

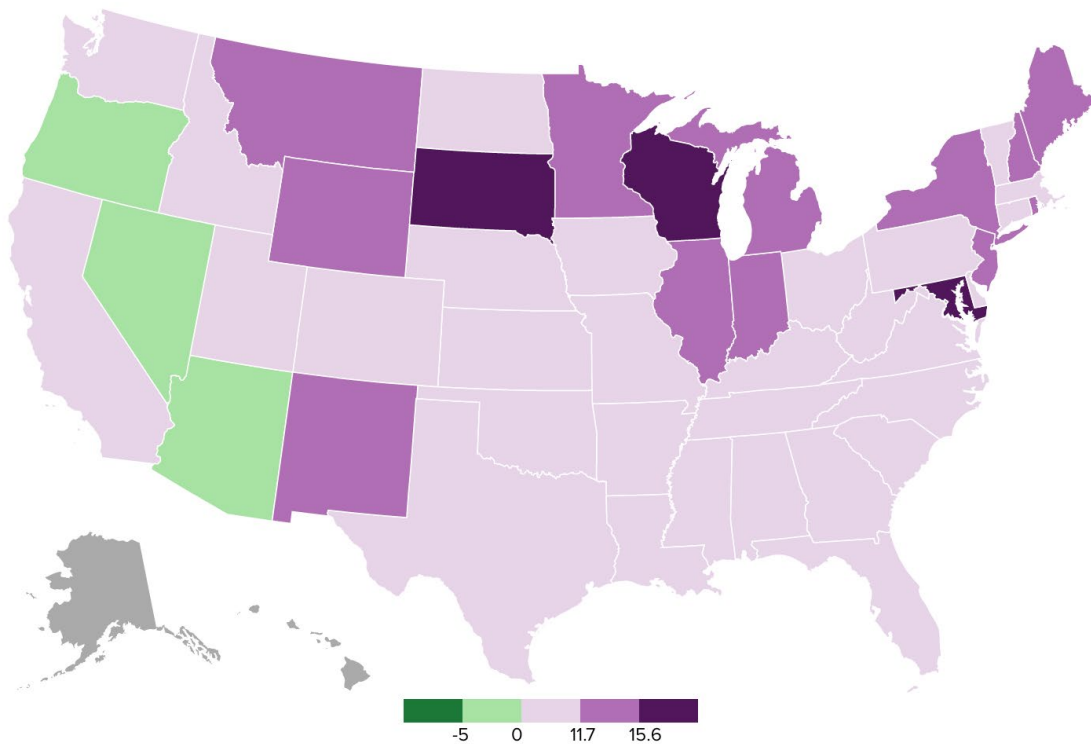
Losing Our Minds:

Brain Drain across the United States

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Over the past 50 years, the United States has experienced major shifts in geographic mobility patterns among its highly-educated citizens. Some states today are keeping and receiving a greater share of these adults than they used to, while many others are both hemorrhaging their homegrown talent and failing to attract out-of-staters who are highly educated. This phenomenon has far-reaching implications for our collective social and political life, extending beyond the economic problems for states that lose highly-educated adults.

This report describes what this so-called “brain drain” looks like across the 50 U.S. states. We use data from the 1940 through 2000 decennial censuses and the 2010 and 2017 American Community Surveys to measure brain drain in each state.

We define a highly-educated “leaver” as someone in the top third of the national education distribution who resides in a state other than her birth state between the ages of 31 and 40. We then analyze brain drain using two measures: “gross” brain drain and “net” brain drain. Gross brain drain is defined as the share of leavers who are highly educated minus the share of adults who remain in their birth state (“stayers”) who are highly educated. Net brain drain is the share of leavers who are highly educated minus the share of entrants to a state who are highly educated.

We find that brain drain (and brain gain) states tend to fall along regional lines, although there are a number of exceptions to this general rule. Overall, dynamic

states along the Boston-Washington corridor (Massachusetts, New York, New Jersey, and Maryland), on the West Coast (California, Oregon, Washington), and in other parts of the country (Illinois, Texas, Colorado, Arizona, and Hawaii) are the best at retaining and attracting highly-educated adults. Meanwhile, states in northern New England (New Hampshire and Vermont), the Rust Belt (Pennsylvania, Ohio, Indiana, Michigan, Wisconsin, and Missouri), the Plains (North and South Dakota and Iowa), and the Southeast (West Virginia, Kentucky, Tennessee, South Carolina, Alabama, Mississippi, and Louisiana), as well as Delaware, fare the worst on both counts.

We also find that most of the top-performing, brain gain states experienced improvements in terms of gross drain, net drain, or both from 1970 to 2017. On the other hand, many brain drain states, especially in the Southeast, have seen declining fortunes on one or both of these measures during this period. Others, including most of the Rust Belt states, have consistently faced high gross drain and net drain over the past half-century.

Our report provides evidence that highly-educated adults flowing to dynamic states with major metropolitan areas are, to a significant extent, leaving behind more rural and post-industrial states. This geographic sorting of the nation's most-educated citizens may be among the factors driving economic stagnation—and declining social capital—in certain areas of the country. If we are connecting less with communities and people who are different than us, we could be more likely to see adversaries among those in whom we might otherwise find a neighbor.

LOSING OUR MINDS: BRAIN DRAIN ACROSS THE UNITED STATES

The problem of “brain drain” has become an important economic concern among state and local policymakers in recent decades. The Ohio legislature introduced a proposal in 2017 to reduce brain drain.¹ In 2016, Hawaii Governor David Ige requested \$10 million to invest in innovation jobs, explaining, “[I]t’s about stopping that brain drain.”² Former Indiana governor Mitch Daniels focused on brain drain during his administration, and now as president of Purdue University he has launched a program to retain Purdue graduates in the state.³

States that fail to retain the most-skilled of those born within their borders—or that fail to replace them by attracting the most-skilled born in other states—are at risk of economic stagnation. Recovery from the Great Recession, for example, has been highly uneven across states and metropolitan areas, and economic growth has become more concentrated in a small number of places.⁴ Communities that experience depopulation may see the erosion of the local economy.⁵

Brain drain out of less-dynamic states, however, may be an equally important cultural and political concern at the national level. To the extent that some states become home to large numbers of college graduates while non-graduates come to reside disproportionately in other states, social segregation across regions of

the country worsens. Cultural norms and values may become more divergent.⁶ Rather than more-cosmopolitan and more-traditional residents intermingling within states, swaths of the country may become more exclusively home to one or the other camp. The places remaining when families with the most resources move to opportunity can be left entirely bereft of community.⁷

Such cultural division would be expected to lead to political division at the national level. Even further, if there is economic inequality between, for instance, coastal cosmopolitans and heartland traditionalists, geographically-based political divides will be exacerbated by economic divides. Compounding the problem, social segregation across states erodes the ability to bridge cultural, political, and economic divides. As communities become more homogeneous, distrust and misunderstanding of those with alternative views increases. The person holding a conflicting viewpoint, rather than being a neighbor, is a distant other.

The extent and distribution of brain drain, far from being simply a state economic concern, has implications for associational life at the national level—what we do together as Americans, regardless of where we live, as opposed to what we do together in local communities. This report explores brain drain by examining the interstate residential mobility patterns of adults.

Highly-educated adults are consistently a larger percentage of those who move compared to those who remain in their birth states. However, we find that these well-educated movers tend to leave certain states and regions of the country at higher rates. In particular, most states in the Rust Belt and Southeast regions of the country and several in the Plains and in New England lose more of their highly-educated natives than do others. These states also fail to attract highly-educated adults from other states. These problems have plagued the Rust Belt states since at least 1970, while the other high-brain-drain states have seen their fortunes worsen over the past half-century. Meanwhile, a smaller number of dynamic states—generally along the Boston-Washington corridor and on the West Coast, but including several regional hubs—are losing fewer highly-educated natives than other states and attracting more talent from other states. These states experienced high brain drain fifty years ago. Thus, there appears to be a growing geographic divide in the United States between talent magnets and communities left behind.

WHAT IS BRAIN DRAIN, AND WHY SHOULD WE CARE?

Americans are a highly mobile people. Roughly a quarter to a third of adults in the United States have moved within the previous five years.⁸ While moving rates have declined in the U.S. over the last few decades, they are still higher than in nearly every other country in the world.⁹

Importantly, moving rates are not equal across groups. College-educated adults are and have historically been more likely to relocate than their non-college-

educated peers, and they are more likely to move further from their birth states than others are.¹⁰ They more frequently move for job-related reasons as well.¹¹ According to leading urbanist Richard Florida, being mobile is particularly critical to the career success of highly-educated adults because the industries these individuals occupy are located in select cities, rather than spread throughout the U.S. like many less-skilled jobs are.¹²

However, mobility comes with a downside: it may lead to brain drain from certain areas of the country, as the highly-educated leave places that offer lower returns for their skills to move to places that offer greater returns.¹³ Florida has written extensively about the growing geographic divide along the lines of education that is taking place in the United States as a result of increased clustering of the highly-educated into a handful of major cities.¹⁴ This trend, he argues, is creating a “new urban crisis” of class segregation.¹⁵ “Winner-take-all cities,” such as Los Angeles, New York, San Francisco, Chicago, and Boston, claim a disproportionate share of highly-educated Americans and attract the majority of venture capital investments in the country.¹⁶ Americans with less education are often either left behind in stagnant economies or pushed out of expensive, dynamic cities.¹⁷

These patterns are self-reinforcing. Metropolitan areas that in earlier decades had higher percentages of college-educated men have seen greater increases in the ranks of those men compared with areas that began with a smaller percentage.¹⁸ One result is that economic growth is becoming more distinctive by region. Benjamin Austin, Edward Glaeser, and Lawrence H. Summers find that the coasts are thriving, the western heartland is doing less well but still prospering, and the eastern heartland is struggling with much slower economic growth.¹⁹ While income convergence across regions was typical in the past, today regional economic disparities “seem to be hardening.”²⁰

The clustering of the highly-educated into major metropolitan areas is part of what some researchers argue is a larger geographical division by self-selection that has been taking place in the United States. In his 2008 book, *The Big Sort*, Bill Bishop makes the case that Americans are increasingly dividing themselves into communities of like-minded individuals.²¹ This has exacerbated political divisions. A greater share of the highly-educated tend to hold liberal political views, compared to those with less than a college education. Those living in urban areas are also more likely to hold liberal political views, whereas those living in rural areas are commonly conservative.²² America’s major metropolitan areas tend to vote Democratic, while most other areas of the country vote Republican.²³ Bishop and Florida, along with other researchers, show that an increasing portion of the U.S. population lives in solidly Democratic or Republican counties.²⁴

National political divisions are exacerbated by the growing importance of the federal government in policymaking and the structure of the Electoral College and U.S. Senate. Neither heartland traditionalists nor coastal cosmopolitans wish to be ruled by the other camp, but because so much of our policymaking occurs at the national level, each camp feels threatened when it is on the losing end of

political competition. Indeed, given the outsized representation of less-populous states that was the price of forming our more perfect union, a minority of citizens can sometimes impose their will on the majority. For these reasons, the stakes of elections and of polarized political debates appear monumental.

More generally, a consequence of the self-sorting in which Americans have engaged is that people are now more likely to live in communities where they are isolated from others who hold different ideologies and values. Far from affecting only politics, social segregation reduces social cohesion and trust. It leaves behind communities with crumbling institutions of civil society. It also impedes the development of “bridging social capital”, or the social wealth that flows from relationships connecting dissimilar communities.²⁵ Social segregation weakens the sentiment that, as Americans, we share something important in common with each other regardless of our other commitments.

MEASURING BRAIN DRAIN

Our analyses rely on Integrated Public Use Microdata Series (IPUMS) data from the 1940 through 2000 decennial censuses and the 2010 and 2017 American Community Survey (ACS).²⁶ We focus on migration between states rather than across local areas or regions. Doing so keeps our sample sizes reliably high, is more manageable than looking at counties, is more informative than looking at regions, and allows us to consider movers and non-movers outside metropolitan areas. Within each survey, we assess whether people born in a state still live in the same state when observed as adults. This approach allows us to examine more years of data than if we were to use a shorter-term measure of migration, such as moving within the previous year or within the previous five years.²⁷ This approach also corresponds more closely with the type of migration that often comes up in discussions of brain drain—the departure of teenagers going to college out of state or young adults taking out-of-state jobs after college.

We look at the state in which an adult is observed in the data when they were between the ages of 31 and 40. This age range comes late enough in the life cycle that most moves immediately following the completion of postsecondary education will have been completed while avoiding moves related to retirement. One consequence of this decision is that outmigration can occur because an adult moved from her birth state or because her parents moved her from her birth state as a child. This distinction may not be a meaningful one, however, for the question of how costly is brain drain.²⁸

This report focuses on the extent to which states are losing their best-educated children. A simple way to identify this group would be to use a measure based on a fixed threshold for years of schooling or highest degree received. However, educational attainment rose over time, so any fixed threshold would capture a more rarified group in earlier years than in later ones. “College graduates” today are a much larger and very different group than “college graduates” were in

the 1940s. Just 6 percent of the adults in our sample had four years of college education or more in 1940, and just 14 percent did in 1970. By 2017, however, 37 percent had at least a bachelor's degree.

Instead of using an absolute threshold, we ranked people in each cohort of 31- to 40-year-olds by educational attainment and (for those with the same educational attainment) by their earning power. We defined the “highly educated” as the top one-third of the distribution in each survey.²⁹

We pool men and women in our analyses.³⁰ We ignore immigrants to the United States, whose place of birth, by definition, was outside one of the 50 states. A vast literature explores brain drain from developing countries to developed ones, a topic beyond the scope of our paper.³¹

Gross and Net Brain Drain

There are four kinds of brain drain that might be concerning for economic, cultural, or political reasons. One worry is that if a state cannot convince its most skilled children to remain within its borders as adults, then the state will suffer from the loss of this “homegrown” talent. We characterize this kind of out-migration as “gross” brain drain. (As we will see, gross brain *gain*—when states are left *more* highly educated after out-migration—is much rarer.)

Of course, what may be of concern is not the loss of state-born talent, but whether this loss exceeds the in-migration of out-of-state talent. In that case, a state would experience “net” brain drain. The opposite of net brain drain is net brain gain—when a state enjoys greater in-migration of skill than out-migration.

Even if a state experiences no substantial net brain drain (because it attracts people to replace the talent it loses), gross brain drain might still be worrisome, since talented people born and raised in a state may have a better understanding of the state's needs and of its people. They are also likely to be more similar to the other residents of the state culturally and demographically, which may lead them to better promote social capital development than talented people from outside the state. In addition, talented entrants might settle in a small number of dynamic areas within a state while talented leavers may be rejecting less-dynamic areas. In that case, the born-and-stayers may suffer from the loss of the leavers but see few benefits from the entrants.

Absolute and Relative Brain Drain

In turn, gross and net brain drain both can be considered from two different perspectives. One might define “best educated” in terms of a national threshold or a state threshold. In our case, “highly educated” could refer to people in the top third of the national skill distribution, or it could refer to those in the top third of the state distribution. States with relatively poorly educated birth cohorts might lose a substantial share of their own best-educated men and women, but since there may be few people who are “highly educated” by national standards, they

may lose relatively few men and women who are so educated that they are in the top third nationally. We refer to brain drain based on national education thresholds as “absolute” brain drain, and that based on state thresholds as “relative” brain drain.

We experimented with several specific measures of brain drain. After surveying past approaches, we decided that none were satisfactory. Many failed to distinguish between states with high skills generally, states with high skill levels despite outmigration of skill, and states with high skill levels due to in-migration of skill. Others failed to distinguish between states with high outmigration in general and states with disproportionately high outmigration of those with the highest skills.³²

To measure brain drain, we distinguish adults born in a given state depending on whether they were still living in the state between the ages of 31 and 40 (“stayers”) or whether they were living in a different state (“leavers”). We also compare these groups to adults who moved to a given state (“entrants”). We measure gross brain drain by subtracting the percent of “stayers” who are highly educated from the percent of “leavers” who are highly educated. If this difference is positive, the state has experienced gross brain drain—people who moved out were more highly educated than those who remained in the state. A negative score would indicate that people still living in their birth state are more highly educated than the members of their birth cohort who moved out. We estimate separate absolute gross brain drain and relative gross brain drain scores, defining “highly educated” in national or in state terms.³³

The net brain drain measure is similarly constructed. We subtract the percent of “entrants” who are highly educated from the percent of “leavers” who are highly educated. A positive score indicates that those who left the state are better educated than those who moved in, meaning that the state has experienced net brain drain. A negative score means the entrants are better educated than the leavers, indicating net brain gain.³⁴ Again, we estimate separate absolute and relative net brain drain scores.³⁵

One weakness of our brain drain measures is that they do not take into account a state’s overall out-migration rates. Our measures do reflect the fact that even if a large number of people are leaving a state, that is only a problem of brain drain insofar as the people who leave a state are better educated than the people who stay in it. However, it is also true that if leavers are better educated than stayers (or entrants), that is only an important problem insofar as a large number of people are leaving the state (or a large number are leaving relative to the number entering the state). That distinction is missing from our brain drain measures.

In addition, it may be less concerning for leavers to be better educated than stayers (or entrants) to the extent that stayers are also relatively highly educated. We address these nuances by displaying brain drain rates against outmigration rates and distinguishing between birth states with different education levels. To simplify the presentation of our results, we describe only the estimates from

1970 and 2017, we confine the relative brain drain results to the appendix,³⁶ and we generally use “absolute brain drain” and “brain drain” interchangeably.³⁷ We provide our entire dataset—from 1940 to 2017, and including the four combinations of gross and net, absolute and relative brain drain—in spreadsheets [available here](#).

FINDINGS: CONTEMPORARY BRAIN DRAIN

Gross Brain Drain

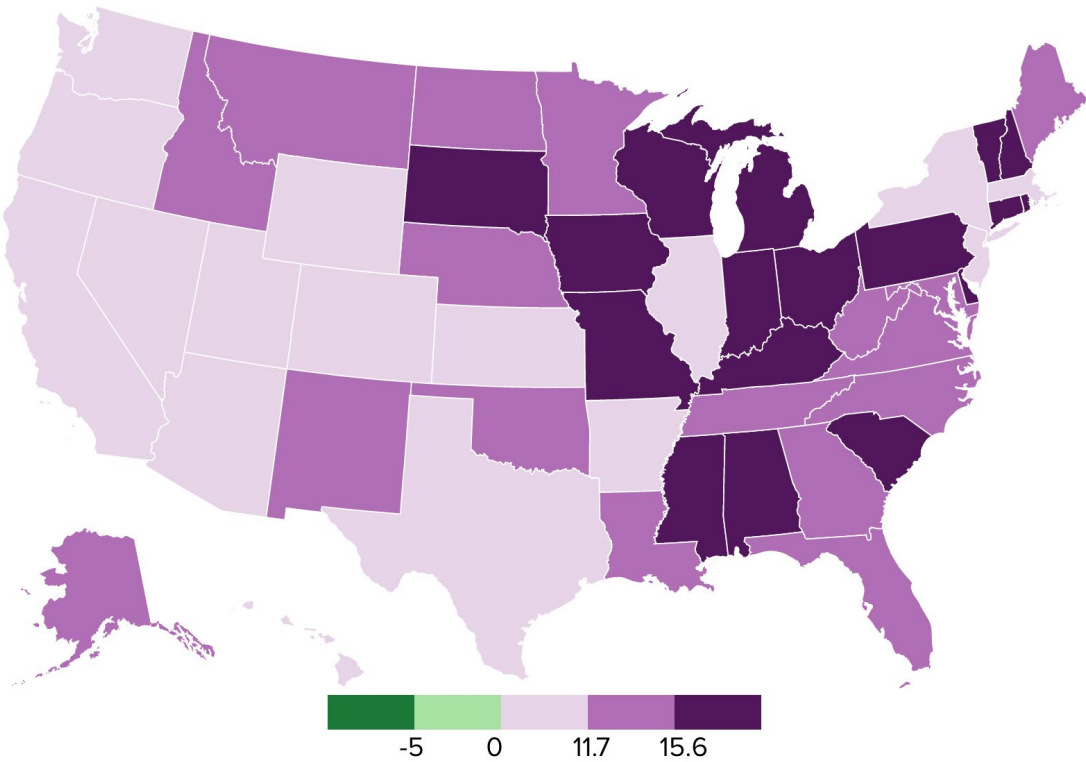
Table 1 lists the states from those with the greatest amount of absolute gross brain drain to the least; Figure 1 displays this geographically. (See Table A1 and Figure A1 in the Appendix for relative gross brain drain.)³⁸

Table 1. Gross Brain Drain, 2017

State	Gap in % Highly-Educated between Leavers and Stayers	State	Gap in % Highly-Educated between Leavers and Stayers	State	Gap in % Highly-Educated between Leavers and Stayers
Vermont	26.3	North Dakota	15.6	Colorado	11.7
South Dakota	24.0	North Carolina	15.5	Utah	11.3
Delaware	23.7	Idaho	15.4	Arizona	10.7
Wisconsin	20.4	Georgia	14.7	Washington	10.0
New Hampshire	19.4	Oklahoma	14.2	Kansas	9.5
Ohio	19.0	Tennessee	14.0	Massachusetts	8.8
Michigan	18.9	Minnesota	13.8	Texas	8.8
Pennsylvania	18.0	Louisiana	13.7	Arkansas	8.5
Indiana	17.8	Montana	13.2	Illinois	8.3
South Carolina	17.4	Virginia	13.2	Oregon	7.9
Rhode Island	17.1	Florida	13.0	New York	7.9
Alabama	17.0	Alaska	13.0	New Jersey	7.8
Iowa	16.8	West Virginia	13.0	Nevada	7.4
Mississippi	16.7	Maine	12.4	Hawaii	5.3
Kentucky	16.4	New Mexico	12.0	California	2.3
Connecticut	16.1	Nebraska	11.8	Wyoming	0.1
Missouri	16.0	Maryland	11.8		

Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the “Measuring Brain Drain” section for details. Absolute gross brain drain is the difference between the share of leavers who are highly educated (top third of the national education distribution) and the share of stayers who are highly educated.

Figure 1. Gross Brain Drain, 2017

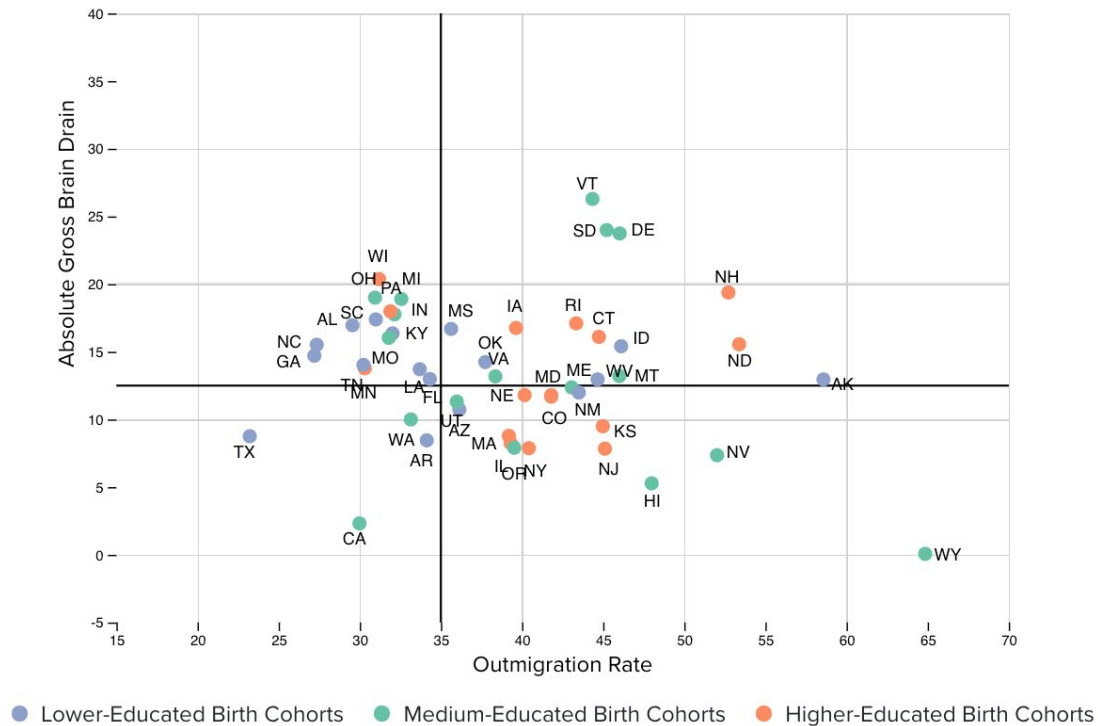


Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the “Measuring Brain Drain” section for details. Absolute gross brain drain is the difference between the share of leavers who are highly educated (top third of the national education distribution) and the share of stayers who are highly educated.

To make sense of these estimates, we organize states into three groups: those with high brain drain and high outmigration, those with high brain drain but low outmigration, and those with low brain drain.³⁹ Leavers being more highly educated than stayers is more painful if it is common for adults born in a state to leave than if most adults remain in the state. Both situations are worse than if leavers mostly resemble stayers. We also distinguish between states with low, medium or high education levels (according to the national education distribution) among adults born there (whether stayer or leaver).⁴⁰

Figure 2 summarizes this information for absolute brain drain. (See Figure A2 for relative brain drain.)

Figure 2. Gross Brain Drain vs. Outmigration Rates, 2017



Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the “Measuring Brain Drain” section for details. Absolute gross brain drain is the difference between the share of leavers who are highly educated (top third of the national education distribution) and the share of stayers who are highly educated. The bolded horizontal and vertical lines indicate the national averages for brain drain and outmigration.

High gross brain drain and high outmigration

In several states, not only are those who leave more likely to be highly educated than those who stay, but outmigration is common. Alaska, Mississippi, Oklahoma, and West Virginia fit this bill. These states’ birth cohorts tend to have low education levels compared to the rest of the nation. Other states with high gross brain drain and high outmigration tend to have birth cohorts with medium-to-high education levels. They include most of the New England states (Connecticut, New Hampshire, Rhode Island, and Vermont); several northern Mountain states and Plains states (Iowa, Nebraska, North Dakota, South Dakota, Idaho, and Montana); and two Mid-Atlantic states (Delaware and Virginia).

High gross brain drain but low outmigration

Some states have high brain drain but also have relatively low rates of overall outmigration. Thus, while those who leave the state may be more educated than those who stay, because relatively few leave, brain drain is likely not as much of an issue. States in the Southeast have high levels of brain drain and low outmigration (Alabama, Florida, Georgia, Louisiana, Kentucky, North Carolina, South Carolina, and Tennessee), but their birth cohorts tend to have low education levels. Other states with this combination of high brain drain and low outmigration include many in the Rust Belt (Indiana, Michigan, Minnesota, Missouri, Ohio, Pennsylvania, and Wisconsin), where birth cohorts tend to have medium to high levels of education.

Low gross brain drain

States with low brain drain include a swath in the Plains, Southwest, and Rocky Mountain regions (Arizona, Arkansas, Colorado, Kansas, New Mexico, Nebraska, Nevada, Texas, Utah, and Wyoming).⁴¹ Low brain drain states also include the West Coast (California, Oregon, and Washington). Most states with low brain drain have birth cohorts with moderate to high levels of education, except for Texas and Arkansas. Finally, low brain drain states also include relatively affluent states with dynamic economies (Hawaii, Illinois, Maryland, Massachusetts, New York, and New Jersey). These states often neighbor high-brain-drain states and serve as regional hubs. These affluent states have birth cohorts with medium to high education levels and also generally have somewhat high outmigration rates.

Net Brain Drain

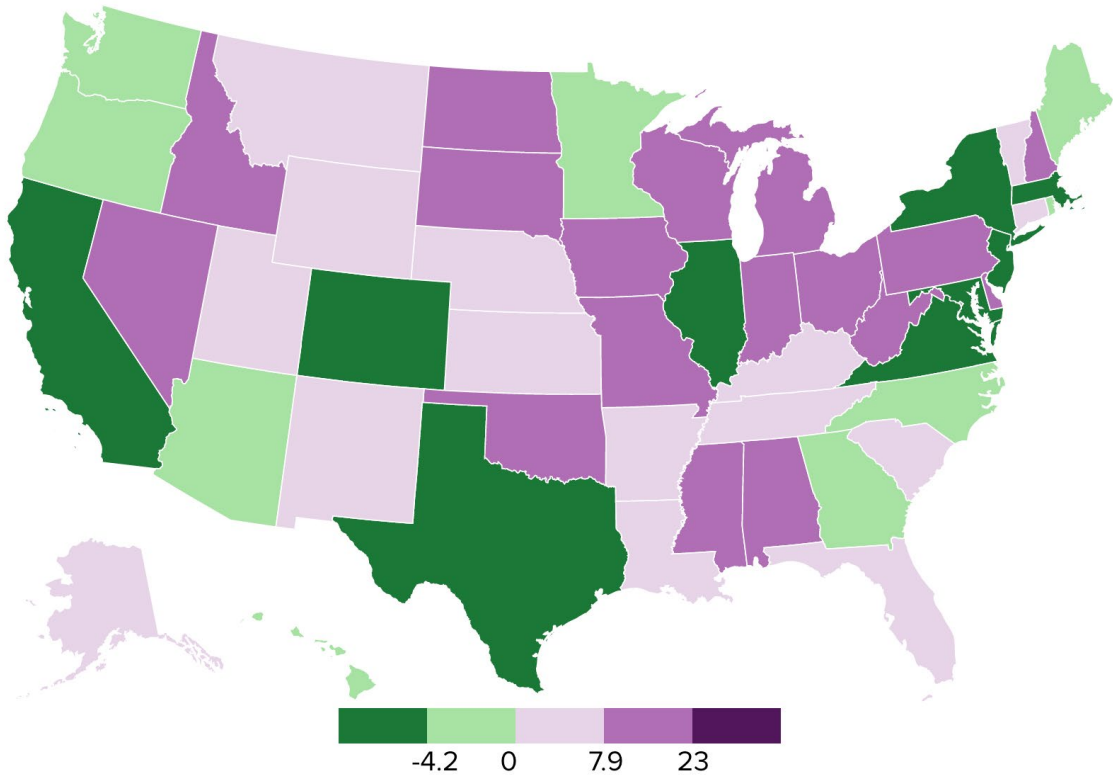
As already noted, a state may have high gross brain drain but, because it attracts highly-educated adults from other states, low net brain drain. Table 2 lists the states from those with the most net brain drain to those with the least; Figure 3 displays this geographically. As with gross brain drain, we display the results for relative net brain drain in the Appendix (Table A2 and Figure A3).⁴²

Table 2. Net Brain Drain, 2017

State	Gap in % Highly-Educated between Leavers and Entrants	State	Gap in % Highly-Educated between Leavers and Entrants	State	Gap in % Highly-Educated between Leavers and Entrants
North Dakota	19.9	Vermont	7.8	Minnesota	-0.9
Delaware	17.2	Kentucky	7.8	Georgia	-1.1
South Dakota	14.6	Nebraska	7.6	Hawaii	-1.6
Iowa	14.3	Kansas	7.5	Arizona	-1.9
Mississippi	13.5	South Carolina	6.3	Washington	-3.4
Idaho	12.0	Montana	5.7	Maine	-3.8
Oklahoma	11.0	Arkansas	5.5	Oregon	-3.9
Wisconsin	10.7	Florida	3.7	Colorado	-4.2
Indiana	10.5	Louisiana	2.4	Texas	-5.8
West Virginia	10.4	Alaska	2.1	Virginia	-6.5
Pennsylvania	10.3	Tennessee	2.1	New Jersey	-6.6
New Hampshire	9.6	New Mexico	1.5	Maryland	-10.1
Michigan	9.4	Connecticut	1.5	Illinois	-10.4
Alabama	8.8	Utah	0.8	New York	-15.7
Missouri	8.8	Wyoming	0.2	Massachusetts	-16.4
Nevada	8.6	North Carolina	-0.6	California	-20.2
Ohio	8.6	Rhode Island	-0.6		

Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the “Measuring Brain Drain” section for details. Absolute net brain drain is the difference between the share of leavers who are highly educated (top third of the national education distribution) and the share of entrants who are highly educated.

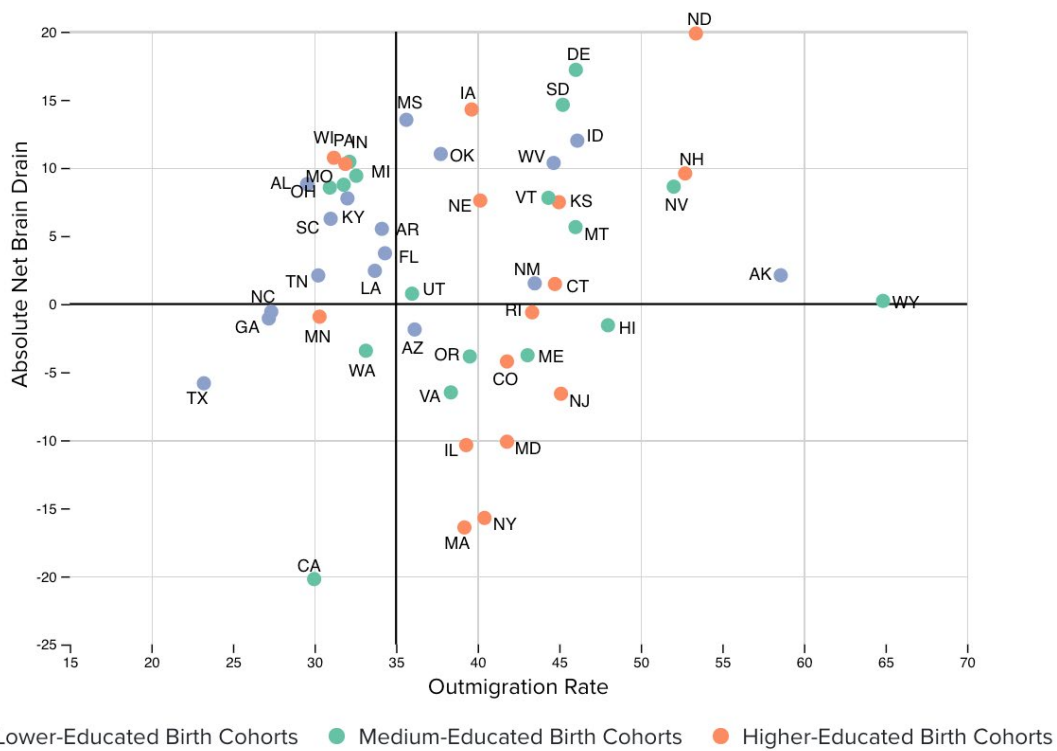
Figure 3. Net Brain Drain, 2017



Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the “Measuring Brain Drain” section for details. Absolute net brain drain is the difference between the share of leavers who are highly educated (top third of the national education distribution) and the share of entrants who are highly educated.

As before, we group states into three categories based on brain drain levels and outmigration rates, and we distinguish between states with low-, medium-, and high-educated birth cohorts. (See Figure 4 for absolute net brain drain, and Figure A4 for relative net brain drain.)

Figure 4. Net Brain Drain vs. Outmigration Rates, 2017



Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the “Measuring Brain Drain” section for details. Absolute net brain drain is the difference between the share of leavers who are highly educated (top third of the national education distribution) and the share of entrants who are highly educated. The bolded horizontal and vertical lines indicate the national averages for brain drain and outmigration.

Net brain drain and high outmigration

States that have net brain drain as well as high outmigration (the worst combination) include a swath of states in the Plains, the Rocky Mountain region, and the Southwest (Arizona, Idaho, Iowa, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, South Dakota, Utah, and Wyoming).⁴³ The birth cohorts in these states range from having relatively low to relatively high education levels. New England states are also well-represented in this category (except Massachusetts and Rhode Island, and Maine has absolute net brain gain).⁴⁴ They have moderately- to highly-educated birth cohorts. Delaware (moderately-educated birth cohorts) and West Virginia and Alaska (low-educated) also have net brain drain and high outmigration.

Net brain drain but low outmigration

States that experience net brain drain but have low outmigration include two distinct groups. The first is comprised of moderately- to highly-educated Rust Belt states (Indiana, Michigan, Missouri, Ohio, Pennsylvania, and Wisconsin). The second consists of less-educated states in the Southeast (Alabama, Arkansas, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee).⁴⁵

Net brain gain

States that experience net brain gain include states in the Northeast and the Mid-Atlantic (Maryland, Massachusetts, New Jersey, New York, Rhode Island, and Virginia). These states generally have high outmigration but high in-migration too, and they have moderately- to highly-educated birth cohorts. The West Coast is also home to net brain gain states (California, Oregon, and Washington, all with moderately-educated birth cohorts). Several other dynamic states also experience net brain gain, including Colorado, Illinois, and Minnesota (with relatively highly-educated birth cohorts) and Texas (relatively low-educated).

SUMMARY OF BRAIN DRAIN IN 2017

We summarize, here, which states have high gross and net brain drain (the worst scenario), low gross brain drain but net brain drain, high gross brain drain but net brain gain, and low gross brain drain and net brain gain (the best scenario).⁴⁶

High gross brain drain and net brain drain

This category is the largest of the four. States with high gross and net brain drain include northern Mountain States and the Plains (Idaho, Montana, Iowa, North Dakota, and South Dakota), some New England states (Connecticut, New Hampshire, and Vermont), as well as Alaska, Delaware, Oklahoma, and West Virginia. These states also suffer from high outmigration. They are losing many of their adults born in-state, those leavers are better educated than the stayers, and they are not attracting highly-educated adults born in other states.

States with high gross and net brain drain but low outmigration include many states in the Rust Belt (Indiana, Michigan, Missouri, Ohio, Pennsylvania, and Wisconsin) and most of the Southeast (Alabama, Florida, Kentucky, Louisiana, Mississippi, South Carolina, and Tennessee). The impact of brain drain in these states is lessened by the relatively small share of people born in the state who leave, but this may be cold comfort, as the leavers are better educated than the stayers and entrants.

Those leaving the highest-gross-brain-drain states that also experience net brain drain tend to end up in neighboring states or in a handful of popular destinations. (See Table 3.) California, Texas, and Florida are especially popular destinations, and Virginia, North Carolina, Georgia, Illinois, and Colorado, are popular regional hubs. California is a top-five destination for 17 of the 25 states in this category.

Table 3. Most Popular Destinations for Highly-Educated Leavers among States with the Highest Gross Brain Drain and Net Brain Drain, 2017

Birth State	Most Popular Destination	Second	Third	Fourth	Fifth
High Outmigration					
New Hampshire	Massachusetts	Maine	New York	California	North Carolina
Vermont	Massachusetts	New York	New Hampshire	Colorado	California
Connecticut	New York	Massachusetts	Florida	California	Virginia
Delaware	California	Pennsylvania	New York	Maryland	New Jersey
West Virginia	Ohio	Virginia	North Carolina	Pennsylvania	South Carolina
Oklahoma	Texas	California	Florida	Arkansas	Colorado
Iowa	Illinois	Minnesota	Missouri	Wisconsin	Nebraska
South Dakota	Minnesota	California	Colorado	Nebraska	Iowa
North Dakota	Minnesota	California	Colorado	Wisconsin	Washington
Montana	Washington	California	Colorado	Arizona	Wyoming
Idaho	Utah	Washington	California	Oregon	Arizona
Alaska	Washington	California	Texas	Arizona	Oregon
Low Outmigration					
Missouri	Illinois	Kansas	Texas	California	Colorado
Wisconsin	Minnesota	Illinois	California	Colorado	Florida
Michigan	Illinois	California	Florida	Texas	Ohio
Indiana	Illinois	California	Florida	Ohio	Texas
Pennsylvania	New York	Virginia	New Jersey	California	Maryland
Ohio	Florida	California	Kentucky	Illinois	North Carolina
Kentucky	Tennessee	Indiana	Texas	Ohio	Georgia
Tennessee	Georgia	Florida	California	Texas	North Carolina
South Carolina	North Carolina	Georgia	Texas	Florida	Tennessee
Florida	Georgia	California	Texas	North Carolina	Virginia
Alabama	Georgia	Florida	Tennessee	Texas	North Carolina
Mississippi	Texas	Alabama	Louisiana	Tennessee	Georgia
Louisiana	Texas	Florida	Georgia	Virginia	California

Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the "Measuring Brain Drain" section for details.

Low gross brain drain but net brain drain

Some states have low gross brain drain but net brain drain. These include several states in the West (Nevada, New Mexico, Utah, and Wyoming), as well as Kansas and Nebraska. These states also have high outmigration. Arkansas also falls into this category, but it has low outmigration. These states can comfort themselves that they are not losing large shares of their best-educated, but they are attracting so few highly-educated adults born in other states that they end up with lower-educated populations than if there were no interstate migration.

High gross brain drain but net brain gain

A few states have high gross brain drain but net brain gain. These include Maine, Rhode Island and Virginia, which suffer from high outmigration, and Georgia, Minnesota, and North Carolina, which have low outmigration. While they are disproportionately losing the best-educated adults born in-state, these states manage to replace those leavers with better-educated entrants.

Low gross drain and net brain gain

Finally, several states have both low gross brain drain and net brain gain. These include West Coast states (California and Washington with low outmigration, Oregon with high outmigration) and Hawaii and Arizona (both with high outmigration). The category also includes some states on the East Coast (Massachusetts, New York, New Jersey, and Maryland—all with relatively high outmigration). Finally, a few states serve as regional migration hubs: Colorado and Illinois (high outmigration) and Texas (low outmigration). These states generally have higher incomes and dynamic economies.

The states with low gross brain drain and net brain gain are most likely to gain residents from other states within this category. (See Table 4.) Of the 60 origin states in the table (five for each of the 12 states), 36 are states that also have low gross brain drain and net brain gain. The states in this category are, to an important extent, trading highly-educated adults with each other. The rest of the states in this category have high gross brain drain and net brain drain (except for Virginia, listed once). Of these states, Pennsylvania, Ohio, and Michigan are most prevalent. Illinois is the only state in this group where every top-five origin state is a net-brain-drain neighbor.

Table 4. Most Common Origin States for Highly-Educated Entrants among States with the Lowest Gross Brain Drain and Net Brain Gain, 2017

State	Most Common Origin	Second	Third	Fourth	Fifth
Low Outmigration					
California	New York	Illinois	Texas	Pennsylvania	Ohio
Washington	California	Oregon	Texas	Illinois	New York
Texas	California	Louisiana	Illinois	New York	Oklahoma
High Outmigration					
Oregon	California	Washington	Texas	Illinois	Idaho
Hawaii	California	Florida	Michigan	Illinois	New York
Arizona	California	Illinois	Michigan	New York	Ohio
Colorado	California	Texas	Illinois	Michigan	Ohio
Illinois	Michigan	Wisconsin	Ohio	Indiana	Missouri
Massachusetts	New York	Connecticut	Pennsylvania	New Hampshire	New Jersey
New York	New Jersey	California	Pennsylvania	Massachusetts	Connecticut
New Jersey	New York	Pennsylvania	Massachusetts	California	Illinois
Maryland	New York	Pennsylvania	New Jersey	Virginia	California

Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the “Measuring Brain Drain” section for details.

FINDINGS: CHANGES IN GROSS AND NET BRAIN DRAIN SINCE 1970

How has brain drain changed over time? We have compiled data back to 1940 and made it publicly available. To keep the analyses here manageable, we focus on the estimates for 1970 and look at changes over this (roughly) 50-year period. We organize states into four groups each for gross and net brain drain depending on their 1970 and 2017 levels.

Gross Brain Drain

Table 5 lists the states from those with the greatest gross brain drain in 1970 to the least. Table 6 ranks states from the highest increase in gross brain drain to the highest decline. Figure 5 displays brain drain in 1970 geographically, and Figure 6 displays the change in brain drain.

Table 5. Gross Brain Drain, 1970

State	Gap in % Highly-Educated between Leavers and Stayers
Delaware	35.5
New Jersey	26.8
Connecticut	25.0
Rhode Island	23.3
Ohio	23.0
Hawaii	22.7
Alaska	22.6
New York	22.5
Illinois	21.0
Indiana	20.7
Michigan	20.5
Wisconsin	20.1
Pennsylvania	20.1
Maryland	20.0
Iowa	19.6
Massachusetts	18.7
Minnesota	18.6
Montana	18.1
South Dakota	15.6
Vermont	14.8
Missouri	14.3
Colorado	14.2
New Hampshire	14.1
Kansas	14.1

Table 6. Change in Gross Brain Drain, 1970-2017

State	2017 Brain Drain Minus 1970 Brain Drain
Kentucky	15.46
Mississippi	15.45
South Carolina	14.7
Alabama	12.16
Vermont	11.46
Nevada	10.82
North Carolina	10.08
Oklahoma	8.57
South Dakota	8.36
North Dakota	7.7
Georgia	7.41
West Virginia	6.2
Tennessee	6.06
Idaho	5.82
New Hampshire	5.3
Arkansas	3.5
Louisiana	3.16
Texas	2.96
Virginia	2.75
Utah	2.4
Washington	1.99
Missouri	1.76
Arizona	1.62
Maine	0.5

Table 5. Gross Brain Drain, 1970

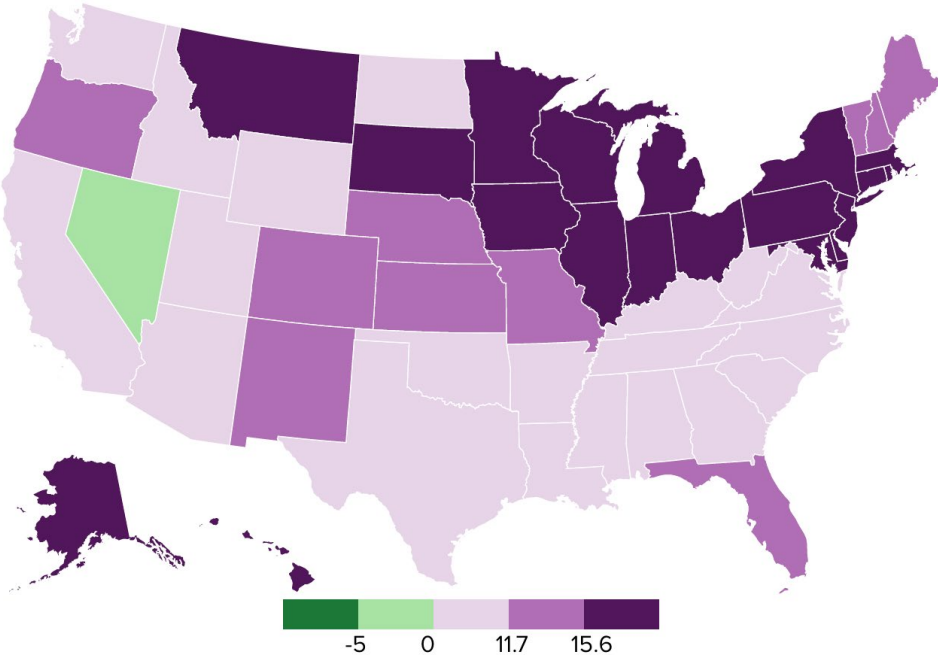
State	Gap in % Highly-Educated between Leavers and Stayers
Florida	14.0
New Mexico	13.6
Nebraska	13.6
Oregon	12.6
Maine	11.9
Louisiana	10.6
Virginia	10.4
Idaho	9.6
Arizona	9.1
Utah	8.9
Washington	8.0
Tennessee	8.0
North Dakota	7.9
Georgia	7.3
West Virginia	6.8
Texas	5.8
Oklahoma	5.7
North Carolina	5.4
California	5.3
Arkansas	5.0
Alabama	4.8
South Carolina	2.7
Wyoming	2.2
Mississippi	1.2
Kentucky	0.9
Nevada	-3.5

Table 6. Change in Gross Brain Drain, 1970-2017

State	2017 Brain Drain Minus 1970 Brain Drain
Wisconsin	0.24
Florida	-0.97
Michigan	-1.61
New Mexico	-1.63
Nebraska	-1.76
Wyoming	-2.08
Pennsylvania	-2.12
Colorado	-2.56
Iowa	-2.82
California	-2.94
Indiana	-2.96
Ohio	-4.03
Kansas	-4.55
Oregon	-4.72
Minnesota	-4.77
Montana	-4.88
Rhode Island	-6.19
Maryland	-8.17
Connecticut	-8.92
Alaska	-9.66
Massachusetts	-9.86
Delaware	-11.74
Illinois	-12.77
New York	-14.65
Hawaii	-17.37
New Jersey	-18.95

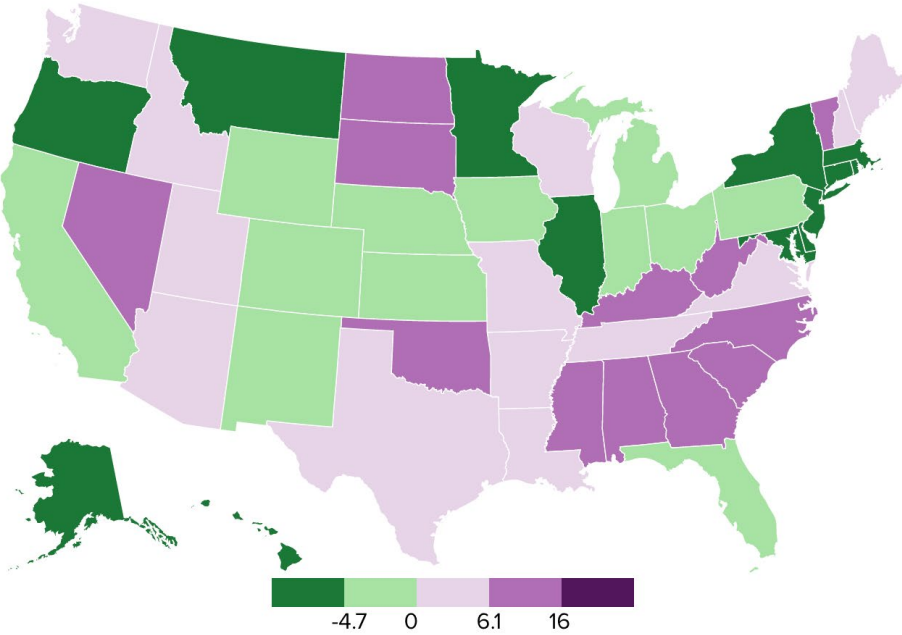
Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the "Measuring Brain Drain" section for details. Absolute gross brain drain is the difference between the share of leavers who are highly educated (top third of the national education distribution) and the share of stayers who are highly educated.

Figure 5. Gross Brain Drain, 1970



Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the “Measuring Brain Drain” section for details. Absolute gross brain drain is the difference between the share of leavers who are highly educated (top third of the national education distribution) and the share of stayers who are highly educated.

Figure 6. Change in Gross Brain Drain, 1970-2017



Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the “Measuring Brain Drain” section for details. Absolute gross brain drain is the difference between the share of leavers who are highly educated (top third of the national education distribution) and the share of stayers who are highly educated.

High gross brain drain in 1970 and 2017

States that had high gross brain drain both then and now include the New England states, except Massachusetts (Connecticut, Maine, New Hampshire, Rhode Island, and Vermont); the Rust Belt states, except Illinois (Indiana, Michigan, Minnesota, Missouri, Pennsylvania, Ohio, and Wisconsin); several Near West states (Iowa, Montana, and South Dakota), as well as Delaware, Florida and Alaska.

Low brain drain in 1970 but high brain drain in 2017

States that have seen the biggest increases in gross brain drain between 1970 and 2017 include the Southeastern states (Alabama, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia), and three more Near West states (Idaho, North Dakota, and Oklahoma).

High brain drain in 1970 but low brain drain in 2017

The biggest declines in brain drain were in western states (Colorado, New Mexico, and Oregon), Middle Atlantic states (Maryland, New Jersey, and New York) plus Massachusetts, as well as Illinois, Hawaii, Kansas, and Nebraska. Some of these states are popular destination states for those from states with both high gross and net brain drain, as Table 3 showed.

Low brain drain in 1970 and 2017

States that are fortunate enough to have had low brain drain 50 years ago and today include many western states (Arizona, California, Nevada, Texas, Utah, Washington, and Wyoming), as well as Arkansas.

Net Brain Drain

Table 7 displays states, from highest net brain drain in 1970 to highest net brain gain. Table 8 ranks the states from the largest increase in net brain drain between 1970 and 2017 to the largest decline. Figures 7 and 8 display the same estimates in maps.

Table 7. Net Brain Drain, 1970

State	Gap in % Highly-Educated between Leavers and Entrants
Michigan	19.55
Ohio	19.29
Illinois	17.84
New York	16.48
Indiana	15.32
Oregon	14.03
New Jersey	12.93
Delaware	12.82
Washington	9.48
Connecticut	9.13
Idaho	9.02
California	8.28
Kansas	6.19
Wisconsin	5.04
Wyoming	4.73
Missouri	4.6
Iowa	4.53
Nevada	4.17
South Dakota	4.05
Minnesota	3.67
Montana	3.67
Nebraska	3.12
Florida	2.59
Rhode Island	2.56

Table 8. Change in Net Brain Drain, 1970-2017

State	2017 Brain Drain Minus 1970 Brain Drain
Alabama	29.15
Kentucky	28.59
South Carolina	26.59
Mississippi	26.42
West Virginia	25.62
North Dakota	25.5
Vermont	24.01
Georgia	17.51
Oklahoma	16.02
North Carolina	14.83
Tennessee	14.52
New Hampshire	14.17
Virginia	12.69
New Mexico	12.61
Arkansas	12.08
South Dakota	10.58
Iowa	9.76
Pennsylvania	8.15
Alaska	7.87
Louisiana	6.8
Maine	5.76
Wisconsin	5.7
Nebraska	4.48
Nevada	4.45

Table 7. Net Brain Drain, 1970

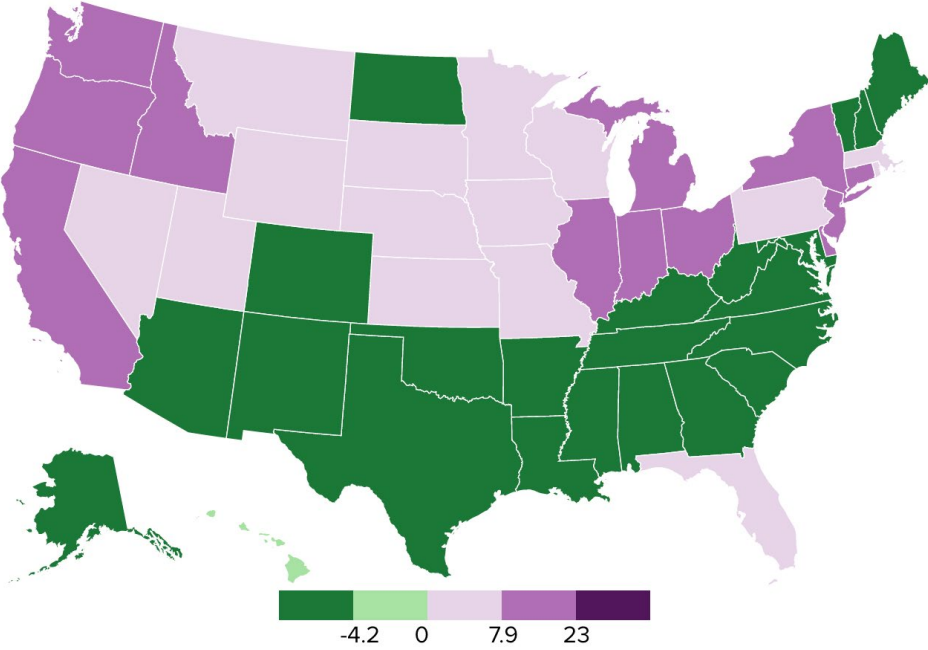
State	Gap in % Highly-Educated between Leavers and Entrants
Pennsylvania	2.14
Massachusetts	0.62
Utah	0.36
Hawaii	-2.31
Louisiana	-4.36
New Hampshire	-4.58
Oklahoma	-5
Maryland	-5.19
Colorado	-5.27
Arizona	-5.52
North Dakota	-5.63
Alaska	-5.76
Arkansas	-6.56
Texas	-7.74
Maine	-9.52
New Mexico	-11.09
Tennessee	-12.42
Mississippi	-12.89
West Virginia	-15.26
North Carolina	-15.4
Vermont	-16.21
Georgia	-18.57
Virginia	-19.18
South Carolina	-20.33
Alabama	-20.34
Kentucky	-20.83

Table 8. Change in Net Brain Drain, 1970-2017

State	2017 Brain Drain Minus 1970 Brain Drain
Delaware	4.38
Missouri	4.16
Arizona	3.65
Idaho	2.98
Montana	1.98
Texas	1.92
Kansas	1.29
Florida	1.14
Colorado	1.05
Hawaii	0.75
Utah	0.4
Rhode Island	-3.17
Wyoming	-4.5
Minnesota	-4.6
Indiana	-4.87
Maryland	-4.92
Connecticut	-7.66
Michigan	-10.13
Ohio	-10.74
Washington	-12.91
Massachusetts	-17.03
Oregon	-17.88
New Jersey	-19.52
Illinois	-28.2
California	-28.48
New York	-32.19

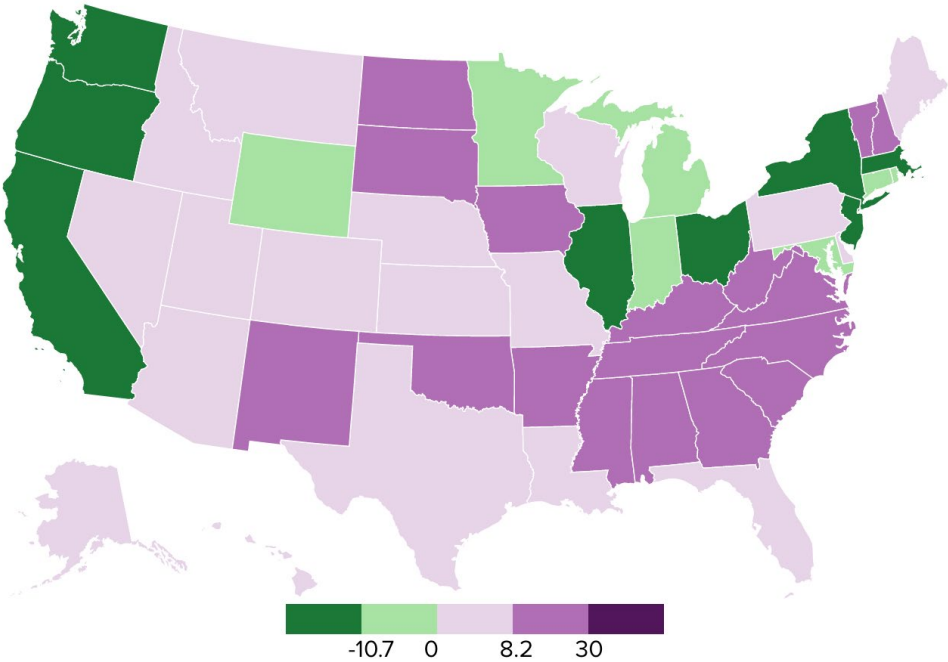
Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the “Measuring Brain Drain” section for details. Absolute net brain drain is the difference between the share of leavers who are highly educated (top third of the national education distribution) and the share of entrants who are highly educated.

Figure 7. Net Brain Drain, 1970



Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the “Measuring Brain Drain” section for details. Absolute net brain drain is the difference between the share of leavers who are highly educated (top third of the national education distribution) and the share of entrants who are highly educated.

Figure 8. Change in Net Brain Drain, 1970-2017



Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the “Measuring Brain Drain” section for details. Absolute net brain drain is the difference between the share of leavers who are highly educated (top third of the national education distribution) and the share of entrants who are highly educated.

Net brain drain in 1970 and 2017

States that had net brain drain in 1970 and 2017 include Mountain states and the Plains (Idaho, Iowa, Kansas, Montana, Nebraska, Nevada, South Dakota, Utah, and Wyoming), states in the Rust Belt (Indiana, Michigan, Missouri, Ohio, Pennsylvania, and Wisconsin), as well as Connecticut, Delaware, and Florida.

Net brain gain in 1970 but net brain drain in 2017

States that were net-brain-gain states fifty years ago but are net-brain-drain states today include much of the Southeast (Alabama, Arkansas, Kentucky, Louisiana, Mississippi, South Carolina, Tennessee, and West Virginia), northern New England states (New Hampshire and Vermont), parts of the Southwest (New Mexico and Oklahoma), and Alaska and North Dakota.

Net brain drain in 1970 but net brain gain in 2017

A number of states switched from net brain drain to net brain gain between 1970 and 2017. They include several northeastern states (Massachusetts, New Jersey, New York, and Rhode Island), states in the upper Midwest (Illinois and Minnesota), and on the West Coast (California, Oregon, and Washington).

Net brain gain in 1970 and in 2017

States enjoying net brain gain in both 1970 and 2017 include Mid-Atlantic and Southeast states (Georgia, Maryland, North Carolina, and Virginia), as well as Maine, Hawaii, and several western states: Arizona, Colorado, and Texas.

SUMMARY OF CHANGES IN BRAIN DRAIN

Combining changes in gross and net brain drain creates 16 possible categories. Here we highlight eight combinations of interest, which include 40 states.

High gross brain drain and net brain drain in 1970 and 2017

Twelve states experienced both high gross brain drain and net brain drain in both 1970 and 2017—the worst combination. Many of these are Rust Belt states (Indiana, Michigan, Missouri, Ohio, Pennsylvania, and Wisconsin); three are Plains or northern Mountain States (Iowa, Montana, and South Dakota). Connecticut, Delaware, and Florida round out the group.

High gross brain drain in both 1970 and 2017 and net brain gain switching to net brain drain

In New Hampshire, Vermont, and Alaska, steadily high gross brain drain was accompanied by net brain drain replacing net brain gain.

Gross brain drain switching from low to high and net brain gain switching to net brain drain

Nine mostly southern states were in the second-most common category, experiencing rising gross brain drain and net brain gain turning into net brain drain: West Virginia, Kentucky, Tennessee, South Carolina, Alabama, Mississippi, Louisiana, Oklahoma, and North Dakota.

Low gross brain drain in both 1970 and 2017 but net brain drain in both 1970 and 2017

Three western states—Wyoming, Utah, and Nevada—had similar brain drain levels in both years.

Gross brain drain switching from low to high but net brain gain in both 1970 and 2017

In three southeastern states, brain drain worsened while the state experienced net brain gain in both years: Virginia, North Carolina, and Georgia.

Gross brain drain switching from high to low and net brain drain switching to net brain gain

In the third-most-common category are states that improved in terms of both gross and net brain drain. These include the dynamic states of Massachusetts, New York, New Jersey, Illinois, and Oregon.

Gross brain drain switching from high to low and net brain gain in both 1970 and 2017

The three dynamic states of Maryland, Colorado, and Hawaii fall into this category.

Low gross brain drain and net brain gain in both 1970 and 2017

Only two states, both in the Southwest, fell into this most-fortunate category: Arizona and Texas.

CONCLUSION

States which retain and attract highly-educated adults stand to reap substantial economic benefits. At the same time, those that bleed much of their homegrown talent will see their economic fortunes decline if they fail to replace the leavers with highly-educated out-of-staters. Yet even if they do manage to offset their losses, these states are still losing a vital source of social capital.

What is more, the outmigration of highly-educated adults has almost certainly played a role in the deterioration of civil society in struggling communities

across the country. And to the extent that the geographic mobility of the highly-educated has increased social bifurcation, it has likely exacerbated distrust of and intolerance toward people who hold different beliefs. One need only glance at today's polarized political environment to see these attitudes on display.

Our research finds that states that are doing the best—low gross brain drain and net brain gain—generally cluster along the Boston-Washington corridor and on the West Coast: Massachusetts, New York, New Jersey, Maryland, California, Oregon, and Washington. Other brain gain states are regional hubs—Hawaii, Arizona, Colorado, Texas, and Illinois. Several of these states experienced high gross brain drain and net brain drain in 1970, but have reversed course; others have seen continued good prospects or improvements on one or both measures. For the most part, these states are home to what Richard Florida would describe as “winner-take-all cities.”⁴⁷

On the other hand, states in the Southeast, in the Rust Belt, and in other parts of the country tend to fare much worse when it comes to retaining and attracting the highly-educated. Several states in the Southeast—West Virginia, Kentucky, Tennessee, South Carolina, Alabama, Mississippi, and Louisiana—had low gross brain drain and net brain gain in 1970, but today generally experience high gross brain drain as well as net brain drain. Most Rust Belt states—Pennsylvania, Ohio, Indiana, Michigan, Wisconsin, and Missouri—have done poorly on these measures in both 1970 and 2017. Perhaps unsurprisingly, states that defy these regional trends (for example, Illinois in the Rust Belt, and Virginia, North Carolina, and Georgia in the Southeast) seem to be attracting highly-educated out-of-staters to their dynamic metropolitan hubs.

Brain drain has significant consequences—economic, yes, but also political and cultural. By increasing social segregation, it limits opportunities for disparate groups to connect. And by siphoning a source of economic innovation from emptying communities, brain drain can also lead to crumbling institutions of civil society. As those natives who have more resources leave, those left behind may struggle to support churches, police athletic leagues, parent-teacher associations, and local businesses. State and local policymakers are understandably focused on the economic consequences of brain drain. But anyone concerned about the health of associational life in America should worry that what this report has mapped out, to some extent, is the geography of social capital drain.

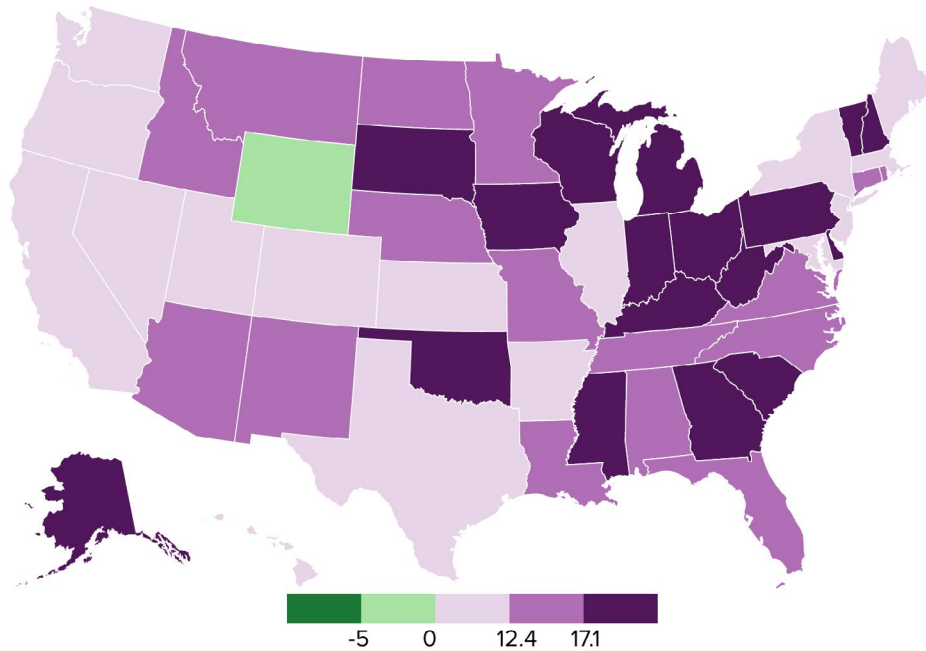
APPENDIX: TABLES AND FIGURES, RELATIVE BRAIN DRAIN

Table A1. Relative Gross Brain Drain, 2017

State	Gap in % Highly-Educated between Leavers and Stayers	State	Gap in % Highly-Educated between Leavers and Stayers
Vermont	25.4	Florida	15.1
South Dakota	22.8	Arizona	14.7
Delaware	22.7	Rhode Island	14.0
South Carolina	21.1	Nebraska	13.8
Wisconsin	20.2	New Mexico	13.5
Alaska	20.2	Virginia	13.0
Kentucky	19.5	Montana	12.9
Ohio	18.9	Minnesota	12.7
New Hampshire	18.9	Maine	12.3
Michigan	18.8	Colorado	12.3
West Virginia	18.7	Arkansas	11.7
Georgia	18.5	Utah	11.7
Indiana	18.2	Maryland	11.5
Iowa	18.1	Washington	11.2
Oklahoma	17.6	Texas	10.9
Pennsylvania	17.5	Massachusetts	10.9
Mississippi	17.3	Kansas	10.1
Alabama	17.1	New Jersey	9.3
Connecticut	17.0	Illinois	8.7
North Carolina	17.0	Oregon	7.7
North Dakota	16.7	New York	7.5
Tennessee	16.6	Nevada	7.3
Missouri	16.2	Hawaii	6.4
Idaho	16.2	California	2.8
Louisiana	15.9	Wyoming	-0.5

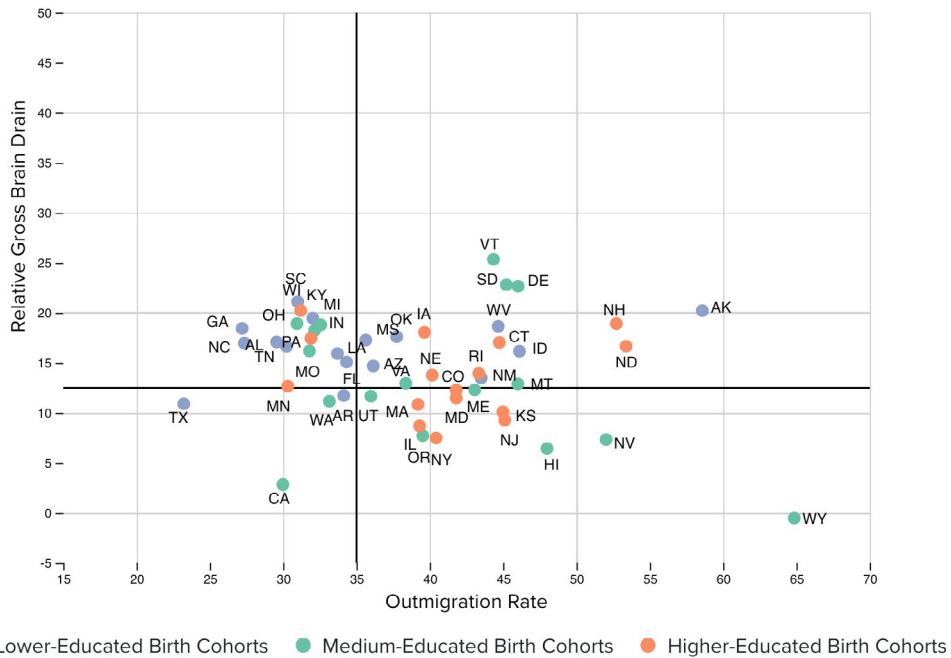
Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the "Measuring Brain Drain" section for details. Relative gross brain drain is the difference between the share of leavers who are highly educated (top third of the state education distribution) and the share of stayers who are highly educated.

Figure A1. Relative Gross Brain Drain, 2017



Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the “Measuring Brain Drain” section for details. Relative gross brain drain is the difference between the share of leavers who are highly educated (top third of the state education distribution) and the share of stayers who are highly educated.

Figure A2. Relative Gross Brain Drain vs. Outmigration Rates, 2017



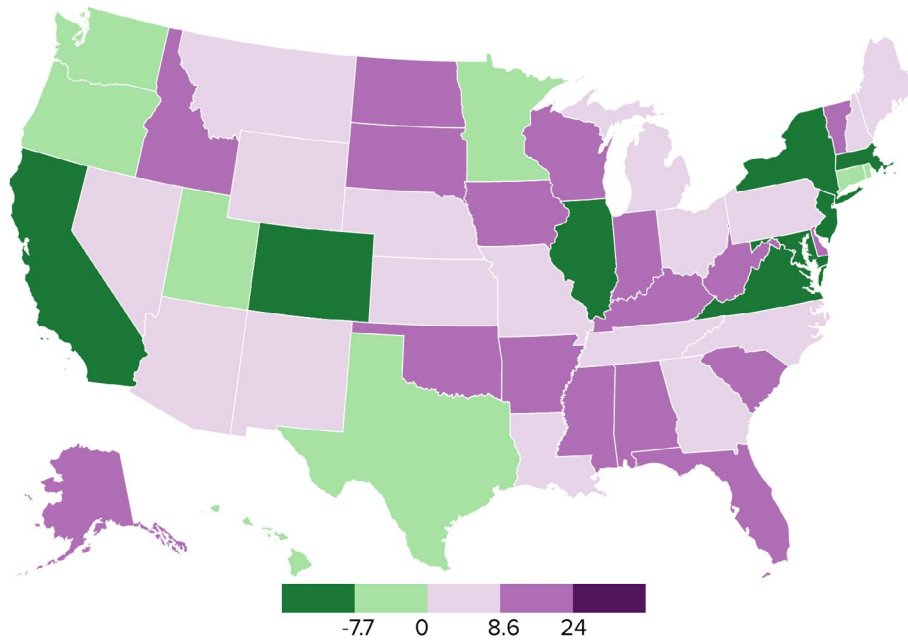
Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the “Measuring Brain Drain” section for details. Relative gross brain drain is the difference between the share of leavers who are highly educated (top third of the state education distribution) and the share of stayers who are highly educated. The bolded horizontal and vertical lines indicate the national averages for brain drain and outmigration.

Table A2. Relative Net Brain Drain, 2017

State	Gap in % Highly-Educated between Leavers and Entrants	State	Gap in % Highly-Educated between Leavers and Entrants
West Virginia	19.8	Ohio	7.2
Mississippi	17.5	Tennessee	7.1
Oklahoma	16.9	New Hampshire	5.9
Delaware	16.1	Georgia	5.5
North Dakota	15.1	Pennsylvania	5.5
South Dakota	14.4	Nebraska	4.9
Idaho	13.3	North Carolina	3.7
South Carolina	12.4	Kansas	2.7
Kentucky	12.4	Wyoming	2.1
Indiana	11.9	Hawaii	-0.3
Alaska	11.8	Texas	-0.6
Iowa	11.2	Utah	-1.0
Alabama	11.0	Washington	-2.0
Florida	10.1	Rhode Island	-2.7
Vermont	9.7	Oregon	-3.9
Arkansas	9.5	Minnesota	-4.2
Wisconsin	8.7	Connecticut	-5.2
Nevada	8.1	Colorado	-7.8
Michigan	7.9	New Jersey	-8.0
New Mexico	7.6	Virginia	-9.0
Louisiana	7.6	Maryland	-9.8
Maine	7.5	Illinois	-12.5
Missouri	7.4	California	-16.8
Arizona	7.3	New York	-21.8
Montana	7.2	Massachusetts	-21.9

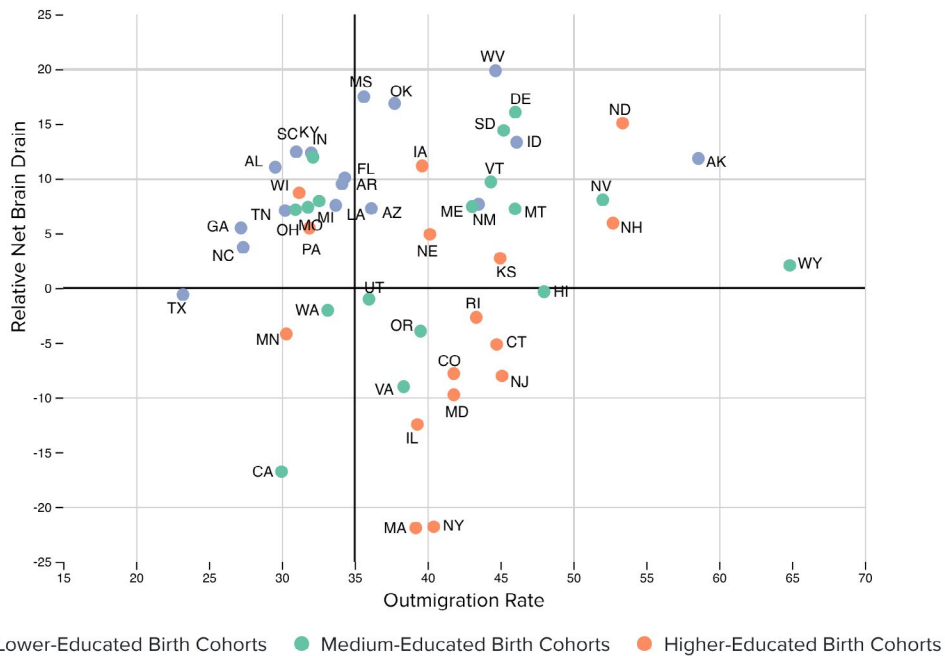
Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the "Measuring Brain Drain" section for details. Relative net brain drain is the difference between the share of leavers who are highly educated (top third of the national state distribution) and the share of entrants who are highly educated.

Figure A3. Relative Net Brain Drain, 2017



Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the “Measuring Brain Drain” section for details. Relative net brain drain is the difference between the share of leavers who are highly educated (top third of the national state distribution) and the share of entrants who are highly educated.

Figure A4. Relative Net Brain Drain vs. Outmigration Rates, 2017



Source: Social Capital Project analyses of IPUMS decennial census and American Community Survey data. See the “Measuring Brain Drain” section for details. Relative net brain drain is the difference between the share of leavers who are highly educated (top third of the national state distribution) and the share of entrants who are highly educated. The bolded horizontal and vertical lines indicate the national averages for brain drain and outmigration.

ENDNOTES

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 26. Technically, we use the 1% samples for 1940, 1950, and 1960, the “1% state form 2” sample for 1970, the “5% state” samples for 1980 and 1990, the 1% sample for 2000, and the 2010 and 2017 1-year ACS samples. See Steven Ruggles et al., *Integrated Public Use Microdata Series: Version 9.0* [Machine-readable database], (Minneapolis: University of Minnesota, 2019), <https://usa.ipums.org/usa/>, accessed March 11, 2019.
 27. The American Community Survey (source of the 2010 and 2017 data) does not ask where adults lived five years earlier. The decennial census only asked where adults lived one year ago in 1950.
 28. It is also the case that someone might have moved from the birth state temporarily, only to return before we observe them in adulthood. Our approach would not consider this an example of brain drain. Some of the people we observe between 31 and 40 will return to their birth state in subsequent years, but we did not explore how large this group is.
 29. Technically, we ranked by educational attainment and the wage percentile in the state in which a person resided when observed at age 31 to 40. Implicitly, those who are higher up the wage distribution are assumed to be “higher educated” than those lower down, conditional on having the same educational attainment. This approach avoids the problem of many people “clumping” at certain educational attainment levels, which makes it difficult to compare similarly sized groups over time.
 30. Early results that restricted the samples to men yielded similar conclusions.
 31. Pierpaolo Giannoccolo, “The Brain Drain: A Survey of the Literature,” (Working Paper, No. 2006-03-02, Università degli Studi di Milano-Biocca, 2009), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1374329, accessed March 11, 2019.
 32. Among the measures we considered and rejected: the share of leavers who are highly educated; the share of leavers who are highly educated divided by the share of stayers who are highly educated; and the share of men born in a state who move and are highly educated.
 33. We also considered using log odds ratios rather than the difference in highly-educated rates. For example, our indicator of gross brain drain divided (1) the odds that a state’s leavers are

highly educated rather than not highly educated by (2) the odds that a state's stayers are highly educated rather than not highly educated. This odds ratio is the same obtained by dividing (1) the odds that a highly-educated person born in the state is a leaver rather than a stayer by (2) the odds that a non-highly-educated person in the state is a leaver rather than a stayer. The final measure is the natural logarithm of this odds ratio. It is higher the greater the gross brain drain. This measure was highly correlated with the simpler and more-easily-interpretable measure we settled on.

34. This measure is equivalent to subtracting a measure of gross brain gain from gross brain drain. The gross brain gain measure, in this case, is the share of entrants who are highly educated, less the share of stayers who are highly educated. We do not focus on this measure in the paper, but we include it in the data we make publicly available.
35. A "gross brain gain" indicator analogous to the log-odds gross brain drain measure would compare (1) the odds that a state's entrants are highly educated rather than not highly educated and (2) the odds that a state's stayers are highly educated rather than not highly educated. Subtracting gross brain gain from gross brain drain would then yield a measure of net brain drain. Mathematically, this is equivalent to a log odds ratio comparing (1) the odds that a state's leavers are highly educated rather than not highly educated and (2) the odds that a state's entrants are highly educated rather than not highly educated. The measure is higher when leavers are more likely to be highly educated than are entrants. Alternatively, the net brain drain measure may be considered to be a log odds ratio comparing (1) the odds that a not-highly-educated person is an entrant rather than a leaver and (2) the odds that a highly-educated person is an entrant rather than a leaver. The measure is higher when the highly-educated are less likely to be entrants than leavers. Again, this measure was highly correlated with the simpler measure of net brain drain we settled on.
36. Contemporary patterns are, with some exceptions, similar whether looking at absolute brain drain or relative brain drain. In fact, the correlation between absolute and relative gross brain drain across states is very strong. Depending on the year, correlation coefficients ranged from 0.89 (in 1940 and 1950) to 0.96 (in 1980). That is to say, it makes little difference for purposes of assessing gross brain drain whether one defines "highly educated" with respect to the national education distribution or the state distribution. The correlation between absolute and relative net brain drain was generally lower, ranging from 0.62 (in 1940) to 0.92 (in 2017).
37. We exclude Washington, DC from our analyses because the estimates were consistently outliers. We suspect this may reflect that some Maryland and Virginia residents who give birth in the District report their birth state as Washington, DC. See <https://twitter.com/RAVerBruggen/status/1095703251419320321>.
38. Note that no state experiences gross brain gain, meaning its leavers are less educated than its stayers. Wyoming does have *relative* gross brain gain.
39. "High" (for brain drain or outmigration) means a value above the national average, and "low" means the value is below the national average.
40. We divide states into thirds to create these categories. We include Washington DC in this ranking, so that each third includes 17 states (though Washington DC estimates are not shown).
41. Arizona and New Mexico are high in terms of relative brain drain (see Figure A2).
42. Note that the relative net brain drain measure compares the share of leavers that are highly educated (according to the education distribution of their birth state) to the share of entrants that are highly educated (according to the education distribution of *their* birth state). If a state has relatively low-educated birth cohorts, it can end up with higher education levels after out- and in-migration without experiencing relative net brain gain by our measure, since entrants may be better-educated than leavers but less highly-educated relative to their birth state education distribution than leavers are relative to *their* birth state distribution.

43. However, Utah has relative net brain gain and Arizona has absolute net brain gain.
 44. Connecticut also has relative net brain gain.
 45. However, Georgia and North Carolina have absolute net brain gain.
 46. The correlation between the two absolute measures—absolute gross drain and absolute net drain— ranged from 0.12 in 2000 to 0.64 in 1960 (0.40 in 2017). The correlation between the two relative measures ranged from 0.27 in 1990 to 0.77 in 1970 (0.42 in 2017).
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