Greener Pastures
Movement, Institutions, and Educational Achievement

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I study the role of institutions on educational achievement across a 120-year period in the United States. Using exam data between 1888-1892 as well as 1890 population data on literacy, I find that modern educational achievement is strongly associated with indicators from the distant past, even when controlling for changing demographic and economic factors. The model explains a significant share of the variation in modern reading scores across state lines.

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I. The Approach

Understanding the legacy of past institutions and their persistent effect on educational outcomes is important because of the tight link between educational success and later life disparities in wages and health. This study uses indicators of educational quality and access in 1890 while controlling for economic and demographic changes between 1890 and 2010 to estimate modern achievement. The result is a cross-sectional model with strong predictive power of modern educational achievement, evidenced by test scores from 2009.

Studies identifying predictors of future educational attainment have been performed in the past but include some marked differences. Lutz and Goujon (2001), Majumder (2010), and Ferrare (2016) note the extensive evidence of intergenerational transmission of education, however, models of these kinds focus

on the influence of demographics and family on future educational outcomes. While Lutz and Goujon (2001) come closest to this model in the attempt to study regional educational outcomes, their model relies on fixed demographic figures, and does not consider regional inertia with varying demographics. In the United States, however, the assumption of static regional demographics does not hold (Greenwood and Seshadri, 2002).

The issue that presents itself from here is separation of familial influences on education. I look at this problem from a regional perspective in which the inertia on educational outcomes is influenced by the roles of past institutions while controlling for changes over the period in economic and demographic factors.

The Great Migration and the Role of Institutions: To distinguish the extent that achievement is tied up with the inertia of institutional differences across states and not on familial influences, I look to evidence of demographic change from the Great Migration. Collins and Wannamaker (2015) show that, among migrants, selection was small, participation was widespread, and initial location and backgrounds of migrants did not account for differences in destination choices. Thus, without selection bias, we now consider how to separate institutional effects from intergenerational effects. If intergenerational transfers were stronger than the effects of historical institutions, we would see a strong downward effect associated with states that exhibit large changes in demography. Using the Great Migration as a guide, then, we look at the absolute value of changes to the percent of the population whose race was marked as white or black between 1890 and 2010. The data show that, even when statistically significant, changes in the share of black and white residents over the period have little effect on modern test scores. Therefore, we must examine the validity of the assumption that a geographic area can be largely influenced by institutions of the past.

Inertia and Stickiness Across Time: The inertia of geography can have large effects. Boberg-Fazlic and Sharp (2018) note that long-run social mobility for a

geographic region can be surprisingly constant, even when accompanied by large structural changes. It follows due to the strong link between education and social mobility that if social mobility can remain fairly constant over long periods of time, educational outcomes may react in a similar way.

Zimmerbauer, Riukulehto, and Suutari (2017) expand on this idea of cultural inertia, stating that even when a region is subject to deinstitutionalization, the culture and identity associated with that region endure and remain meaningful for inhabitants for a long time. They also find evidence of stickiness in historical structures, and even go as far as to argue that entrenched sociocultural distributions can never be completely erased from the consciousness of its inhabitants.

Furthermore, even when institutions are changed and policies expanding access to education are put in place, changes in educational achievement do not necessarily follow. Banerjee and Duflo (2011) note the differences in reading and math achievement across different nations, as well as within the same nation, that are associated with the same grade level. The implication from this is that educational achievement and educational attainment should be treated as two separate items. This is why I have focused the efforts of this study on scores. I refer to this as educational "achievement" or "outcomes".

To measure the stickiness of educational institutions, therefore, a baseline score or ranking was needed to establish the historical educational achievement from states in the United States. This was found in test scores attained from the United States Civil Services Commission and literacy rates obtained from the 1890 US Census. I will expand on the history and validity of these exam results in the following section.

To control for other influences over the time period, including demographic changes precipitated by the Great Migration, we utilize data from the 1890 US Census on race and wealth, data from the 2010 US Census on race, and data from the Bureau of Economic Analysis on per-capita income in 2010. Economic change

is measured on a nominal basis and demographic change is measured as a percentage of total population at the time of measure.

History and Validity of the Civil Services Exam: The ideal baseline score or ranking for interstate educational achievement would be a standardized exam administered to a large sample of the population of each state. The issue with this approach, however, is that the first national assessments were held in 1969 (National Assessment for Educational Progress, 2019). Before this time there were varying arrays of testing options utilized across the country. Monroe's (1918) list of existing tests and standards in the year 1917 lists eighty-four standardized tests for elementary schools and twenty-five for high schools. On top of this, standardized testing was a relatively new concept in 1917. Scientific and empirical measures of student achievement based on standardized testing did not begin until the 1890s (Vinovskis, 2019). Because of this, tests administered before this time are criticized for their lack of objectivity, and the potential biases of the assessors (Gallagher, 2003).

Tests that strove for objectivity before this time were subject to another issue: scale. While many credit Horace Mann's introduction of written exams to the Boston Public School Committee in 1845 as the first example of standardized testing, these were only administered on a local scale, and other cities trying to copy this model ended up creating their own exams (Vinovskis, 2019 and Gallagher, 2003).

The model I use takes test scores from the United States Civil Services exams, specifically the Departmental Copyist and Clerk exams and the Railway Mail Exam.

The United States Civil Services exams arose from the Pendleton Act, approved January 16, 1883. The purpose of this act was to establish a classification system that fairly tested the merits of job applicants to the federal civil services (Civil Service Commission, 1884). While this encompassed a wide variety of departments

and positions, three specific exams were utilized, the Clerk and Copyist examinations of the Departmental service and the Railway Mail exam.

When considering the issues presented with standardized testing at this time, these exams are unique in their structure and accurate in their measurement. This is because they were (i) uniform in their structure, (ii) unbiased in their assessment, and (iii) widespread in their use.

i.   According to pages 213-217 of the 1888 Civil Services Commission Report, Copyist and Clerk exams across state boundaries were controlled in time allotted, subject, relative weight of subject area, and difficulty of content questions.

ii.   According to page 22 of the 1883 Civil Services Commission Report, Board of Examiners are given rules to follow for grading and provided with anonymous tests, so they did not know whose paper they were marking.

iii.   According to page 7 of the 1888 Civil Services Commission Report, one or more examinations were held in every state and territory, schedules of examinations were announced in the early part of the year, and exam schedules remained similar across years.

With these things in mind, we turn our attention towards selection bias of test takers. Based on data obtained from the Civil Services Commission reports, we can reasonably estimate the average years of education of test takers. Based on data obtained from the 1890 US Census, we can reasonably estimate the average years of education of state populations. In all 50 states and the District of Columbia, the estimated years of education of test takers was above that of the estimated years of education of the general public. What is more, the spread of years of education

between the middle 47 observations for test takers is two years, and the spread of years of education between the middle 47 observations for state population is nearly four years. So, not only is there a higher level of education among test takers, but also a lower variance in the number of years.

The Validity of Census Literacy Measures: The ideal information on a state's culture towards education would include in depth information on differences in access, preferences, and quality of education for multiple demographic categories. While this would be hard to obtain, especially given the time in which this data was pulled from, the US Census gives us two acceptable proxy variables.

I made use of information on male literacy rates and the gender gap in literacy from the 1890 US Census. Woßmann (2003) points out that literacy rates are a minor proxy for human capital, but often used to measure the percentage of the population without any schooling. There are also benefits to using literacy as a basic measure of school quality. Roser and Ortiz-Ospina (2019) note that quality of education often varies, and schooling does not produce literacy in the same way everywhere. Literacy rates, therefore, can be used as a proxy for the percentage of the population receiving at least a basic education. Literacy gaps, on the other hand, can be used as a proxy for the equality of educational opportunities between genders within that state.

Final Note on the Characteristics: The past results on the Civil Services Exams, male literacy rates, and the gender literacy gap therefore gives us a combination of variables that capture quality and access to education. From there, we use changes in a states racial makeup to distinguish intergenerational from regional effects on educational achievement and we use the difference between per-capita wealth in 1890 and per-capita GDP in 2010 to control for the effects of economic growth.

II. Model

I make use of past measures of educational quality, educational access, and socio-cultural factors to produce a model that predicts current educational outcomes.

A. Basic Elements

I identified sources of data pertaining to the education quality of states around the year 1890. The first was for information on population, demographics, and literacy rates separated by state. The first source was the US census for the year 1890 (Census Office, 1895). The second source was a test administered across state lines at that time, the Civil Services exam of the United States, which was implemented after the Pendleton Civil Service Reform Act (47th Congress, 1883). The test results were obtained from the Civil Service Commission reports and summed over the years 1888-1892 (Civil Service Commission, 1889-1893). Because these test results were summed, I established a cross sectional dataset.

Past Academic Performance: Exam results were taken from the Civil Service Commission reports between 1888-1892. The chief limitation of this data was sample size. To reduce the effects of sample size, I used aggregated results from three exams over a five-year period.

These aggregate results were then used to establish a percentage variable reflecting the percent of those examined who received a passing grade. Scores defined as passing were uniform across states, and therefore give an accurate reflection of equivalent achievement on an equivalent test.

Tests that were singled out for observation were the Clerk, Copyist, and Railway Mail exams. This was for uniformity. The Copyist exam contained four sections, three of which were related to literacy and the fourth related to arithmetic. The Clerk exam expanded on this by adding an additional two sections also related to

literacy.[1] The two exam results together make up the Departmental Exam Pass Percentage. From there, the Railway Mail exam results were added to the Departmental Exam results to create the Total Exam Pass Percentage. Adding observations from additional exams was considered, however, this idea was eliminated upon consideration of the weights and variety of the other exams.[2]

Past Educational Attainment and Equity- To establish a state-level gauge on the percentage of the population with access to a basic education and cultural factors that influence education, I sought evidence of a disparity of human capital accumulation. This was established using information on literacy and population. The literacy information, including its demographic breakdowns were taken from the 1890 Census. From here, states are assigned percentage values based on the proportion of the population who are literate, defined as someone who can both read and write. I separate these into male literacy rates and the gap between male and female literacy rates.

Economic and Demographic Data- The Census information on population and demographics was taken from the 1890 and 2010 US Censuses. To control for the demographic effects from the Great Migration, the absolute change in the percentage of white residents was added to the absolute change in the percentage of black residents over the period. To control for per capita economic growth, I subtracted per-capita wealth from the 1890 Census from per-capita income in 2010 from the Bureau of Economic Analysis.

Current Academic Performance- As a measure of current academic performance at the state level, I used test scores obtained from the 2009 National Assessment of

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[1] See Appendix A. This information is pulled from the 1890 Civil Service Commission Report, Pages 190-193.

[2] Four exam categories, Departmental, Customs Service, Postal Service, and Railway Mail were available. A Clerk in the Departmental service had exam results weighted towards literacy related questions, but the other three departments had their own established weights and question types. The Railway Mail exam comes close, however, it also includes geographic questions that account for about half the weight of the exam. Another issue arises from including exam results for other jobs within the Departmental Service, as these were often curated specifically towards a job.

Educational Progress (Department of Education, 2009). This provided scores on reading levels for 8th grade students in 2009.

B. Model Specification

To study the persistence of educational outcomes by geography, one would like information on family history, length of time lived in an area, more specific information on where people were educated, and information on the effects of people moving from historically highly educated areas to less educated ones, and vice versa. Unfortunately, this information is not directly available from historical sources. This model, therefore, uses a sample of exam results to establish an educational baseline, and then makes use of demographic data on literacy and population to account for access to education and cultural differences. Educational and cultural equity therefore is seen as a state's ability to make use of talented residents widely and equally, and it would be hypothesized that underuse of talent would have a negative effect on educational achievement in the future.

Differences in modern reading scores are estimated with the following model:

$$\Upsilon_s = \alpha + \frac{D_{ps}}{D_{es}} + \frac{D_{ps}+R_{ps}}{D_{es}+R_{es}} + \frac{M_{ls}}{M_{ts}} + \left| \frac{M_{ls}}{M_{ts}} - \frac{F_{ls}}{F_{ts}} \right| + (|B_{1890s} - B_{2010s}| +$$
$$|W_{1890s} - W_{2010s}|) + (GDPPC_{2010s} - GDPPC_{1890s}) + \varepsilon_s$$

Where the dependent variable Y_s represents the modern reading ability of state *s*, represented by the reading ability of 8th graders in that state, evidenced by the 2009 National Assessment of Educational Progress. The variable α represents the constant intercept. Let D_{ps} be the number of individuals in state *s* who received a passing grade on the Copyist or Clerk exam for the civil services and D_{es} be the number of individuals in state *s* who took the Copyist or Clerk exam for the civil services between 1888-1892. It follows that $\frac{D_{ps}}{D_{es}}$ is the pass rate for state *s* on the

departmental exams. Let R_{ps} be the number of individuals in state s who received a passing grade on the Railway Mail exam for the civil services and R_{es} be the number of individuals in state s who took the Railway Mail exam for the civil services between 1888-1892. It follows that $\left(\frac{D_{ps}+R_{ps}}{D_{es}+R_{ps}}\right)$ is the pass rate on all three exams for state s. Let M_{ls} be the number of male residents who are literate in state s and M_{ts} be the total number of male residents in state s as given by the 1890 US Census. It follows that $\frac{M_{ls}}{M_{ts}}$ is the male literacy rate of state s in 1890. Let F_{ls} be the number of female residents who are literate in state s and F_{ts} be the total number of female residents in state s as given by the 1890 US Census. It follows that $\left|\frac{M_{ls}}{M_{ts}}-\frac{F_{ls}}{F_{ts}}\right|$ is the absolute value of the gap between male and female literacy rates. Let B_{YYYYs} and W_{YYYYs} be variables reflecting the percentage of the population of state s whose race was marked Black or White in year YYYY. It follows that $(|B_{1890s}-B_{2010s}|+|W_{1890s}-W_{2010s}|)$ is a measure of the racial shift between 1890 and 2010 in state s. Let $GDPPC_{YYYYs}$ be the per-capita GDP in year YYYY. It follows that $(GDPPC_{2010s}-GDPPC_{1890s})$ represents the per-capita economic growth between 1890 and 2010 in state s. Finally, ε is the error term.

The variables for access to education and cultural differences in educational access are $\frac{M_{ls}}{M_{ts}}+\left|\frac{M_{ls}}{M_{ts}}-\frac{F_{ls}}{F_{ts}}\right|$. This combines the male literacy rate for state s with the literacy rate gap between males and females in state s. This was designed to measure the share of the population with access to a basic level education as well as cultural differences that occur when there is a gender bias in educational access.

The variables used for the base achievement in education are $\frac{D_{ps}}{D_{es}}+\left(\frac{D_{ps}+R_{ps}}{D_{es}+R_{ps}}\right)$. These give the percentage rate of individuals examined who received passing grades on the Departmental exams in state s and the percentage rate of individuals examined who received passing grades on Departmental or Railway Mail exams.

This variable is designed to measure the quality of education in that state at the time the tests were taken. A positive coefficient on this variable therefore implies that positive educational outcomes of today are in some way influenced by the positive educational outcomes of the past.

The variables used to separate the effects of intergenerational vs regional transfers of educational achievement are $(|B_{1890s} - B_{2010s}| + |W_{1890s} - W_{2010s}|) + (GDPPC_{2010s} - GDPPC_{1890s})$. These control for demographic change, especially in regards to the Great Migration, and per-capita economic growth over the period.

Simple Model.—I first consider the direct comparison of departmental exam pass rates for state s around 1890 to the reading scores for state s in 2009. In Figure 1, we see this comparison graphed as a scatter plot. This direct comparison shows fairly consistent trends.

FIGURE 1. STATES WITH > 500 OBSERVATIONS: COMPARISON OF MODERN SCORES AND PAST PASS RATES
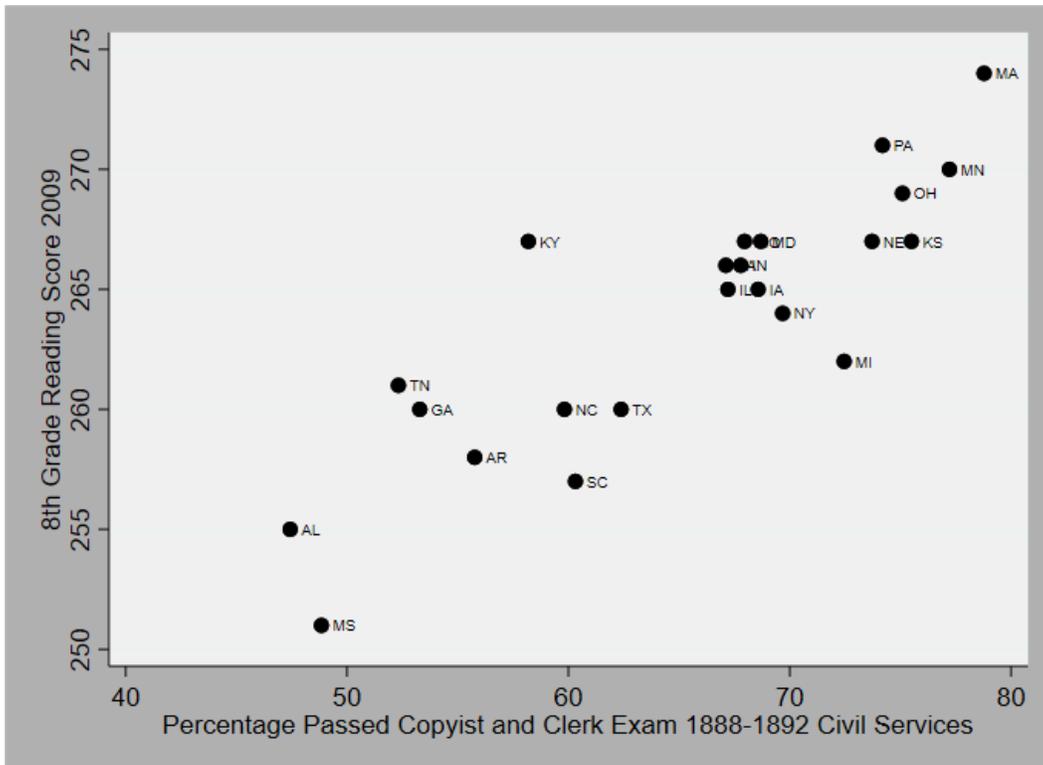
Using reading scores alone, we get a simple regression $Y_s = \alpha + \frac{D_{ps}}{D_{es}} + \varepsilon_s$ from which to estimate current reading scores simply on the basis of past scores. I make no claim of a causal relationship, only that a state beginning from a higher base is likely to maintain that higher base. The external effects of a state s having a relatively better education system is that others seeking better education would continue to migrate there, further enforcing the positive educational outcomes as states continue attracting the most motivated parents and students. As we saw before, due to the selection bias of test takers, years of schooling was relatively flat across states. It follows that states with better outcomes would produce higher levels of achievement for a similar number of years in school.

Model Completion.— A final iteration of our model takes into account the baseline gauges of educational quality and access while controlling for demographic and economic changes over the period. In Table 1 we show how the model performs depending on the number of exam observations we consider. Of note is the increasing explanatory power of the Departmental Exam as the number of observations increases.

III. Results

The results of our analysis lead to jointly statistically significant estimates of 2009 reading scores. The strongest influence across all models was the pass percentage of Departmental Exams around 1890. This implies that past achievement is a strong driver for future positive outcomes. Another thing to note is the mostly insignificant role of demographic shifts in regard to modern test scores. In the model limited to states with 500 exams and using only 3 regressors, the departmental exams, the demographic change, and a weighted version of the Total Exam Pass Percentage, even though the variable for demographic change becomes statistically significant, the relative effect on scores is still small.

TABLE 1—ESTIMATES OF 2009 READING SCORES

Restricted to states with total observations	>50 Exams	>100 Exams	>500 Exams	>500 Exams 3 Regressors
Departmental Exam Pass Percentage	0.39***	0.43***	0.47**	0.45***
	(0.08)	(0.08)	(0.19)	(0.06)
Total Exam Pass Percentage	-0.42**	-0.43	0.13	
	(0.16)	(0.17)	(0.29)	
Total Exam Pass Percentage (Weighted)				0.13**
				(0.06)
Male Literacy Pct. in 1890	0.5**	0.49**	-0.28	
	(0.22)	(0.23)	(0.31)	
Abs Value of Gender Literacy Gap 1890	-2.43***	-2.48***	-0.246	
	(0.81)	(0.82)	(1.2)	
Abs Value White/Black Pop. Change	-0.05	-0.03	-0.14**	-0.31***
	(0.05)	(0.05)	(0.05)	(0.09)
Per Capita Growth 1890-2010	0.09	0.1	-0.05	
	(0.05)	(0.06)	(0.09)	
Constant	221.9***	219.8***	256.8***	232.4***
	(18.95)	(20.09)	(23.26)	(3.75)
Number of States	45	40	23	23
Number of Exams Referenced	28512	28168	24032	24032
R-Squared	0.71	0.73	0.82	0.84

Notes: Standard Errors in Parenthesis

Source: Civil Service Commission Reports 1888-1892, 1890 US Census, and 2009 National Assessment of Educational Progress

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

For the model limited to states with 500 exams and using three regressors, a one-percent increase in the Departmental Exam pass rate around 1890 is associated with a 0.45 point increase in 2009 Reading Scores. The weighted Total Exam Pass Percentage variable was created by multiplying the Total Exam Pass Percentage by the percentage of total exams taken in state *s* that were departmental exams. This would thus decrease the weight associated with states that have higher proportions of Railway Mail exams. It thus adds more predictive power to the Departmental Exam.

A one-percent swing in the absolute value of the demographic shift of white residents added to the absolute value of the demographic shift of black residents is associated with a 0.3 point decrease in 2009 Reading Scores. Crucially, this control

variable for the effects of demographic shifts associated with the Great Migration is statistically significant. This supports evidence of intergenerational transfers of academic achievement, however, the overwhelming influence and significance for modern test scores is the variable for past institutional quality of education in a state, evidenced by the Civil Services Exam.

Looking at the model limited to states with more than 100 exam results, we note the increased significance of the absolute value of the gender literacy gap in 1890 and its association with modern test scores. This increased influence may compensate for the lack of testing observations and may imply something more about the selection bias of the exams. Because literacy is used as a proxy for the availability of educational resources in a state, this implies that the unequal distribution of educational resources in the past has an influence on the educational achievement of residents today. It is important to note that replacing the absolute value of gender literacy with a simple male literacy minus female literacy percentage was not nearly as effective. This implies that when educational resources are allocated in favor of a particular group, regardless of what that group is, future educational outcomes are negatively influenced.

These models imply that, for a state to increase future educational achievement, resources must be widespread, of high quality, and available to individuals of all demographic groups and backgrounds. They also imply that, while intergenerational transfers of academic achievement are valid, they can be offset by moving to a region with a record of high past academic performance.

Alternative Specifications: A number of alternative specifications were utilized to investigate the robustness of the results. I (i) controlled for the number of residents who were born and living in the same state, (ii) removed exam results altogether and created a model using census data alone, thereby increasing the number of states able to be included to 48, (iii) used the results from other exams administered

by the civil services commission at this time as well as the aggregate exam results summed up from all exams, (iv) used modern math scores or combined math and reading scores as the dependent variable.

When attempting to control for the number of residents who were born and living in the same state, I first pulled data from the Census on the direct numbers. From here I established a percentage of total residents living in state s who were also born in state s and attempted to control for this. This measure turned out to be highly insignificant. Another attempt was made to control for the proportion of residents marked as immigrants on the 1890 census. This also proved to be insignificant, so both of these measures were removed from the final model.

By creating a model using census data alone, we forgo the measure of educational quality for population statistics. The benefit of using census data alone is that we are able to increase the number of states studied to 48 and we do not have to rely on sample data with a low number of observations as provided by the Civil Services Commission's exam results. The results, however, were less significant, indicating the need for a measure of learning depth, which available from Census-only data.

As established before, the nature of the Departmental Exams, which includes the Copyist and Clerk exams from the Departmental service of the United States Civil Services, made them well suited to gauge the reading and writing abilities of the individuals taking them. At lower sample sizes, the Railway Mail exam seemed to provide a needed boost to the number of observations, however, they ceased to be as important as observations rose. This is evident in the weighted effect in the >500 observation model. Further inspection of the Railway Mail Exam, evidenced by referencing the Civil Services Commission reports, indicates an exam with scores weighted to non-relevant subject areas, as seen in Appendix A. Beyond the Railway Mail Exam, the issue with including more exam results was the general variety of exams administered by other services and a difference in the ability level needed to pass these exams.

By including math scores from 2009, either through the creation of a sum variable with the scores of both reading and math added together, or by regressing on math scores alone, the results were statistically significant, however, they were not as strong. This was to be expected, as the exam contents from 1890 were more relevant to reading scores. As evidenced before, the Copyist exam had four sections, three of which related to literacy measures such as reading or writing, and the Clerk exam had six sections, adding two additional literacy measures.

III. Conclusion

This paper shows the modern effects of successful past institutions. Using evidence of demographic change after the Great Migration, we can focus on the regional influence on educational achievement. Much of educational achievement in a geographic area can be linked to the institutional influences made evident by past educational performance and availability of education among that region's inhabitants. These results seem to be stronger than the intergenerational transfers.

Keeping in mind the tight link between education and later life outcomes, states have an incentive to produce higher levels of achievement among its residents, however, cultures and societies tend to persist, even in the face of large structural changes. For policy, this implies that attempts to improve educational achievement are subject to externalities associated with the historical success of the institutions within an individual's geographic area.

In regards to the stickiness of educational achievement, one area of study that seems open to further efforts is showing how educational achievement changes for individuals who move from historically lower achieving regions to historically higher achieving regions, and vice-versa. This study uses averages and works on an aggregate scale, thus, dialing down into individual circumstances may give

further insight on the effects of movement and how location influences intergenerational transfers of educational achievement.

I should caution that the findings reported above have not been recreated over varying time horizons, and thus the strength of the results still needs further exploration. It can be argued there is a degree of randomness that has led to the given outcomes, especially in regard to the proxy variables, however, there is strong evidence to support the hypothesis of a relationship between location and the educational outcomes of the past and present.

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Appendix:

A. These are the weights of the Departmental Copyist and Clerk exams, followed by the Railway Mail exam from the 1890 Civil Services Commission Report.

COPYIST EXAMINATION (Series No. 20).

Subjects.	Relative weights.
First: Orthography	2
Second: Penmanship	3
Third: Copying	3
Fourth: Arithmetic	2
Total of weights	10

CLERK EXAMINATION (Series No. 20).

Subjects.	Averages.	Relative weights.	Products of averages multiplied by weights.
First: Orthography	90	3	270
Second: Penmanship	85	3	255
Third: Copying	90	3	270
Fourth: Letter-writing	80	4	320
Fifth: Elements of the English language	80	2	160
Sixth: Arithmetic	95	5	475
Divide the sum of the products by the sum of relative weights		20	1,750
And the general average is ascertained to be			87.5

FOURTH BRANCH OF CLASSIFIED SERVICE—RAILWAY MAIL SERVICE (Series 1).

CLERK EXAMINATION.

Subjects.	Relative weights.
First: Orthography	1
Second: Penmanship	1
Third: Copying	2
Fourth: Letter-writing	1
Fifth: Arithmetic	2
Sixth: Geography of the United States	4
Seventh: Railway and other systems of transportation in the U.S.	5
Eighth: Reading addresses	4
Total of weights	20