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Educational Migration: Brain Drain in Kentucky

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Capstone Paper for the 2012 MPA Class

University of Kentucky
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Executive Summary

Kentucky has been steadily growing in its bachelor degree holder production over the past ten years, with almost 4500 more college degree holders produced per year in 2010 than in 2000. The literature has shown that this is good news for the economic growth prospects of the state, because a more highly skilled work force means a higher potential for production. This newly educated workforce, however, will not help Kentucky to grow if they take those skills elsewhere.

Using five-year American Community Survey data for Kentuckians over the age of 17, I was able to determine that Kentucky is not a brain drain state, but has actually been able to attract an estimated 2,930 college degree holders net of those lost to other states. Then, by breaking the state down into Public Use Microdata Areas, I was able to find patterns of loss or gain in human capital regionally. The golden triangle region of the state was not only the most saturated but also the most successful in attracting college degree holders.

If the literature about matching is correct, then policy makers should continue and even enhance current policy aimed at increasing degree production and workforce development, if they wish to attract more high-skilled labor. This is because the theory on matching posits that regions with higher preexisting levels of human capital are better at attracting more highly skilled labor. Also, attention should be given to the state migration patterns evident in this study, with regards to the loss of college degree holders to southern states, and the gain of college degree holders from the bordering states to the north.
Brain Drain or Brain Gain?

It is generally held that a more educated society will be a more productive (and prosperous) society. This remains true for states like Kentucky. While the Commonwealth has been successful in growing its base of bachelor or higher graduates, as I will show later, it remains below the national average for overall higher educational attainment. This has been an issue of great interest to Kentucky lawmakers and has resulted in programs like the Kentucky Educational Excellence Scholarship. The Council on Postsecondary Education was even a response to the Kentucky higher education reform efforts, as laid out in the “Kentucky Postsecondary Education Improvement Act of 1997.” Through such actions, Kentucky lawmakers have made investment in higher education a priority.

An investment in human capital, however, is only valuable to the state if that increased human capital is then reinvested in the state’s economy. When an out-migration of human capital occurs resulting in a net decrease in overall skill level, it is referred to as brain drain. Most of the research that addresses brain drain looks at the national level, but as Marthur would argue in his 1999 article, the general principles also apply at the state level (Marthur, 1999).

Kentucky’s workforce will be less productive on average if its most educated residents emigrate to different states or countries. For that reason, my research question is broken into two parts:
1. Is Kentucky a brain drain or brain gain state?

2. Do certain regions of Kentucky lose or attract college degree holders more than other regions of Kentucky?

Based on prior research, there are several factors that could be involved in an individual’s decision as to whether or not they should move. The main characteristic of movers that I will be analyzing is educational attainment, but I will also look at other individual demographic and economic characteristics in order to gain a clearer picture of Kentucky’s net migration status.

**Relevant Theory and Literature**

As my primary concern with brain drain stems from an underlying concern about the economic development of the state, I reviewed two types of literature. First, and perhaps the most involved, is the literature addressing the relationship between average resident education and an area’s economic growth. The second subject that would help provide context for this analysis is literature that pertains to migration, particularly the various incentives and motives involved with influencing an individual’s decision to move.

In reference to the body of literature about the relationship between a population’s average educational attainment and economic growth, Robert Barro found in 1991 that there is a significant positive relationship between initial levels of human capital and growth. He proposes that this is because of two factors. First, human capital “facilitates the absorption of superior technologies.” Second, human capital is more difficult to manipulate than physical capital (two of the major inputs to production), therefore having
a higher initial stock of human capital allows a jurisdiction to more easily adjust its physical capitals to a level sufficient for growth. Barro notes that the relationship between human capital and growth is more significant among adult males than adult females, and that his model really only applies to secondary and postsecondary levels of education (Barro, 2001).

Eric Hanushek and Dennis Kimko found similar results in their 2000 article. From their cross-country study, they found that “labor-force quality differences are important for growth; these quality differences are related to schooling (but not necessarily the resources devoted by a country to schooling) and that quality has a causal impact on growth” (Hanushek and Kimko, 2000). Though they found that government efforts on a national level have little effect on schooling quality, we know that in America, at least, merit-based scholarships, like the Kentucky Educational Excellence Scholarship, have a positive effect on state-level college or university enrollment (Groen, 2003; Perry, 2001).

For the reasons mentioned above, it is important to stem the out-migration of human capital. In his 1974 article, Bhagwati posits certain reasons why brain drain has negative economic impacts at the national level. Two of the more salient points are as follows:

1. “If the social marginal product exceeds the private marginal product, thanks to strong externalities… then there is a loss to those left behind.”

2. “If the state has financed the education which is embodied in the skilled worker who migrates, and if it is assumed that the state would have taxed this skilled worker… then his emigration does deprive those left behind of this return and thus worsens their welfare (Bhagwati, 1974).”
These two points implicitly encourage policymakers to attempt to incentivize their most skilled workers to stay, or to try to entice more skilled laborers to migrate into the state, than those who do leave. Both the externalities associated with a productive worker, and the potential revenue associated with their individually increased economic productivity are an attractive proposition for state policy makers seeking to improve their constituency’s situation.

The migration literature is also incredibly broad in its scope, and provides a litany of theories and models by which to understand the movement of people. My research question in particular focuses on human capital factors, as measured by educational attainment, related to migration.

The anticipated return on human capital played a large role, according to George Borjas, when an individual decided to move within the United States. Using the National Longitudinal Survey of Youth between 1979 and 1986, they found that, while relatively young, the individuals who moved (Borjas focuses on human capital factors for self-selected migration), tended to do so if there was a “mismatch between their skill endowments and the returns paid to skills in their native state.” Movers would then “move to states with greater wage dispersion than their native state,” suggesting they anticipated the ability to earn a higher wage due to their skill level, and subsequently the opportunity to earn more (Borjas, Bronars, and Trejo, 1991).

A 2005 paper by Christopher Berry and Edward Glaeser is particularly helpful in understanding a “pull” factor of highly skilled migrants. They found that “places with higher levels of human capital have attracted more skilled people over the last three decades.” So this “correlation between the initial share of metropolitan area adults with
college degrees and change in that variable” means that there is a brain-gain in places where there are already many highly skilled individuals (Berry and Glaeser, 2005).

This means that highly skilled labor chooses to leave places with a lower initial stock of human capital (representing a “push” factor of migration). William Easterly discusses in his book a 1993 article by J. E. Rauch, which described one factor in why people choose to migrate.

It found that the wage of an individual with the same skill and education characteristics was higher in cities whose populations had higher average skills. In other words, a person who moved from a low-human-capital city to a high-human-capital city would earn higher wages. This study’s interpretation is that an individual with given schooling is more productive—and so gets paid more—when he or she lives and works with more highly skilled people (Easterly, 2002).

Easterly sums up the studies Rauch, Berry and Glaeser, and other authors wrote on matching when he said “The patterns found by these studies suggest that an individual’s opportunity for matching with other skilled individuals is as important as the individual’s own skills” (Easterly, 2002). The theory of matching plays a prominent role in the policy recommendations outlined later in this paper.

One interesting side note is how the type of human capital in addition to the level of human capital may have implications for growth. Industries that focus on production, rather than redistribution, have historically provided for stronger economic growth. So-called STEM fields (science, technology, engineering, and mathematics) are particularly important to production activities. A 1991 article by Murphy, Shleifer, and Vishny
supports this idea, particularly with engineering. In determining the allocation of talent, they found that some careers like law, while paying better individually do not result in very strong positive externalities for the society as a whole, as reflected by the jurisdictions growth rate than other career options, such as engineering (Murphy, Shleifer, and Vishny, 1991).

As aforementioned, brain drain is normally a concept studied at the national level. Work that has been done on interstate educational migration has predominantly sought to understand the movement of students to out-of-state colleges and universities. One particular insight that has been gained in this arena is the usefulness of state merit-based aid as an attempt to retain high achieving students. Zhang and Ness found in 2010 that merit-based aid programs result in a 10% increase of in-state enrollments, and a 10% decrease in out-migration. This results in a total enrolment increase of around 4% (Zhang and Ness, 2011).

Moreover, studies have shown that students who attain postsecondary degrees at in-state institutions are more likely than their peers to remain in-state after graduation (Groen, 2003). A study by Kristin Perry in 2001, for example, found that 84% of students who attend in-state colleges tend to remain in-state post graduation; 64% of students who attend out-of-state colleges do not return to their home state (Kelly, 2011).

These figures are important for Kentucky because the state has made great strides in increasing its college-level graduation rates, and has a vested interest in keeping newly skilled labor in the state. In 2010, Kentucky produced 30% more bachelor degrees per year than in 2001 (Kelly, 2011). On average, Kentucky increased its college degree production by 449 graduates per year, every year for that decade. Figure 1 charts
Kentucky’s college degree production growth over the past decade.

Figure 1: Number of Undergraduate Degrees Produced Annually in Kentucky from 2000-01 to 2009-10

The Commonwealth’s progress in degree production has increased its national rankings in many categories relating to higher education over the past decade. Perhaps the most notable improvement is a jump from 44th to 35th in the nation for six-year graduation rates at public and private four year institutions, and doubling the national average for growth in percent of adults 25-64 years old with college degrees (Kelly, 2011).
Table 1: Selected higher education production metrics:

<table>
<thead>
<tr>
<th>College Attainment and Completion Metrics</th>
<th>2000</th>
<th>State Rank 2000</th>
<th>2009</th>
<th>State Rank 2009</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of Adults Aged 25 to 64 with College Degrees (Associate and Higher)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KY</td>
<td>24.5%</td>
<td>47</td>
<td>30.5%</td>
<td>45</td>
<td>24.4%</td>
</tr>
<tr>
<td>US</td>
<td>33.8%</td>
<td></td>
<td>38.1%</td>
<td>-</td>
<td>12.8%</td>
</tr>
<tr>
<td>Six-Year Graduation Rates - Four Year Institutions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KY</td>
<td>39.3%</td>
<td>44</td>
<td>47.8%</td>
<td>35</td>
<td>21.7%</td>
</tr>
<tr>
<td>US</td>
<td>53%</td>
<td></td>
<td>55.5%</td>
<td>-</td>
<td>4.6%</td>
</tr>
</tbody>
</table>

Sources: NCES: IPEDS Graduation Rate and Completion Surveys; U.S. Census Bureau 2009 American Community Survey and 2000 Decennial Census (Public Use Microdata Samples)

**Research Design**

In attempting to answer my research questions, I used the American Communities Survey (ACS) 2010 five-year estimates as my data source. The data are provided at the individual level with geographic identifiers, specifically the state level using Federal Information Processing Standards, or FIPS codes, as identifiers, and the sub-state level using Public Use Microdata Areas, or PUMA, identifiers. I then selected responses for individuals over the age of 17, so as not to include individuals who are unlikely to be in the labor force, or college degree holders. My primary concern, again, is to determine whether those who hold a bachelor’s degree, a master’s degree, a professional school degree, or a doctorate degree (henceforth referred to as college degree holders) are moving from Kentucky or adding to the existing pool of college degree holders within Kentucky.

Much of economic development theory depends on regions so I began by aggregating the individual responses by PUMA.
According to the Census website, PUMA is a Census-oriented geographic region of 100,000 people or more. The Census uses existing county boundaries to determine each PUMA boundary, rather than subdivide counties and form a weaker unit of analysis. Kentucky has 25 major PUMAs. Each state has a system of PUMAs that are identified with a system of ascending codes starting at 100, and increasing by the hundreds. Using state FIPS codes as the unique identifier, the Census distinguishes them from other states’ PUMAs. In Kentucky, Jefferson County is further subdivided into five smaller PUMAs and Fayette County into two, due to their large populations. For the purpose of my study, I combined each of these subdivisions, resulting in a Jefferson county PUMA (number 1700) and a Fayette county PUMA (number 1900).

Figure 2.1: Map of Public Use Microdata Areas in Kentucky

Using the “pweight,” a population-weighting variable provided by the ACS, I then weighted all the responses. By doing this I was able aggregate the data, and look at the regional differences in migration between each of the 25 Kentucky PUMAs, computing a point estimate for those regions that have been successful in attracting college degree holders from out of state, and those regions that have, on net, lost them to
other states. Because I am more concerned with movement in and out of the state than movement within the state, I omitted those who moved within the state when determining the net percentages of migration per PUMA.

At the state level, I used individual level responses within Kentucky for those who:

- Moved from a different state to Kentucky
- Moved to Kentucky from a different state
- Moved within Kentucky
- Lived in Kentucky and did not move
- Kentucky’s total preexisting population

In this way I was able to contrast the characteristics of those who migrated from Kentucky, immigrated to Kentucky, and remained in Kentucky.

By using individual responses at the state level, I was able to identify whether Kentucky as a whole is experiencing a brain drain or gain. For the purposes of this paper, I define brain drain or gain as the net number of college degree holders the state has lost or gained between 2006 and 2010 (the years laid out by the ACS five year survey). Since most human capital development efforts are typically implemented at the state level, this analysis will have the most direct policy implications for lawmakers and program administrators.

I also estimated descriptive statistics for selected characteristics of the immigrants, emigrants, non-movers, those who moved within the state, and the state as a whole to compare and contrast the various groups. In particular I looked at the number of
college degree holders as a percentage of the State’s total population (the human capital measure) and the state-wide averages for age, sex, marital status, the presence and age of their own children, race, citizenship status (demographic measures), personal annual income, personal annual earnings, the poverty to income ratio, and employment status (economic measures). I then compared the five groups on a selection of these characteristics, which I found to be particularly insightful.

Using ArcGIS, a mapping software, I displayed the data geographically in order to highlight regional or geographic patterns. This type of analysis is often useful to state policy makers.

This study is primarily descriptive- attempting to inform decisions about the workforce, and ultimately the economic development potential of the state. By looking at brain drain from the state as a whole and the PUMA regions within the state, I was able to gain two perspectives of the Kentucky’s brain drain or brain gain status.

**Findings and Analysis**

My findings and analysis are broken into two parts as per my research design. The first looks at how college degree holders move at the Public Use Microdata Area level. The second section pertains to where Kentucky’s out-migrating college degree holders move to, and from where in-migrating college degree holders moved. Finally, in the same section, I analyze some of the characteristics of the five categories (those who moved to the state, those who moved from the state, those who moved within the state, those who did not move at all, and the Kentucky population as a whole).
**PUMA Level Migration of Individuals with a College Degree:**

Table 2 represents the net change after migration in and out of individuals with a college degree or higher in each of the 25 Kentucky PUMAs. The migration rates range from -2.6% to 4.3%, with a state average of a 0.5% increase in college degree holders per PUMA. The point estimate for total migration, using the person weight provided by ACS, is an increase of 6,073 individuals over the five-year period.

Table 2: Public Use Microdata Area migration patterns (weighted)

<table>
<thead>
<tr>
<th>PUMA</th>
<th>Percentage of the population with a college degree</th>
<th>Total net gain or loss of college degree holders</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>17.12%</td>
<td>0.18%</td>
</tr>
<tr>
<td>200</td>
<td>10.47%</td>
<td>-0.57%</td>
</tr>
<tr>
<td>300</td>
<td>11.54%</td>
<td>4.25%</td>
</tr>
<tr>
<td>400</td>
<td>19.17%</td>
<td>-0.73%</td>
</tr>
<tr>
<td>500</td>
<td>10.54%</td>
<td>-0.52%</td>
</tr>
<tr>
<td>600</td>
<td>11.40%</td>
<td>1.45%</td>
</tr>
<tr>
<td>700</td>
<td>10.51%</td>
<td>-0.91%</td>
</tr>
<tr>
<td>800</td>
<td>10.54%</td>
<td>-2.45%</td>
</tr>
<tr>
<td>900</td>
<td>9.00%</td>
<td>-2.64%</td>
</tr>
<tr>
<td>1000</td>
<td>9.84%</td>
<td>0.36%</td>
</tr>
<tr>
<td>1100</td>
<td>16.84%</td>
<td>-0.97%</td>
</tr>
<tr>
<td>1200</td>
<td>22.25%</td>
<td>1.58%</td>
</tr>
<tr>
<td>1300</td>
<td>10.92%</td>
<td>0.36%</td>
</tr>
<tr>
<td>1400</td>
<td>15.57%</td>
<td>3.84%</td>
</tr>
<tr>
<td>1500</td>
<td>11.62%</td>
<td>-1.44%</td>
</tr>
<tr>
<td>1600</td>
<td>15.40%</td>
<td>0.07%</td>
</tr>
<tr>
<td>1700</td>
<td>26.43%</td>
<td>1.90%</td>
</tr>
<tr>
<td>1800</td>
<td>20.00%</td>
<td>1.15%</td>
</tr>
<tr>
<td>1900</td>
<td>34.40%</td>
<td>0.63%</td>
</tr>
<tr>
<td>2000</td>
<td>21.48%</td>
<td>1.31%</td>
</tr>
<tr>
<td>2100</td>
<td>13.31%</td>
<td>1.36%</td>
</tr>
<tr>
<td>2200</td>
<td>12.46%</td>
<td>-0.90%</td>
</tr>
<tr>
<td>2300</td>
<td>21.49%</td>
<td>-0.30%</td>
</tr>
<tr>
<td>2400</td>
<td>25.53%</td>
<td>2.13%</td>
</tr>
<tr>
<td>2500</td>
<td>21.81%</td>
<td>3.38%</td>
</tr>
<tr>
<td>State</td>
<td>16.39% (Mean)</td>
<td>0.50% (Mean)</td>
</tr>
</tbody>
</table>
The map below (Figure 2.2) representing the Net Migration column of Table 2 illustrates an interesting geographical pattern. The region known as the “golden triangle,” or the region bound by Cincinnati, Louisville, and Lexington, has seen a relatively high, net in-migration of postsecondary degree-holders (with the exception of Fayette County which had only a small increase, and Campbell and Pendleton counties, which saw small decreases). The only other PUMAs with a noticeable increase were 300 (which is in the Clarksville, TN metropolitan area, and the home of Ft. Campbell), 2100 (a feeder community for the northern and central Kentucky labor force), and 600 (which is along the I-75 corridor, midway between Lexington and Knoxville).

Eastern Kentucky and much of western Kentucky were net exporters of postsecondary degree holders. Eastern Kentucky lost between 1% and 2%, with the exception of 1000, home of Pikeville, and the Pikeville Regional Medical Center, which may explain the relative stability of their college degree holding migration patterns. Much of western Kentucky also exported postsecondary degree holders, but less severely than the eastern region.

Figure 2.2: Percentage of college degree holders net migration by PUMA
Figure 2.3 illustrates the percentage of the population that has a postsecondary degree. Not unlike the net migration map (Figure 2.2) there is a strong concentration of postsecondary degree holders in the golden triangle. The difference here is that far western Kentucky also has a relatively high percentage of college degree holders, as does PUMA 400, which is along the I-65 corridor mid-way between Louisville and Nashville, as well as the home of Western Kentucky University in Bowling Green.

Notably low concentrations of postsecondary degree holders are eastern Kentucky with only around 9% - 13% of the population holding such degrees. Certain parts of western Kentucky also have rates hovering around 10% - 11%.

Figure 2.3: Percentage of college degree holders by PUMA

In general, both of these maps show a concentration of highly educated human capital. The golden triangle is clearly the winner among PUMAs in the state when it comes to importing and concentrating postsecondary degree holders. In both maps, the Bluegrass Region (central and northern Kentucky) has a higher concentration of, and
attracts more residents with a college degree or higher than the rest of the state, with a few exceptions.

PUMA 300, while only being a moderately saturated region for postsecondary degree holders, was the clear frontrunner in net imports of such individuals. In fact, it imported .41 percentage points more than the next biggest importer, in northern Kentucky. With regards to the saturation of postsecondary degree holders, far western Kentucky is the outlier. While it was not among the most concentrated regions, it kept pace with most of central Kentucky. Possible explanations for this would be the presence of Murray State University in Murray, and Mid-Continent University in Mayfield. Other than this and PUMA 400, which are noted above, most PUMA regions have the patterns that were expected.

The maps demonstrating the PUMA net in-migration (Figure 2.2) and college degree holding concentrations (Figure 2.3) visually show a similarities between the PUMAs existing percentage of college degree holders and the net in-migration. Empirically, this same correlation is strong. Table 3.1 shows the correlations between the percent of interstate movers who hold a college degree and the percent of the PUMA’s preexisting population that hold a college degree. Considering that “1” is a perfect correlation, these relationships are quite strong.

Table 3.1: Correlation between percentage of college degree holders among movers and the percent of the PUMA population with a college degree

<table>
<thead>
<tr>
<th>Correlation with the percent of population with a college degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent moving from Kentucky with a college degree</td>
</tr>
<tr>
<td>Percent to Kentucky with a college degree</td>
</tr>
</tbody>
</table>
Even when slightly modifying the measures, as in Table 3.2, the correlations remain strong. In this case, I tested for a correlation between the raw estimates for college degree holders moving to and from the state with the pre-existing college degree holding population among the 25 PUMAs. Using this method, the college degree holders moving from Kentucky has an even stronger correlation with the preexisting population of college degree holders. The correlation between college degree holders moving to Kentucky and the preexisting population is almost identical in this method to the percentage method in Table 3.1. Both of these methods are statistically significant at a ninety-five percent level of confidence.

Table 3.2: Correlation between number of college degree holding interstate movers and the total PUMA population with a college degree

<table>
<thead>
<tr>
<th>Correlation with the total College Degree Holders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total college degree holders moving from Kentucky</td>
</tr>
<tr>
<td>Total college degree holders moving to Kentucky</td>
</tr>
</tbody>
</table>

*Migration of College Degree Holders between Kentucky and Other States:*

Table 4.1 shows the top ten states that sent more college degree holders to Kentucky than they received from Kentucky between 2006 and 2010. These figures are weighted according to the “pweight” variable provided as part of the ACS 5 year dataset, at a five percent confidence interval. It is important to reiterate that both tables 4.1 and 4.2 represent the top ten net senders and receivers respectively. The top ten gross senders and receivers represent a much higher volume of migration. What is shown is simply the difference between how many college degree holders moved to Kentucky from that state minus the number who moved from Kentucky to that state.
Much of the data show trends consistent with what might be expected. Five of the seven bordering states were among the top ten net senders of college degree holders. Beyond that, Florida sent, on net, the most college degree holders to Kentucky with an estimated 614, with Ohio just behind at 603. California, Michigan, and New York also make the list, sending roughly between 300 and 500 college degree holders, on net.

It is also important also to note the last row, “Abroad,” in the “Gross Moved to Kentucky From” column. The ACS asks where an individual moved from if they indicated they did not live in the state one year ago. To that end, we can determine not only which state someone moved from, but also which country. When I aggregated all those who moved here from abroad, that category became the second largest gross sender of college degree holders, only after Ohio. Unfortunately, I was unable to calculate the net gain or loss abroad because the ACS only surveys those living inside the United States.

Table 4.1: Top ten states that sent college degree holders to Kentucky, 2006-2010.

<table>
<thead>
<tr>
<th>Gross Moved to Kentucky From:</th>
<th>Gross Moved from Kentucky To:</th>
<th>Net Total To KY</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>Total</td>
<td>Percent of Total</td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Florida</td>
<td>1,423</td>
<td>5.76%</td>
</tr>
<tr>
<td>Ohio</td>
<td>3,211</td>
<td>13.00%</td>
</tr>
<tr>
<td>Indiana</td>
<td>2,072</td>
<td>8.39%</td>
</tr>
<tr>
<td>Missouri</td>
<td>791</td>
<td>3.20%</td>
</tr>
<tr>
<td>Illinois</td>
<td>1,309</td>
<td>5.30%</td>
</tr>
<tr>
<td>California</td>
<td>974</td>
<td>3.94%</td>
</tr>
<tr>
<td>Michigan</td>
<td>926</td>
<td>3.75%</td>
</tr>
<tr>
<td>New York</td>
<td>739</td>
<td>2.99%</td>
</tr>
<tr>
<td>North Carolina</td>
<td>742</td>
<td>3.00%</td>
</tr>
<tr>
<td>West Virginia</td>
<td>504</td>
<td>2.04%</td>
</tr>
<tr>
<td>Abroad</td>
<td>3,143</td>
<td>12.72%</td>
</tr>
</tbody>
</table>
Much like the previous table, Table 4.2 looks at the loss of college degree holders to other states. Whereas five of the seven bordering states sent a net gain of college degree holders to Kentucky, the remaining two received college degree holders from Kentucky. Tennessee, in fact, was the single largest recipient, with an estimated 628 individuals. Virginia, being the last remaining bordering state, was the tenth largest recipient, with only 87.

Interestingly, both Carolinas made an appearance on each list. While North Carolina sent a net 241 individuals, South Carolina received 234. Also, whereas California was the only western state to be in the top ten net senders, Iowa, Texas, Kansas, and Oregon were all among the top ten receivers.

Table 4.2: Top ten states that received college degree holders from Kentucky, 2006-2010.

<table>
<thead>
<tr>
<th>Gross Moved to Kentucky From:</th>
<th>Gross Moved from Kentucky To:</th>
<th>Net Total from KY</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>Total</td>
<td>Percent of Total</td>
</tr>
<tr>
<td>Tennessee</td>
<td>1,453</td>
<td>5.88%</td>
</tr>
<tr>
<td>Georgia</td>
<td>814</td>
<td>3.30%</td>
</tr>
<tr>
<td>Iowa</td>
<td>39</td>
<td>0.16%</td>
</tr>
<tr>
<td>South Carolina</td>
<td>351</td>
<td>1.42%</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>349</td>
<td>1.41%</td>
</tr>
<tr>
<td>Texas</td>
<td>700</td>
<td>2.83%</td>
</tr>
<tr>
<td>Kansas</td>
<td>178</td>
<td>0.72%</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>140</td>
<td>0.57%</td>
</tr>
<tr>
<td>Virginia</td>
<td>533</td>
<td>2.16%</td>
</tr>
<tr>
<td>Oregon</td>
<td>18</td>
<td>0.07%</td>
</tr>
</tbody>
</table>

The total migration status of Kentucky can be seen in Table 4.3. After receiving 24,702 college degree holders from other states and sending 18,629, Kentucky saw an estimated brain gain of 2,930 college degree holders. If you add in those who moved to
Kentucky from abroad that number jumps to 6,073, but this figure cannot be relied upon as accurate considering there are no data for how many Kentuckians moved abroad. As illustrated in figure 2.1, much of this gain was in the golden triangle region of the state.

Table 4.3: Net gain of college degree holders

<table>
<thead>
<tr>
<th>Moved to Kentucky</th>
<th>Moved From Kentucky</th>
<th>Net Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excluding Abroad</td>
<td>21,559</td>
<td>18,629</td>
</tr>
<tr>
<td>Including Aboard</td>
<td>24,702</td>
<td>18,629</td>
</tr>
</tbody>
</table>

The following map (Figure 3) is a visual perspective of the patterns above. Red states represent receivers, and blue states represent senders. The darker the color the more were sent or received (respectively). Perhaps the most interesting aspect if this map is the lack of net transfer either way in a large block of the western states, specifically Idaho, Montana, Wyoming, North and South Dakota. Parts of New England also showed a relatively balanced human capital trade.

Figure 3: State senders and receivers (net)

The following table (Table 5) shows selected characteristics of several populations involved with migration: those who left the state, those who came to the
state, those who moved within the state, those who did not move and are within the state, and the state’s averages as a whole. These characteristics are weighted using the same “pweight” variable provided by the census from the same five year sample, at a five percent confidence interval.

For the purposes of this paper, the most important characteristic is that of the percentage of each cohort who are college degree holders. The data shows that those who move into and out of the state are significantly more educated (as a percentage of the whole) than those who do not move into and out of the state. They are also more educated than the state average.

We can tell that college degree holding interstate movers are 36 years old on average, approximately 90% to 95% of them are citizens, they bring in an average income of between $26,000 and $28,000 annually and consequentially make well above poverty levels. Approximately 50% of movers are employed in the civilian labor force, with a third of movers being out of the civilian labor force. The remainder of the population is either involved in the military labor force, or is unemployed (just above 8%). Around 80% of interstate movers are white, around 9% are African American, and around 4% are Asian. Finally, around 70% of interstate movers have no children of their own, and roughly 23% have children under the age of 17.

Some major differences to point out amongst these characteristics begin with the average personal income. Emigrants from the state make, on average, $28,224 annually, whereas immigrants to the state make $26,107 annually. Those who moved within make less than either emigrants or immigrants at only $20,777 while those Kentuckians who
did not move at all made more at $30,066 annually. Those who did not move at all (in addition to the state average) were much older than those who moved intrastate or interstate. Non-movers were 48.4 years old on average, intrastate movers were 35.6 years old on average, and emigrants and immigrants were 36.2 and 36.9 years old respectively.

One final particularly interesting difference is associated with marital status. While interstate movers averaged at around 41% married, intrastate movers averaged only 26.6%, in spite of the closeness in average age. Non-movers and the state average were both well into the 50% range for those who are married, but they also had a higher average age, possibly explaining their higher marital status.

Table 5: Selected population characteristics:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Moved From KY</th>
<th>Moved to KY</th>
<th>Moved within KY</th>
<th>Didn't move and in KY</th>
<th>Total KY Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of population with a postsecondary degree</td>
<td>29.8%</td>
<td>26.8%</td>
<td>15.4%</td>
<td>19.4%</td>
<td>19.2%</td>
</tr>
<tr>
<td>Percent of population who are citizens</td>
<td>94.9%</td>
<td>89.5%</td>
<td>97.0%</td>
<td>98.2%</td>
<td>97.7%</td>
</tr>
<tr>
<td>Age</td>
<td>36.2</td>
<td>36.9</td>
<td>35.6</td>
<td>48.4</td>
<td>46.7</td>
</tr>
<tr>
<td>Personal Income (annual, mean)</td>
<td>$28,224</td>
<td>$26,107</td>
<td>$20,777</td>
<td>$30,066</td>
<td>$28,962</td>
</tr>
<tr>
<td>Personal Earnings (annual, mean)</td>
<td>$24,393</td>
<td>$22,496</td>
<td>$17,761</td>
<td>$23,072</td>
<td>$22,513</td>
</tr>
<tr>
<td>Poverty to Income Ratio</td>
<td>269.6%</td>
<td>248.0%</td>
<td>214.1%</td>
<td>299.6%</td>
<td>288.4%</td>
</tr>
<tr>
<td>Male</td>
<td>52.3%</td>
<td>53.6%</td>
<td>49.6%</td>
<td>48.1%</td>
<td>48.4%</td>
</tr>
<tr>
<td>Female</td>
<td>47.7%</td>
<td>46.4%</td>
<td>50.4%</td>
<td>51.9%</td>
<td>51.6%</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>40.6%</td>
<td>41.2%</td>
<td>26.6%</td>
<td>58.3%</td>
<td>54.8%</td>
</tr>
<tr>
<td>Widowed</td>
<td>3.4%</td>
<td>3.4%</td>
<td>3.9%</td>
<td>7.9%</td>
<td>7.4%</td>
</tr>
<tr>
<td>Divorced</td>
<td>13.2%</td>
<td>12.1%</td>
<td>13.1%</td>
<td>12.7%</td>
<td>13.2%</td>
</tr>
<tr>
<td>Separated</td>
<td>4.1%</td>
<td>3.4%</td>
<td>3.8%</td>
<td>1.8%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Never Married</td>
<td>38.7%</td>
<td>40.0%</td>
<td>52.6%</td>
<td>19.3%</td>
<td>22.4%</td>
</tr>
</tbody>
</table>
### Employment Status

<table>
<thead>
<tr>
<th>Employment Status</th>
<th>2001%</th>
<th>2002%</th>
<th>2003%</th>
<th>2004%</th>
<th>2005%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civilian, at work</td>
<td>52.9%</td>
<td>48.8%</td>
<td>53.7%</td>
<td>55.3%</td>
<td>55.0%</td>
</tr>
<tr>
<td>Civilian, with a job, not at work</td>
<td>1.4%</td>
<td>1.1%</td>
<td>1.8%</td>
<td>1.5%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>8.3%</td>
<td>8.5%</td>
<td>8.3%</td>
<td>4.2%</td>
<td>4.8%</td>
</tr>
<tr>
<td>Armed Forces, at work</td>
<td>5.7%</td>
<td>6.9%</td>
<td>0.4%</td>
<td>0.3%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Armed forces, with a job, not at work</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Not in labor force</td>
<td>31.7%</td>
<td>34.7%</td>
<td>35.8%</td>
<td>38.8%</td>
<td>38.2%</td>
</tr>
</tbody>
</table>

### Race

<table>
<thead>
<tr>
<th>Race</th>
<th>2001%</th>
<th>2002%</th>
<th>2003%</th>
<th>2004%</th>
<th>2005%</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>84.5%</td>
<td>79.3%</td>
<td>84.2%</td>
<td>90.8%</td>
<td>89.8%</td>
</tr>
<tr>
<td>African American</td>
<td>8.3%</td>
<td>10.9%</td>
<td>11.0%</td>
<td>6.6%</td>
<td>7.2%</td>
</tr>
<tr>
<td>American Indian</td>
<td>0.2%</td>
<td>0.4%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Alaska Native</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Specified American or Alaskan Tribes</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Asian</td>
<td>3.6%</td>
<td>4.0%</td>
<td>0.9%</td>
<td>0.9%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Hawaiian and Pacific Islander</td>
<td>0.1%</td>
<td>0.4%</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Some other race</td>
<td>2.0%</td>
<td>3.1%</td>
<td>1.7%</td>
<td>0.6%</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

### Policy Recommendations

If the goal of policymakers is to foster economic development, then one of the ways they can accomplish this goal is to increase the state’s human capital (Barro, 2001).

In relation to the issue of brain drain, and this paper, policymakers would want to find ways to retain the human capital that has been developed, and to attract further human capital from out of state.
As mentioned before, people make decisions to move based on a number of factors; the primary factor I focused on was the concept of matching. To review, authors like Borjas, Rauch, Glaeser and Berry all concluded that the return on the investment of human capital incentivizes individuals to move where that return can be maximized. One of the ways highly educated individuals can do that is to move where their skills will be matched by those of their coworkers. Because those co-workers have a comparable skill level, both benefit from higher levels of production, which is more likely to lead to higher wages than their previous residence.

When looking at PUMA concentrations of college degree holders and net migration patterns, I found that there was a strong correlation between the college attainment of those who moved to a PUMA, and the concentration of college degree holders in that PUMA. This in no way proves that there is a causal relationship, but it does indicate that some relationship exists. In this way, the theory on matching can apply to Kentucky.

The Status Quo

Applying the concept of matching to the data, one major recommendation would be whether to work to maintain the status quo. The studies mentioned earlier from Patrick Kelly, and Zhang and Ness indicate that the rate of college degree production in Kentucky is increasing, and that merit-based scholarships are useful in ensuring that the better students remain in state. The studies from Groen and Perry go further in stating that the majority of students who attend college in-state remain in that state after graduation. Kentucky offers a merit-based scholarship to in-state students in the form of the Kentucky Educational Excellence Scholarship for this reason. So from matching theory,
it follows that the increase in human capital attributed from ongoing retention and degree production programs should result in the attraction of more highly skilled workers.

*Concentration in the Golden Triangle*

Concentrating the human capital we *do* have is also an option for becoming more attractive to outside college degree holders; the golden triangle is an obvious component for this approach. Because half of the top ten sending states are north of Kentucky, and half are bordering states, perhaps targeted advertising campaigns in those states and along the Ohio River border about the Bluegrass Region’s industry, workforce, and amenities would reinforce preexisting notions. Again, consistent with the principle of matching, the concentration of labor should then attract college degree holders to central Kentucky.

As the concentration of college degree holders increases in this region, incentives to out-migrate might decrease among the preexisting college degree holders. Production and wage increases resulting from the higher overall human capital would, in this scenario, raise Kentucky’s wage-earning potential relative to its competing states (i.e. Tennessee, Georgia, etc.).

*Workforce Development Strategies*

Another method of increasing the skill level of Kentucky’s workforce, and therefore attracting more college degree holders, would be to increase the state’s workforce development efforts. The Kelly study mentioned in my literature review showed that Kentucky had a college degree attainment level of 33.7% for those 25-44 in 2009, but when you extend the age range to 25-65 it drops to 30.5% (Kelly, 2011). While
unemployment levels are still high at 8.2% (Bureau of Labor Statistics, 2012) degree completion programs have a unique opportunity to thrive.

Policymakers may not view non-traditional degree completion programs as high of a priority as initial degree production, but there are some ways it could be accomplished. One option would be for local Workforce Investment Boards (WIB) to offer grant money for individuals to complete an unfinished degree. This grant money could be competitively awarded for individuals who meet certain criteria, like being over the age of 40, only needing so many credits to complete a degree, etc. Another option would be to work with local community and technical colleges to place older, unemployed workers into degree programs that align their preexisting skills to those local businesses are seeking.

**Limitations and Further Research**

By using the five year sample from the ACS, I was able to analyze all of Kentucky’s geographic regions. Using a five year sample also means using a total combined sample size of 343,300. Because of this I had to weight the responses to better reflect the characteristics of the population (which is over 4 million) using estimates rather than the raw data. Because I used estimates specified for Kentucky, the results are only generalizable for this state, and should not be applied nationally, or for other states.

Many of the states that Kentucky lost college degree holders to were to the south. Tennessee, Georgia, and South Carolina collectively received 1,393 more college degree holders from Kentucky than they sent to Kentucky. In 2000, the Council on Postsecondary Education, in cooperation with the Department of Transportation,
conducted a survey of individuals who graduated from Kentucky colleges and Universities, including those that left the state (CPE Special Report 07.1, 2007). A similar study in the future might be able to determine what specifically drew individuals southward.

Also, due to the nature of the unrestricted ACS data, I was unable to break down the migration patterns by year. Obviously the period of time between 2006 and 2010 was among the most economically volatile in our nation’s history. This volatility almost certainly had an effect on the decisions for whether or not to move amongst all Americans, not just college degree holders. However, I feel that because the time frame of my data spans both the good times from 2006 to mid-2008 and the hard times from mid-2008 to 2010, much of this variability is lost in the averages, so the data remains reliable.

This paper’s intent was only to determine whether Kentucky experienced a brain gain or a brain drain, not to explain why people decided to out-migrate or in-migrate. This, however, is a tantalizing question, and would be an excellent topic for future research. Another topic of interest would be to obtain more restrictive data that could show a difference from year to year in migration patterns in order to determine what variance occurred, if any, between pre-recession and post-recession years.

Finally, if it were possible to track a panel of individuals who moved into and out of the state, gauging the change in characteristics, particularly economic variables, would be able to determine whether there was an advantage to moving into or out of the state.
All of these topics would present policymakers with better information when advocating for better economic growth conditions.

**Conclusion**

The question of whether or not Kentucky is able to retain and attract college degree holders is primarily a question about its economic development potential. Literature has shown that a highly skilled workforce is important for economic development, and that the loss of that workforce damages the potential for economic growth.

Keeping this in mind, I can say that Kentucky has not been damaged through the out-migration of college degree holders. On the contrary, it was able to attract nearly 3,000 college degree holders net of those that left the state over the course of five years, in addition to increasing the number of college degree holders through degree production. If the principle of matching is in fact true, the state should continue its current course of action, and even increase programs targeted at developing the workforce and retaining high-performing students.

Even though Kentucky has been able to retain and attract students on the whole, it has not been able to do so consistently. The Public Use Microdata Areas in central and northern Kentucky have been very successful in college degree holder attainment and attraction, with only one exception. The eastern and western PUMAs, however, have not been successful in attracting and retaining college degree holders and even lost that segment of the population over the five-year period. In this knowledge, policymakers can choose whether to use an asset-based development strategy, or a needs-based
development strategy. If they would prefer to build on assets, then those PUMAs should be allowed to maintain their current course of losing college degree holders, and focus rather on central and northern Kentucky. Conversely, if policy-makers prefer a needs-based approach, then it is obvious that these regions will require substantial investment in workforce development and higher education.
Works Cited


