

“Long-Term Perspectives on Geographic and Economic Mobility, 1800-1900”

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Abstract

Patterns of geographic mobility over the 19th century are examined and compared to contemporary rates. The results show that rates of interstate migration were high in the first half of the nineteenth century, fell through 1900, and rose to current levels after 1950. The economic correlates of migration to the frontier between 1850 and 1860 are then assessed. The study asks how many people actually moved to the west, how many of them were poor, unskilled workers, and how did the subsequent economic performance of migrants compare to that of non-migrants using more than 5,000 males linked across the 1850-70 federal censuses. It finds substantial migration to the frontier by urban residents, particularly unskilled workers, and substantial gains in wealth for these migrants. Those who moved to the frontier were generally of lower average quality than those who stayed behind, lending further support to the view of the frontier as a “safety valve.”

Introduction

The relocation of productive inputs can be a powerful force promoting economic growth. In the U.S., though much growth has occurred at the extensive margin as new territory was added and new resources discovered, an important aspect of U.S. economic

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growth has been the mobility of factors of production. A number of studies have documented the convergence of regional wage rates as labor has moved from low wage areas to high wage areas, and the convergence of regional interest rates as capital has sought out superior returns in areas of capital scarcity. Though there is a body of evidence suggesting that convergence in these markets had already occurred to a substantial degree by the Civil War, we know little about the dynamics of the adjustment process (Rosenbloom 1996; Bodenhorn and Rockoff 1992). For example, in the labor market, what were the returns necessary to induce migration to the expanding west? How selective was the process of labor migration? What were the most prominent migration pathways?

This essay examines labor mobility in the nineteenth century. It establishes the patterns of labor migration that prevailed over the century and then examines the relationship between economic and geographic mobility at the middle of the century, focusing on migration between two extremes: the expanding frontier and the settled urban and rural regions in the east. The questions addressed bear directly on the course of nineteenth century U.S. economic development, and harken back to an old debate in U.S. economic history — how important was the frontier? But they also provide a context for understanding more recent patterns of growth. An understanding of the returns to migration and the selectivity of migration in a historical setting will make it possible to assess whether patterns observed in the contemporary U.S. (e.g. Borjas, Bronars, and Trejo 1992) are peculiar to the circumstances of the late twentieth century or are more enduring and transcendent.

This study fills these gaps in our understanding of the process of American economic development by offering direct evidence on the extent, character, and consequences of migration to the west between 1850 and 1870. It examines a sample of 4,938 adult males who have been located in both the 1850 and 1860 federal census manuscript schedules (Ferrie 1996) and a new sample of adult males located in the census manuscripts from both the 1860 and 1870 federal censuses. These data make it possible to measure directly the rate of migration to the western frontier between 1850 and 1870, how that rate varied according to the characteristics of individuals and their communities, and how the subsequent experiences of migrants compared to the experiences of those they left behind. Section I sketches the patterns of geographic mobility from colonial times to the present. The following two sections describes some previous research on the link between geographic and economic mobility, particularly as it relates to migration to the frontier; Section IV briefly describes the data; Section V traces the pathways of migration to the frontier and assesses the role of urban laborers in migration to the frontier; Section VI presents an analysis of the migration decision using the 1850-60 data; Section VII offers some tentative results on the 1860-70 data; and Section VIII concludes.

I. Patterns of Geographic Mobility, 1780-1990

Our understanding of migration patterns in the contemporary period derives from data in the March Current Population Survey — which annually asks respondents to report their place of residence one year ago, and every decade asks them to report their place of

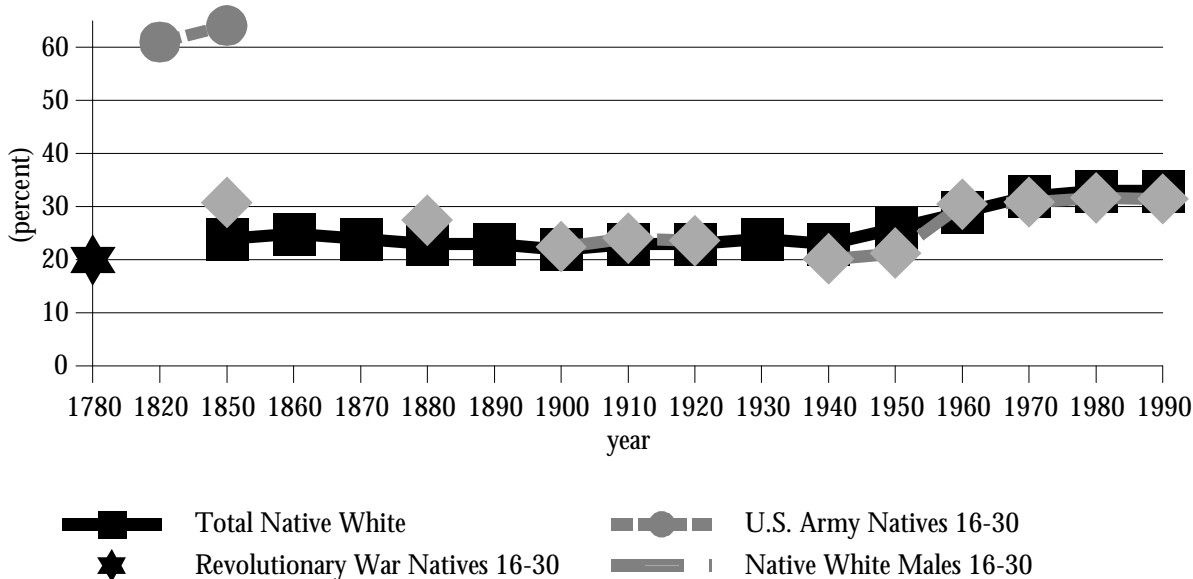


Figure 1: Percent Residing Outside Colony or State of Birth, 1780-1990.

residence five years ago — and the decennial population census — which has included a question on place of residence five years ago since 1940. These sources, or anything like them, are unavailable for the nineteenth century, so in order to assess long-term patterns of geographic mobility, we must look elsewhere. One alternative is the question on place of birth asked at every decennial census since 1850. For the native-born population, when compared to place of residence at the time of the census, this can reveal patterns of interstate migration from birth until enumeration in the census. Figure 1 shows the fraction of the population residing outside their state of birth for each year. The series seems remarkably stable: at each census from 1850 to 1950, about a quarter of the population reported a state of residence different from the state of birth. Since 1970, this has risen to a third.

The comparison between place of residence and place of birth is less than perfect, though, as an indicator of patterns of labor migration. It is sensitive to the age structure of

the population, and includes the migration of very young children as well as that of adults. It also gives little precise information on when migration occurred: we do not know whether most of the migration is recent or has occurred only over several decades. By selecting a subgroup from the population, though, we can do better. Using the Public Use Micro Samples for 1850, 1880, 1900-1920, and 1940-1990, we can construct a similar mobility measure for a group more relevant to the measurement of labor migration: white, native-born males between the ages of 16 and 30. The resulting series is shown in Figure 1. It reveals both a higher level of interstate migration at each date, and somewhat greater variability over time: the rate fell from 1850 through the end of the nineteenth century, remained stable until 1950, and rose to current levels (around 30 percent) after 1960.

Unfortunately, the data are unavailable before 1850. In order to see whether the rate of interstate migration was high by historical standards in 1850, we must turn to another source: military enlistment records. Muster rolls for the U.S. Army in the 1850s and the 1810s and for the Revolutionary War provide an alternative measure of interstate migration.¹ Each enlistee reported his colony or state of birth; when compared to the colony or state in which the enlistment occurred, this provides a measure of migration comparable to that found in the census. The sample of enlistees has been limited to native-born males age 16 to 30 at the time of enlistment. To enhance the comparability of the data across the three eras, the Revolutionary War data has been limited to enlistments in 1780 and 1781. The

¹ These data were collected by the Center for Population Economics at the University of Chicago. The Revolutionary War data have been used by Villaflor and Sokoloff (1982) to assess migration patterns in the colonial period.

characteristics of these enlistees, from years when colonies reported significant difficulties in meeting their enlistment quotas after the first years of the Revolution, should be similar to those from the 1810s and 1850s when the army was composed of professional soldiers who enlisted for a fixed term and presumably had few attractive labor market alternatives.²

The results are again shown in Figure 1. The migration rate for the colonial period is only about twenty percent; it rose to more than sixty percent in the 1810s, and increased slightly again to sixty-four percent in the 1850s. The difference between the 1780s and the 1810s and 1850s does not reflect a substantial change in the labor market alternatives of recruits as indicated by their occupation at enlistment: in fact, between the 1780s and 1810s, the fraction of artisans and farmers among enlistees actually rose (from 63 percent to 73 percent) as the fraction of seamen and unskilled laborers fell correspondingly.³

In 1850, it is possible to compare the rate to the rate derived from the population census: the rate of interstate migration over the first sixteen to thirty years of life was more than twice as great for army enlistees as it was for males age 16 to 30 in the general population. If the rates for the 1810s and 1780s are adjusted by an amount similar to that necessary to bring the 1850s enlistees in line with the population of males age 16 to 30 (on the assumption that the relative labor market opportunities and migration propensities of enlistees and males generally were similar in all three eras), a clear pattern of change emerges:

² For all three eras, the data have also been weighted by the population at the nearest census (1780, 1820, or 1850) to compensate for the fact that the sampling procedure did not extract observations from each colony or state in exact proportion to the colony's or state's population.

³ In the 1850s, 74 percent of enlistees were artisans and farmers.

an increase in the rate of interstate migration sometime between the end of the Revolutionary War and the end of the War of 1812, a drop-off in migration rates in the last half of the nineteenth century, and a rise in the last thirty years. Surprisingly, the big increase in migration rates in the nineteenth century does not correspond to the period of most rapid territorial expansion: the center of the nation's population moved its greatest distance in the 1850s, but high rates of interstate migration had apparently been achieved before mid-century. The increase in interstate migration corresponds instead to the penetration of the Trans-Appalachian frontier and the settlement of the Ohio River Valley.

II. Historiography of The "Frontier" Debate

For the 1850s and 1860s, we can provide a more complete picture of migration, by examining the migration of specific individuals observed in successive decennial censuses. Though it is possible to examine many dimensions of internal migration with these data, attention will be restricted here to migration to the frontier. The view of the western frontier as the source of America's distinctive economy and political system has been a source of persistent controversy since its statement by Frederick Jackson Turner more than a century ago. Despite the attention devoted by scholars to testing "the frontier thesis," particularly the view of the frontier as a "safety-valve" relieving pressure on urban labor markets in the east, few have offered evidence bearing on the central issues in the debate: how many people actually moved to the west, how many of them were poor, unskilled workers, and how did the subsequent economic performance of migrants compare to that of non-migrants? Instead,

less direct evidence was employed for the first forty years of the debate: estimates of the number of those living in the west who had been born in the east, estimates of the cost of purchasing a farm in the west, and estimates of how migration to the west affected labor in eastern cities (Shannon 1945; Danhof 1941).

By the 1950s and early 1960s, a new view had emerged in which these issues were deemed irrelevant: in a general equilibrium framework, expansion into the west and the movement of at least some of the eastern population into this region *must* have kept eastern urban wages higher than they would otherwise have been, unless both labor and product markets were completely segmented by sector and region (Murphy and Zellner 1958; von Nardoff 1962). This conclusion holds regardless of who moved to the west. Though this view has largely carried the day in the debate over whether the frontier mattered as a safety valve, it nonetheless leaves a number of questions unanswered regarding the *mechanism* through which labor markets adjusted to the growth of the west. We still do not know how important urban wage earners were in the western movement, nor how great a gain in fortune was needed to induce migration to the west, nor how long this process of adjustment operated.

III. More Recent Research

The only study to address the safety-valve thesis directly in the last century is Goodrich and Davison (1935, 1936), who combed western newspapers for the names of migrants from a handful of New England cities. They adopted their largely anecdotal approach after noting the then insurmountable difficulties inherent in using the federal census manuscripts for the purpose of determining who was moving to the frontier: “The Census and the records of the General Land Office throw little light upon the precise question at issue . . . at least short of the task of taking the names of individual wage-earners in a given census and then searching for them in the haystacks of succeeding enumerations.” This study uses just such a methodology. It follows specific individuals located in adjacent federal censuses, 1850-60 and 1860-70.

Recent papers by Steckel (1989) and Schaefer (1985, 1987) have started down the road suggested by Goodrich and Davison. These studies examined individuals located in both the 1850 and 1860 federal census manuscripts. To take advantage of the availability of census indexes for 1850, both samples were constructed, by drawing a sample of male-headed households from the 1860 census and then locating these households in the 1850 census. Since males who had established households by 1850 were easier to locate than those who had not, both samples contain more older, married males with children than were present in the general population of males who survived the 1850s. For example, Steckel reports (1989, p. 197) that 44.9% of those in his sample were ages 30 to 39 in 1850, while only 3.7% were under age 25. He concedes that “This structure of the sample captures little of the high rates

of mobility often observed among young adults” (1989, p. 197). The samples used here overcome this shortcoming by linking males *forward* from 1850 to 1860 and from 1860 to 1870, resulting in a population that better follows the age structure of the male population present in the U.S. between 1850 and 1860 and between 1860 and 1870.

IV. The Data

The data are (1) individual-level observations on 4,938 American males from a new sample linked from the Integrated Public Use Micro Sample (IPUMS) of the 1850 federal census of population (Ruggles *et al.* 1995) to the 1860 federal census manuscript schedules (Ferrie 1996); and (2) individual-level observations on 882 American males linked from the 1860 federal census manuscripts to the 1870 federal census manuscripts.¹ The sample contains each individual’s location (state, county, city, ward) and self-reported occupation and real estate wealth in both years in which the individual was found. Personal wealth is included in 1860 and 1870. For each location in the 1850-60 sample, the distance from the frontier and the population were obtained from the 1850 and 1860 published census volumes (U.S. Census Office 1853; U.S. Census Office 1863). The wealth measures in the 1850-60 sample have been adjusted for differences across regions and over time in prices, using the regional price index of Coelho and Shepherd (1974).

¹ The 1860-70 sample is part of a larger sample that will cover most states and territories and include roughly 7,000 observations when completed. The states included here are New York (Kings, Richmond, and Suffolk Counties), Iowa, California, Washington, Oregon, Nevada, and New Mexico.

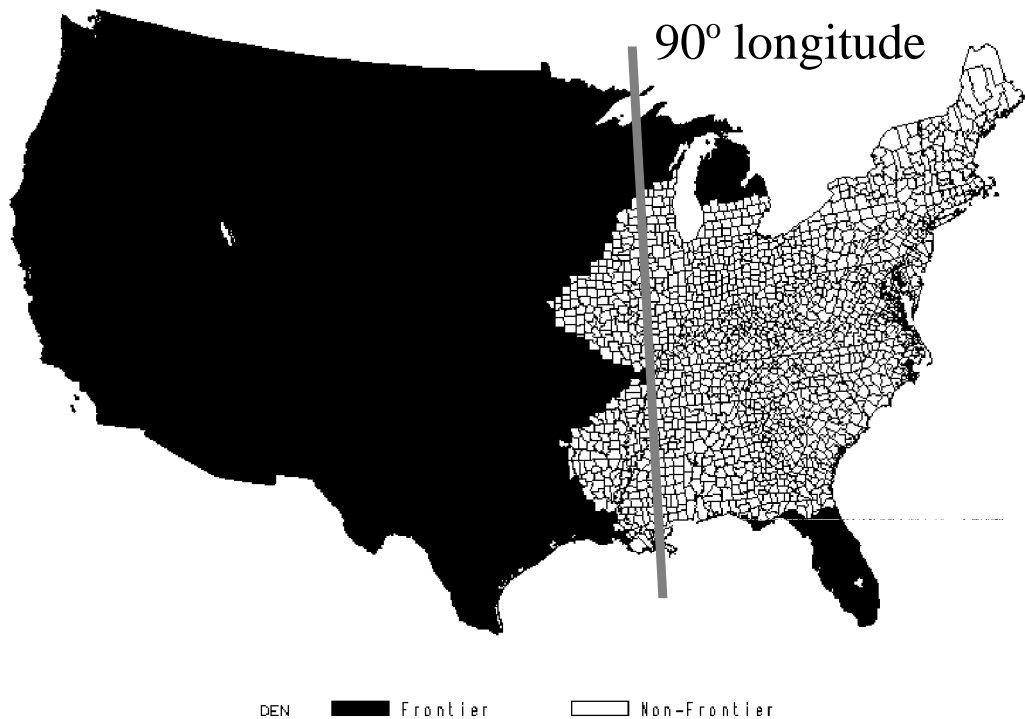


Figure 2 Frontier and Non-Frontier Counties in 1850. The frontier was found for each state by locating the line in X-Y space that provided the best separation between high (6 & over per square mile) and low (under 6) density counties.

Since the object of the analysis here is to assess the extent, character, and consequences of movement to the frontier, we must begin with a definition of “the frontier.” The publication of Turner’s original essay in 1893 was prompted by the announcement in the 1890 Census of Population that by the Census Office’s definition — an area of roughly contiguous counties or territories with population densities below six persons per square mile — the frontier had ceased to exist. Since this definition would classify only a very small number of individuals as frontier migrants between any two censuses, though, a more

expansive definition has generally been employed. For example, Steckel (1989) defined the frontier as Minnesota, Iowa, Kansas, Texas, and states farther west. The results presented below use 90° west longitude as the frontier's eastern boundary. Figure 2 shows this boundary. Frontier places include Minnesota, the Dakota Territory, Iowa, Kansas, Nebraska, Colorado, Idaho, Arkansas, Louisiana, Texas, Arizona, New Mexico, Nevada, California, Oregon, and Washington, western Wisconsin, western Illinois, and the western two thirds of Missouri. The results were similar when Steckel's definition was used and when the frontier was defined as those counties west of the line for each state producing the cleanest separation between high (six persons or more per square mile) and low (fewer than six persons per square mile) density counties.

The principal advantage of the 1850-60 sample is its representativeness, particularly with respect to age, an important correlate of migration. For example, though only 3.7 percent of the males in rural households in Steckel's (1989) sample were under the age of 25, 46.3 percent of males in the present sample were under age 25 in 1850. In the free U.S. male population age 10 to 65 in 1850, 47.2 percent were under age 25 (Ruggles *et al.* 1995). While 44.9 percent of males in Steckel's rural sample were between 30 and 39, only 18.4 percent of those examined here and 18.3 percent of those in the free male population age 10 to 65 were between ages 30 and 39.

V. The Characteristics of Frontier Migrants

A number of characteristics have been suggested as determinants of migration to the frontier. The most important from the perspective of Turner's view of the frontier as a "safety valve" for disaffected workers, at least in the most direct version of this view, are the pre-migration occupation and location of those later found in frontier places. If the frontier was a direct outlet for urban workers, people from urban places should have been prominent in the movement west. An over-representation of laborers in frontier migration would suggest the importance of the frontier for the group most likely to suffer from depressed labor market conditions in eastern cities.

Early critics of the "safety valve" suggested why laborers should have been under-represented among frontier migrants: they were too poor to save the cost of migration (Kane 1936), they were unable to take advantage of cheap western land because they did not know how to farm (Kane 1936), and that cheap western land was not really so cheap once farm-making costs were calculated (Danhof 1941). Neither Goodrich and Davison (1935, 1936) nor Steckel (1989) found evidence of substantial frontier migration by laborers or others originating in urban places. For example, Goodrich and Davison concluded that urban laborers were too small a component of westward migration to be detected. Steckel reports (p. 212) that only 9.5 percent of migrants to the frontier resided outside rural places in 1850, while 21.5 percent of the free population outside the west lived in places of 2,500 or more in 1850.²

² In Steckel's (1989) study and in the analysis below, urban places are any census subdivisions (cities, towns, townships) listed separately by the census.

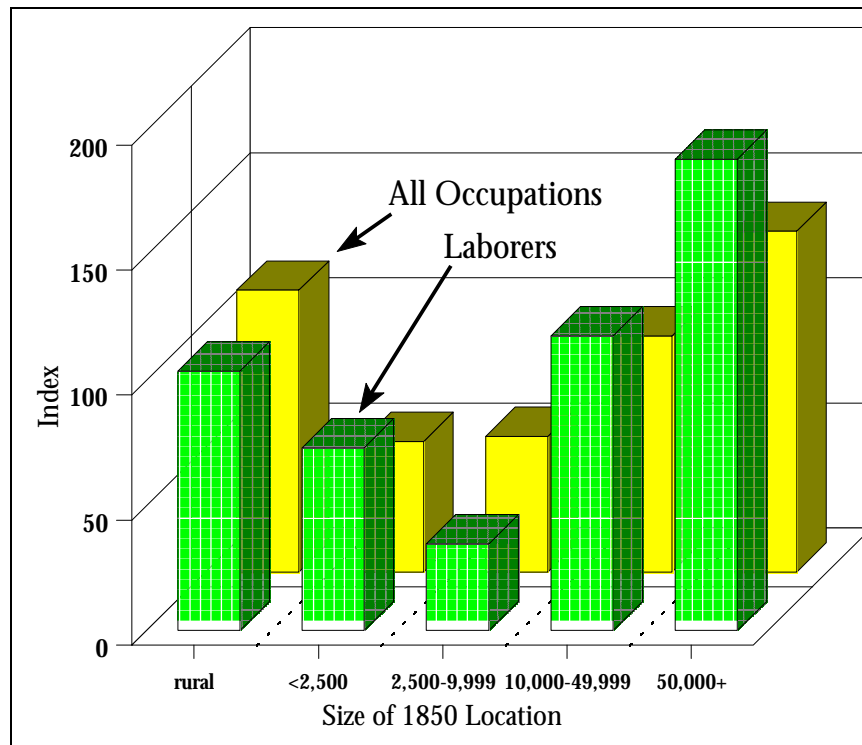


Figure 3 Index of Representation in Frontier Migration: The share of each group in frontier migration divided by the share in the sample, multiplied by 100.

Though this might seem ample evidence with which to dismiss the value of the frontier as a safety valve, it becomes less so upon closer inspection. Though the cost of migration was substantial, many common laborers were able to save substantial amounts out of their wages, amounts which accumulated in savings accounts or in home equity (Alter *et al.* 1994; Thernstrom 1964). Even critics of the safety valve thesis concede that many of those in U.S. cities were a generation or less removed from careers in agriculture (Shannon 1945). The presence of large numbers of farm tenants on the frontier as early as the 1850s and 1860s suggests that outright purchase of farm land was not the only route to a career in

frontier agriculture.³ Finally neither the evidence offered by Goodrich and Davison (1935, 1936) nor that offered by Steckel (1989) is conclusive: the former relies on laborers achieving mention in local newspapers and the latter excludes the youngest, least established males.

In the 1850-60 sample, 24 percent of migrants to the frontier resided in urban places in 1850, while 33 percent of all males in the sample were in such places in 1850. Those who originated in urban places were thus under-represented in migration to the frontier. Males who were laborers in urban places in 1850 were also under-represented, though slightly less so than all workers in urban places: 27 percent of laborers who were frontier migrants were in urban places in 1850, but 29 percent of laborers in the sample began the 1850s in such places. A closer look, however, reveals that some urban workers, particularly urban laborers from the largest places, were indeed over-represented in frontier migration. Figure 3 presents a measure of the prominence of different types of workers in frontier migration. The figure shows the Index of Representation for each size of location, for all workers and for laborers only. When the index is 100, the group is represented in frontier migration exactly according to its share in the population; entries above 100 indicate over-representation and entries below 100 indicate under-representation. Though some of the cell sizes are small, these findings suggest that some migration from eastern cities to the frontier, particularly migration by unskilled workers, has been missed in previous studies; as a result, the evidence in favor of the safety-valve thesis may be more substantial than previously thought.⁴

³ Bogue (1963, pp. 64-65) reports that tenancy rates ranged from 15 to 24 percent in four counties in Iowa and Illinois.

⁴ For all occupations, the cell sizes for frontier migrants are 272 (rural), 23 (under 2,500), 18 (2,500-9,999), 19 (10,000-49,999), and 26 (50,000 and over). For laborers, the corresponding cell sizes are 108, 11, 4, 11, and 13.

TABLE 1
Rates of Frontier Migration 1850-60 and 1850 Location of Males
on the Frontier in 1860

State	Rate of Migration to Frontier	1850 Location of Males on Frontier in 1860
Alabama	12.2%	1.7%
Connecticut	4.2	1.4
Florida	7.7	0.3
Georgia	6.1	1.7
Illinois	16.4	5.6
Indiana	15.4	10.6
Kentucky	14.6	6.4
Louisiana	23.1	0.8
Massachusetts	4.2	5.0
Maryland	1.8	0.6
Maine	4.2	2.2
Michigan	8.3	2.8
Mississippi	22.2	1.1
North Carolina	1.0	0.3
New Hampshire	2.0	0.6
New Jersey	2.7	1.4
New York	6.2	17.3
Ohio	18.8	17.6
Pennsylvania	6.3	11.2
Rhode Island	5.4	0.6
South Carolina	2.0	0.3
Tennessee	17.0	4.2
Virginia	2.6	1.7
Vermont	2.5	0.8
Wisconsin	15.9	3.9

Note: For 1850-60, "Frontier" is places west of 90° longitude.

The data on 1850-60 migrants also makes it possible to say more precisely what specific pathways were followed in reaching the frontier. Table 1 shows (1) the rate of migration to the frontier from 1850 to 1860 in the sample; and (2) 1850 location of individuals who were found on the frontier in 1860. The first figures suggest that frontier migration was most common among those already closest to the frontier: the highest rates

were seen in states such as Illinois, Indiana, Ohio, and Wisconsin in the north, and Mississippi, Louisiana, and Tennessee in the south, while the lowest rates were in the southeast and New England. The second figures suggest that the average frontier resident in 1860 was likely to have come from one of just four states: Indiana, New York, Ohio, and Pennsylvania together accounted for nearly fifty-seven percent of those found on the frontier in 1860.

VI. Modeling the Migration Decision

The linked data provide a convenient measure of how individuals' fortunes changed as they changed locations: wealth.⁵ The analysis has been structured to exploit the fact that individuals in the sample are observed at two points in time, so we can observe both the changes in location and the changes in wealth experienced by individuals over the 1850s. Suppose first that both the probability the individual would move to the frontier and the change in the log of wealth between 1850 and 1860 (Δy) for an individual who was not located on the frontier in 1850 can be written as a function of observed and unobserved individual and location characteristics in 1850. The change in log(wealth) will also be a function of whether the individual migrated to the frontier between 1850 and 1860:

⁵ There are presently too few migrants to the frontier in the 1860-70 sample to perform the following analysis, so the results in this section will be limited to the 1850-60 sample. Since personal wealth was not recorded in 1850, only the change in real estate wealth will be examined here.

$$\begin{aligned}
\text{Prob}(\text{Migrate}) &= \lambda' C_i + \mu_i \\
\Delta y_i &= \beta' X_i + \gamma M_i + \epsilon_i
\end{aligned}
\tag{1}$$

where C includes 1850 individual and location characteristics associated with the net benefits of migration, X is a vector of 1850 individual and location characteristics associated with the change in wealth from 1850 to 1860, M is a dummy variable that is one if the individual moved to the frontier during the 1850s and zero otherwise, λ and β are vectors of parameters to be estimated, and μ and ϵ are error terms orthogonal to C and X with $E(\mu_i)=0$, $E(\epsilon_i)=0$ and finite variance.

The vector C includes age, literacy, the log of real wealth, family size, occupation, the size of the 1850 location, an interaction between whether the 1850 location had 10,000 or more inhabitants and whether the individual was a laborer, distance to the frontier, and whether a previous interstate move was made by the individual. Mobility should decrease with age as individuals make more location-specific investments and as the time horizon over which they can reap the net benefits of migration becomes shorter. Literacy may make it easier to obtain information about opportunities at other locations. A large investment in real estate at the 1850 location may reduce mobility if it captures the impact of location-specific investments. Family size should raise the cost of moving (both the direct cost of transportation and the set-up cost at the new location). Some occupations (farming) may signal a greater attachment to a location, while others (laborer) may signal less attachment. The size of the 1850 location and an interaction between location size and whether the individual was

a laborer were included to see whether the over-representation of urban laborers seen in the previous section remains after controlling for other influences on migration. Whether a previous interstate move was made before 1850 (determined by comparing the reported state of birth and the 1850 state of residence) should capture the impact of any unobserved characteristics associated with a high propensity to migrate. The propensity to migrate will also be influenced by proximity to alternative locations, so C includes a measure of the distance from the 1850 location to the frontier.⁶

The vector X includes age, nativity, literacy, occupation, the size of the origin location, an interaction between whether the 1850 location had 10,000 or more inhabitants and whether the individual was a laborer, and the fraction of the household's members who were male. Age, nativity, literacy, occupation, and size of location have been shown in a number of other studies to be correlated with wealth accumulation. The interaction was included to see whether urban laborers reaped any unusual benefits from migration to the frontier. The fraction male in the household was included for two reasons: (1) holding constant family size, the family's gender composition may influence its productivity due to differences in physical strength and the assignment of family members to traditional, gender-specific tasks; and (2) holding constant family size, this variable should be uncorrelated with the net benefits of migration, so it can be excluded from the vector C , an exclusion which will prove useful below.

⁶ Distance to the frontier was defined as the difference between the longitude of the 1850 location (measured in radians) and 1.57 (90° longitude).

The first two columns of Table 2 show the results when these two equations are estimated separately by OLS.⁷ The baseline group for the migration equation is illiterate craft and white collar workers in rural places in the state where they were born; for the wealth change equation, it is native-born, illiterate craft and white collar workers in rural places who did not move to the frontier. The migration equation in Column (1) shows that the probability of moving to the frontier decreases with age between ages 10 and 65, though at a decreasing rate close to age 65. Laborers were 2.9 percentage points less likely than others to move to the frontier. But laborers from places of 10,000 or more inhabitants were actually 2.7 percentage points more likely to move to the frontier than the baseline group. Those closest to the frontier were more likely to move there, as were those who had made a previous interstate move. The wealth change regression in Column (2) shows that additions to wealth increased with age through age 33.5 then decreased, immigrants added less to their wealth, households with relatively more males saw their wealth grow more rapidly, and migrants to the frontier reaped a gain in wealth of 45 percent.

The results suggest both important differences between those who moved to the frontier and those who did not and important differences in the gains in wealth among those who went west and those who did not. This is unsatisfactory, however, since these two relationships are likely to be interdependent: the decision to migrate will depend in part on the expected economic gain from relocating (assumed here to be the gain in wealth net of

⁷ Estimation of the migration equation using a logistic regression produced a slightly better fit, but no change in the qualitative results that follow. The OLS results are presented to facilitate comparisons with the regression for the change in wealth.

TABLE 2
Determinants of Frontier Migration and Wealth Accumulation, 1850-60

	$\Delta \log(\text{Real Wealth})$				
	Migration (1)	$\Delta \log(\text{Real Wealth})$ (2)	Movers (3)	Stayers (4)	Migration (5)
Intercept	0.169*** (0.025)	0.409 (0.342)	-8.543*** (1.621)	1.083*** (0.413)	0.099 (0.124)
Age-30	-0.002*** (0.001)	0.019*** (0.007)	0.048 (0.035)	-0.003 (0.008)	-0.003*** (0.001)
(Age-30) ² x 10 ⁻³	0.0290 (0.019)	-2.711*** (0.258)	-5.774*** (1.662)	-2.213*** (0.318)	-0.096* (0.054)
Foreign-Born		-0.412*** (0.166)	0.104 (0.609)	-0.006 (0.182)	-0.030
Literate	-0.009 (0.020)	-0.012 (0.275)	0.610 (1.200)	-0.179 (0.335)	-0.030 (0.021)
log(Real Wealth)	-0.001 (0.002)				-0.000 (0.002)
Family Size	-0.003 (0.002)				-0.001 (0.003)
Farmer	-0.002 (0.011)	-0.065 (0.143)	0.470 (0.569)	-0.080 (0.160)	-0.020 (0.013)
Laborer	-0.029*** (0.012)	-0.115 (0.159)	-0.328 (0.608)	-0.427** (0.182)	-0.034*** (0.011)
Urban	0.003 (0.011)	-0.130 (0.126)	-1.657*** (0.615)	-0.392*** (0.147)	0.021 (0.021)
Laborer x City>10,000	0.056*** (0.022)	-0.081 (0.294)	2.510** (1.139)	0.212 (0.339)	-0.004 (0.038)
Pct. Males in Family		2.602*** (0.272)	4.248*** (1.147)	2.725*** (0.306)	
1.57-Longitude	-0.384*** (0.051)				-0.302*** (0.043)
Previous Migrant	0.025*** (0.009)				0.024*** (0.008)
Moved to Frontier		0.451** (0.197)			
$\Delta \hat{y}^m - \Delta \hat{y}^s$					0.199* (0.120)
ρ			-0.980*** (0.004)	0.850*** (0.058)	
σ			3.986*** (0.050)	5.343*** (0.379)	
Adjusted R ²	0.036	0.057			
-2Log-Likelihood				27,136.780	2,344.682
Observations	4,670	4,670		4,670	4,670

Notes: Significant at * 90% ** 95% *** 99%. Standard errors are in parentheses. The standard errors in Columns (3) and (4) are corrected for Heteroskedasticity (White 1980). Columns (1) and (2) are estimated by OLS; Columns (3) and (4) are estimated by Full Information Maximum Likelihood; Column (5) is a logistic regression estimated by Maximum Likelihood. The results in Column (5) are partial derivatives evaluated at the sample means.

migration costs), and the gain in wealth will reflect this wealth-maximizing decision rather than some exogenously-applied “treatment” like the random assignment of individuals to frontier and non-frontier locations over the 1850s. In order to make explicit the connection between the economic benefits that migrants to the frontier may have anticipated and their decision whether or not to migrate, we now adopt instead a simple “mover/ stayer” framework.⁸ Assume that the individual chooses whether or not to migrate in order to maximize the change in the log of real estate wealth Δy . This eliminates any individual specific effect correlated with the *level* of wealth in 1850 or 1860 for both movers and stayers. For movers (m) from non-frontier places (n) to the frontier (f), the change in the log of wealth is

$$\begin{aligned}\Delta y_i^m &= y_{ift'} - y_{int} \\ &= \beta'_m X_{it} + v_i^m\end{aligned}\tag{2}$$

where v_i^m is an error term with $E(v_i^m)=0$, $Var(v_i^m)=\sigma_m$. For stayers (s) in non-frontier places (n), the change in the log of wealth is

$$\begin{aligned}\Delta y_i^s &= y_{int'} - y_{int} \\ &= \beta'_s X_{it} + v_i^s\end{aligned}\tag{3}$$

where v_i^s is an error term with $E(v_i^s)=0$, $Var(v_i^s)=\sigma_s$.

⁸ This framework has been used by Lee (1978) to study union/non-union wage differentials, by Willis and Rosen (1979) to examine the returns to schooling, and by Nakosteen and Zimmer (1980) and Robinson and Tomes (1982) to analyze migration and income.

The individual migrates if an index of the net benefit of migration, M_i^* , is positive:

$$\begin{aligned}
 M_i^* &= \delta_1 C_i + \delta_2 (\Delta y_i^m - \Delta y_i^s) - v_i \\
 M_i^* &= \delta Z_i - v_i \\
 M_i &= 1 \quad \text{iff } M_i^* > 0 \Rightarrow \delta Z_i > v_i \\
 M_i &= 0 \quad \text{otherwise}
 \end{aligned} \tag{4}$$

where C is as defined above, I_i is a dummy variable indicating whether the individual migrated to the frontier over the 1850s, Z includes all the regressors in C and X , and v_i is an error term with $E(v_i)=0$, $Var(v_i)=\sigma_v$.

This is a ‘‘Type 5 Tobit model.’’ Estimation by ‘‘Full Information Maximum Likelihood’’ (FIML) proceeds in five steps (Maddala 1983, pp. 234-240; Amemiya 1985, pp. 395-400). First, assume that v_i^m , v_i^s , v_i follow a trivariate normal distribution. Equations (2) and (3) can now be re-written as

$$\begin{aligned}
 \Delta y_i^m &= \beta'_m X_i + v_i^m \quad \text{iff } \delta Z_i > v_i \\
 &= \beta'_m X_i + \rho_m \sigma_m \left[\frac{\phi(\delta Z_i)}{\Phi(\delta Z_i)} \right] + \mu_i^m
 \end{aligned} \tag{5}$$

$$\begin{aligned}
 \Delta y_i^s &= \beta'_s X_i + v_i^s \quad \text{iff } \delta Z_i \leq v_i \\
 &= \beta'_s X_i + \rho_s \sigma_s \left[\frac{-\phi(\delta Z_i)}{1 - \Phi(\delta Z_i)} \right] + \mu_i^s
 \end{aligned} \tag{6}$$

where $\rho_m = \text{Corr}(v_i, v_i^m)$, $\rho_s = \text{Corr}(v_i, v_i^s)$, $E(\mu_i^m) = E(\mu_i^s) = 0$, $\text{Var}(v_i)$ has been normalized to 1, ϕ is the standard normal density function, Φ is the cumulative normal distribution function, and the error terms μ_i^m, μ_i^s are heteroskedastic (since they depend on δZ_i). Second, estimate Equation (4) by Probit ML to obtain the parameters $\hat{\delta}$. Use this vector, together with Z_i to calculate the inverse Mills ratio:

$$\frac{\phi(\hat{\delta}Z_i)}{\Phi(\hat{\delta}Z_i)} \quad (7)$$

Third, estimate Equations (5) and (6) by weighted least squares (to account for the heteroskedasticity), including the inverse Mills ratio as a regressor, as in the Heckman two-step estimator for selection, to obtain $\hat{\beta}_m, \hat{\beta}_s, \hat{\rho}_m \hat{\sigma}_m, \hat{\rho}_s \hat{\sigma}_s$. Fourth, use these parameters as starting values in the joint ML estimation of Equations (4), (5), and (6), providing more efficient estimates (Amemiya 1985, p. 400) than the separate estimates used by Lee (1978). Finally, estimate $\Delta \hat{y}_i^m$ and $\Delta \hat{y}_i^s$ for each observation using $\hat{\beta}_m' X_i, \hat{\beta}_s' X_i$, insert these into Equation (4), and re-estimate Equation (4) by Probit ML to obtain the structural parameters $\hat{\delta}_1, \hat{\delta}_2$, and correct the standard errors for the fact that some of the regressors are estimated values (Maddala 1983, pp. 252-256).

This strategy suffers from a few difficulties when applied empirically. The first is the identification of the parameters in the migration decision equation, Equation (4). In order to identify δ , there must be at least one variable contained in X that does not appear in C . Since X includes the fraction of the household's members who are males but C does not, this

condition is satisfied. In order to identify δ_{2j} , there must be at least one variable contained in C that does not appear in X . Since C includes an indicator for previous interstate migration and measures of family size, and distance to the frontier, but these are excluded from X , the latter condition is also satisfied.

Another problem, as Robinson and Tomes (1982, pp. 477-478) note, is that the “mover/ stayer” framework imposes some strong restrictions when used to analyze migration. The most important is the need to limit the number of origins and destinations, even though the logic of the model suggests at least the possibility of a different wealth change equation for each origin and each alternative location. The only origin examined here will be “non-frontier places.” The two possible destinations are “frontier places” and “non-frontier places.” This treats those who remain in the same county between 1850 and 1860 the same as those who migrate within the non-frontier states. It also treats rural-to-urban and urban-to-rural movers within the non-frontier states the same as persisters. Though this is somewhat unrealistic, it simplifies the analysis considerably and reflects a belief that the differences among these groups are far less important than differences between any of them and migrants to the frontier.⁹ This framework also imposes some restrictive assumptions on the error structure of Equations (7) and (8).¹⁰

The results are shown in the last three columns of Table 2. Columns (3) and (4) show the parameters of the wealth change regressions for migrants to the frontier and those who

⁹ A later version will employ a multinomial probit migration decision equation in place of Equation (4), allowing for a larger number of types of moves.

¹⁰ See Robinson and Tomes (1982, pp. 479-480) for a discussion of these issues.

did not move to the frontier, corrected for the endogeneity of the location decision. Among frontier migrants, wealth gains continued through age 34, after which wealth growth was negative. Those who originated in urban places saw slower wealth growth, but laborers from places of 10,000 or more saw more rapid wealth growth than the baseline group. Households with more males also saw more rapid wealth accumulation. Among those who did not move to the frontier, the effect of age was negligible and laborers again saw smaller gains, but laborers from larger towns and cities did not surpass the baseline group in wealth accumulation. Families with more males accumulated wealth faster, but the value of males was only 64 percent as great as it was among frontier migrants, suggesting differences between frontier and non-frontier places in the value of male labor compared to the value of female labor.

The coefficients on ρ and σ in Column (3) reveal that frontier migrants were negatively selected: their wealth accumulation on the frontier was less rapid than the wealth accumulation of those who did not move to the frontier would have been had they moved to the frontier. The coefficients on ρ and σ in Column (4) show that those who did not go to the frontier were positively selected: their wealth growth was more rapid in non-frontier places than the wealth growth of frontier migrants would have been in non-frontier places if they had not moved to the frontier. Frontier migrants, then, would have experienced below average rates of wealth accumulation compared to non-migrants either on the frontier if both groups had moved to the frontier or off the frontier if both groups had not moved to the frontier. These selection effects are statistically significant.

Using the coefficients from Columns (3) and (4), it is possible to estimate the coefficient vector δ in Equation (4) to determine the impact of potential differences in wealth growth and other factors as determinants of migration patterns. The results of this exercise are shown in Column (5).¹¹ The probability of migration to the frontier fell with age through age 46, then rose, was about three percentage points lower for those who could read and write than it was for the illiterate, was lower for laborers by 3.4 percentage points, and was no greater for laborers from places of 10,000 or more than for the baseline group. Proximity to the frontier and a previous interstate move were also associated with a greater probability of moving to the frontier. Finally, the expected gain in wealth resulting from migration had a positive and statistically significant impact on the probability of migration: an anticipated differential between wealth growth on and off the frontier of 50 percentage points raised the probability of migration to the frontier by 1.2 percentage points, compared to an actual frontier migration rate of 7.7 percent.

VII. Some Results for the 1860s

Though the 1860-70 sample is still too small to permit a detailed examination of the migration decision like that in the previous section, there are enough observations to assess

¹¹ The standard errors in Column (5) of Table 2 have not been corrected for the fact that one of the regressors (the estimated $\Delta y^m - \Delta y^f$) is an estimated value (Maddala 1983, pp. 252-256). In general, this correction has a substantial impact only on the standard error for $\Delta y^m - \Delta y^f$ (Maddala 1983, p. 238).

TABLE 3
Wealth Levels and Changes in Wealth By Location, 1850-60 and 1860-70

	Non-Frontier in Both Years	Moved to Frontier	Frontier in Both Years
1850-60			
Real Wealth 1850	\$709.31	\$30.00	\$265.77
Real Wealth 1860	2,770.15	680.00	507.69
ΔReal Wealth	2,060.84	650.00	241.92
Pers. Wealth 1860	1,875.89	579.00	271.15
Obs.	196	20	26
1860-70			
Real Wealth 1860	2,431.94	3,447.56	1,750.72
Real Wealth 1870	4,339.93	2,851.56	4,279.51
ΔReal Wealth	1,907.99	-596.00	2,528.79
Pers. Wealth 1860	835.07	2,313.81	591.92
Pers. Wealth 1870	3,009.63	726.25	1,613.54
ΔPers. Wealth	2,174.56	-2,183.56	1,021.62
Obs.	283	16	583

Note: For 1850-60, “Non-Frontier” is places east of 90° longitude with an 1850 population of 10,000 or more, and “Frontier” is Iowa, Nevada, New Mexico, California, Washington, and Oregon. For 1860-70, “Non-Frontier” is three counties near New York City: Kings, Suffolk, and Richmond, and “Frontier” is Iowa, Nevada, New Mexico, California, Washington, and Oregon. None of the wealth figures shown here have been adjusted for differences in prices across time or locations.

whether two key outcomes of the migration process — the rate of movement to the frontier and the differences in wealth accumulation among persisters on the frontier, migrants to the frontier, and persisters in non-frontier places — were similar in the 1860s to what they were in the 1850s. There are good reasons to expect differences across these decades: the most important may be the disruption to migration patterns caused by the Civil War, but even in the war’s absence, rates of migration and outcomes for migrants relative to others may have changed as the frontier moved through increasingly arid prairie between the 96th and 100th meridians (Allen 1957). For the 1860s, the frontier is defined as Iowa, Nevada, New Mexico, California, Washington, and Oregon, while the non-frontier area is three counties near New

York City: Kings, Suffolk, and Richmond. For comparison with the 1850s, the frontier was defined identically; the non-frontier area is places with 1860 populations of 10,000 or more east of 90° longitude.

The first difference between the 1850s and 1860s is an apparent drop in the rate of migration to the frontier: between 1850 and 1860, 9.3 percent of males who either remained in non-frontier places of 10,000 or more or migrated to the frontier (N=216) were located on the frontier in 1860; the figures for the 1860s (N=299) is only 5.4 percent. This drop in the rate of frontier migration comes despite a reversal in the relative fortunes of those on and off the frontier, shown in Table 3. Over the 1850s, those who remained off the frontier in urban places saw their real estate wealth nearly triple from \$709 to \$2,060 (N=196), while those who were on the frontier in both years saw a doubling of their real estate wealth from \$266 to \$507 (N=26). Over the 1860s, real wealth among those off the frontier in both years grew from \$2,431 to \$4,339 (N=283), while the real wealth of those on the frontier in both years grew from \$1,750 to \$4,279 (N=583). Migrants to the frontier were apparently unable to reap these benefits of rising wealth on the frontier: real wealth grew \$650 for frontier migrants in the 1850s (N=20), but actually fell \$596 for frontier migrants in the 1860s (N=16). These findings suggest that the frontier may have been an important route to economic success, even for urban residents, during the 1850s, but that the frontier's appeal dimmed somewhat in the 1860s.

VIII. Conclusions and Implications

The role of the frontier as an escape for urban workers, particularly the unskilled, has been downplayed in much of the debate following the work of Frederick Jackson Turner. Though the results offered here are too weak a lever to overturn a century of scholarship in this respect, they suggest the need for a thorough re-evaluation of the criticisms of the safety-valve thesis. At least for the 1850s, unskilled urban workers were indeed a significant part of the movement to the western frontier. In real estate wealth terms, they seem to have made more of the opportunities offered by the frontier than other workers. Though frontier migrants would have earned below average returns had they remained in the east and earned less on the frontier than those who remained away from the frontier would have earned on the frontier, this suggests that migration to the frontier conferred benefits on those at the bottom of the ability distribution and provided an important alternative means to economic success for these workers.

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