counties led to this result. The inclusion of this variable does little to change the estimated coefficients for the other variables.

Table 1- Regressions (Blacks Born 1850-1860)

Dependent Variable: (Male Lit 1880 - Female Lit 1880) - (Male Lit 1870- Female Lit 1870)		
Independent Variable		Coefficient (standard error)
	1	2
Home Manufacturing/Manufacturing Output	0.02273 0.0145	0.02009 0.0126
Farm Impliments per Capita	-0.00523 0.0037	-0.00240 0.0033
% Manufacturing Workers (Females)	-0.27138 0.2004	-0.23095 0.1741
% Population Employed in Manufacturing	1.19981 0.8394	0.57889 0.7302
% Cotton of Farm Output	-0.02583 0.0691	-0.03518 0.0600
% Large Farms	0.07199 0.1027	0.04367 0.08923
Average Total Property	0.00005 0.0001	-0.00002 0.0001
% Residing in Urban Area	-0.06498 0.0990	-0.04965 0.0860
Constant	**0.09926***** 0.0461	**0.08758**** 0.0401
Gender Literacy Gap in 1870		**-0.97585***** 0.0656
State Fixed Effects	X	X
R-Squared	0.0098	0.2571
Number of Observations	701	701

Notes: Figures denoted with boldface and * , **, and *** indicate significance at the 0.10, 0.05, and 0.01 level.

One problem with the results in table one is the inclusion of younger individuals in the sample. Those born in 1860 were ten years old in 1870. It is likely that a high percentage of these younger individuals obtained literacy through school attendance between the two census periods. This likely creates a lot of noise in the regressions and would cause the estimated coefficients of these independent variables to be insignificant- as the determinants of school attendance are vastly different than those associated with peer to peer learning via workplace interaction. To alleviate these concerns I restrict the sample to a smaller and older age cohort. I re-estimate the equations using a data set of counties that had at least one black of each gender born between 1850 and 1854 in both the 1870 and 1880 Census. One problem with narrowing the age group under investigation is the large decrease in the size of the sample from 701 to 474 counties.

Table two presents the results of estimating equation two using the smaller sample of older age cohorts. The results using this new sample are different. The estimated coefficients on the two variables used to proxy for labor market interaction are positive and statistically different than zero. The two variables are the percentage of the population employed in manufacturing and the percentage of the county's farms that were over 100 acres in area. Being employed in manufacturing would provide a litany of opportunities for individuals to learn how to read or write from their co-workers. Similarly, if a county had a higher concentration of large farms it was more likely that males were engaged in agricultural employment outside the context of the family structure. The other variables, with the exception of the initial gender literacy gap, are all statistically insignificant from zero.

Table 2- Regressions (Blacks Born 1850-1854)

Dependent Variable: (Male Lit 1880 - Female Lit 1880) - (Male Lit 1870- Female Lit 1870)		
Independent Variable		Coefficient (standard error)
	1	2
Home Manufacturing/Manufacturing Output	0.02378 0.0243	0.01467 0.0234
Farm Impliments per Capita	-0.00499 0.0053	-0.00312 0.0051
% Manufacturing Workers (Females)	0.07470 0.3141	0.02977 0.3020
% Population Employed in Manufacturing	**2.50391** 1.1944	**2.00015*** 1.1501
% Cotton of Farm Output	0.10386 0.1022	0.037521 0.1162
% Large Farms	**0.26358*** 0.1511	**0.26189*** 0.1530
Average Total Property	-0.0004 0.0004	-0.00025 0.0004
% Residing in Urban Area	0.05323 0.1474	0.07256 0.1418
Constant	-0.00680 0.0741	-0.00600 0.0713
Gender Literacy Gap in 1870		**-0.82222***** 0.1323
State Fixed Effects	X	X
R-Squared	0.0098	0.1000
Number of Observations	474	474

Notes: Figures denoted with boldface and * , **, and *** indicate significance at the 0.10, 0.05, and 0.01 level.

Conclusion

This paper has detailed the tremendous divergence of the reported literacy of black males and females between the 1870 and 1880 Censuses. The findings of this paper have some major implications. First, economists have typically assumed that parents invest in the human capital of their children. When the returns to human capital are larger, parents are assumed to invest more. This logic has been used to explain the higher rates of literacy and degree attainment for males in many countries across many different time periods. However, results from this paper throw this theory into doubt. If human capital attainment is a result of parental investment that is responsive to the expected returns of the labor market, one would expect that younger males would have literacy rates greater than their female counterparts.

One factor in this common assumption could be due to the inadequacy of previously available data. Published census volumes commonly give a partial view of literacy by providing literacy rates for older individuals and not providing gender and race specific literacy rates. This paper uses data from the Integrated Public Use Micro Sample of the 1870 and 1880 United States Censuses. This is individual-level data and allows for the construction of literacy rates for specific age, gender, and racial groups. The inspection of age and gender specific literacy rates provides a different picture than that provided by published census volumes. More specifically, it shows the dynamic nature of the gender literacy gap.

Another implication of this paper is a revision of perceptions about the way in which individuals gain literacy. The quick reversal of the gender literacy gap suggests

that human capital attainment is often the result of personal labor market experiences. In societies with less developed educational systems, peer to peer interaction can be a major way in which individuals acquire literacy. Regressions testing this theory are mixed. Two variables that are associated with increased labor market interactions for males are positively correlated with the change in the literacy gap. Variables that were used as proxies for increased and decreased labor force participation on the part of females have little explanatory power.

Finally, the results of this paper suggest that educational efforts to increase literacy rates for women in developing countries may not be successful in reducing the gender literacy gap. Young black women in the South were very successful in school and were able attain a higher rate of literacy than young males by 1870. However, by 1880 they were faced with a large literacy deficit. In addition to the literacy of individuals transforming labor market experiences, it appears that labor market experiences can also transform the literacy of individuals.

References

Collins, William J. and Robert A. Margo, "Historical Perspectives on Racial Differences in Schooling in the United States", NBER Working Paper 9770, June 2003.

Cornelius, Janet Duitsman. 1991. *'When I can Read My Title Clear' Literacy, Slavery, and Religion in the Ante-bellum South*. Columbia: University of South Carolina Press.

Douglass, Frederick, *Narrative of the Life of Frederick Douglass: An American Slave*, Oxford: Oxford University Press, 1999.

Gray, Thomas R., *The Confessions of Nat Turner*, Baltimore: Lucas and Deaver, 1831.

Haines, Michael R., and the Inter-university Consortium for Political and Social Research, Historical, Demographic, Economic, and Social Data: The United States, 1790-2000 [Computer file], ICPSR02896-v2. Hamilton, NY: Colgate University/Ann Arbor: MI: Inter-university Consortium for Political and Social Research [distributor], 2005-04-29.

National Archives, "Records of the Education Division of the Bureau of Refugees, Freedmen, and Abandoned Lands 1865-1871", Microcopy No. 803

Ruggles, Steven, Matthew Sobek, Trent Alexander, Catherine A. Fitch, Ronald Goeken, Patricia Kelly Hall, Miriam King, and Chad Ronnander. *Integrated Public Use Microdata Series: Version 3.0* [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor], 2004.

Smith, James P., "Race and Human Capital," *American Economic Review*, September 1984, Vol. 74, pp. 685-698.

Williams, Heather A., *Self-Taught: African American Education in Slavery and Freedom*, Chapel Hill: The University of North Carolina Press, 2005.