The Effect of Non-Resident Enrollment Growth on In-State College Students

Diyi Li

June 2018

I use student-level administrative data from a state flagship university to study the effect of changes in non-resident enrollment on in-state student outcomes. I leverage within-major and cross-time variation in non-resident enrollment using a differences-in-differences framework. I find no evidence of negative effects of non-resident enrollment growth on third-year persistence or performance outcomes for in-state students. Moreover, there is no effect heterogeneity by in-state student gender or race. There is some evidence of effect heterogeneity when I split total non-resident enrollment into (a) out-of-state domestic enrollment and (b) foreign enrollment. Specifically, the results reveal no adverse effects of out-of-state domestic enrollment growth on in-state students for any outcome measure. However, although it is modest in magnitude, there is some evidence that increasing foreign enrollment has negative effects on the postsecondary persistence of in-state students.

Acknowledgments: I thank the Missouri Department of Higher Education for providing access to data, Mark Ehlert for research support, and Brad Curs, Gabriel Gassmann, David Kaplan, Cory Koedel, and Peter Mueser for feedback on earlier drafts. All errors are my own.

1. Introduction

A historically large number of non-resident, i.e., out-of-state domestic and foreign students, have matriculated into public universities across the United States in the last decade.[1] This has drawn attention from national media and sparked debates among policy makers about who should attend public universities (Anderson and Douglas-Gabriel, 2016; Courdriet, 2016; Loudenback, 2016; Powell, 2016). Public universities have traditionally prioritized in-state students, which is consistent with state appropriations being a primary source of revenue. However, between 2004 and 2014, the total number of in-state students only grew by 3 percent at the 50 state flagship universities.[2] During this same period, the number of out-of-state students increased by 47 percent and the number of foreign students rose by 244 percent.[3]

The magnitude of non-resident enrollment growth is changing the composition of students at public universities and may impact the educational experiences and attainment of in-state students. On one hand, non-resident students provide valuable tuition revenue, which could benefit in-state students by improving per-student resources.[4] On the other hand, the influx of out-of-state and foreign students could bring stronger competition and make in-state students worse off. Policy

---

[1] Non-resident students are identified on the basis of public institutions' fee assessment policies. There are two types of non-resident students that are referred to separately in this paper, i.e., out-of-state domestic students and foreign students.

[2] Based on the author's calculation using the Integrated Postsecondary Education Data System (IPEDS) sample of first-time, degree-seeking undergraduates of 50 state flagship universities. The flagship university for each state is defined as the highest ranked university according to 2017 U.S. News and World Report Best Colleges Ranking.

[3] Meanwhile, there has been a national shift away from state appropriations as the primary source of funding for public universities. From fiscal year 2004 to 2014, state appropriations for flagship universities grew by 19 percent. During the same period, revenues from tuition and fees increased markedly, by 124 percent. As a result, tuition and fees revenue exceeded state appropriations for flagship universities in 2010 and the gap between them continues to grow. This is based on the author's calculation using IPEDS data on state appropriations and tuition and fees (after deducting discounts and allowances). The data are not adjusted for inflation.

[4] Non-resident undergraduate students pay a significantly greater amount of tuition and fees than in-state students at public universities. In the 2015/16 academic year, tuition and fees for non-resident students at 50 flagship universities is on average 2.6 times as much as that for in-state students. This is based on the author's calculation using IPEDS data on tuition and fees for full-time, first-time undergraduate students (academic year programs) by student residency in the 2015/16 academic year.

makers have shown contrasting preferences. In states such as California and Virginia, state legislators have pressured public universities to limit non-resident enrollment growth to protect the interests of taxpayers (Bellows, 2017; Watanabi, 2017). In contrast, in Missouri, public universities have been encouraged to increase non-resident enrollment to generate revenue (Huguelet, 2017). To date there is little evidence on how non-resident enrollment growth affects in-state college students to inform this debate.

The influx of out-of-state and foreign students at the undergraduate level has been carefully documented in recent research (Bird and Turner, 2014; Bound et al., 2016; Jaquette and Curs, 2015; Jaquette et al., 2016; Rizzo and Ehrenberg, 2004).[5] Additionally, researchers have modeled the domestic and global market conditions for public universities that are related to enrollment changes (Cooke and Boyle, 2011; Hoxby, 1997; Kato and Sparber, 2013; Rosenzweig, 2006; Shih, 2015). In terms of the impact of non-resident enrollment growth on in-state student outcomes, there are just a small number of studies. Only a few studies aim to estimate the effects of either out-of-state (Curs and Jaquette, 2017) or foreign (Anelli et al., 2017; Machin and Murphy, 2014; Shen, 2016) undergraduate enrollment growth, and even fewer make use of administrative microdata.[6] Studies to date have relied heavily on institutional data and focus primarily on initial enrollment as the key outcome of interest for in-state students; i.e., whether non-resident

[5] A number of relevant studies also focus on foreign enrollment growth at the graduate level (Borjas, 2007; Bound et al., 2009; Shih, 2016), or the K-12 level (Betts, 1998; Betts and Fairlie, 2003; Figlio and Ozek, 2017).

[6] Evidence on how non-resident enrollment affects in-state students is mixed. Anelli et al. (2017) find adverse effects of foreign enrollment on native students' likelihood of graduating in STEM fields. Machin and Murphy (2014) find no evidence of foreign enrollment crowding out native undergraduate students. Using IPEDS data, Curs and Jaquette (2017) show that out-of-state enrollment growth does not affect in-state enrollment at their full sample of public universities. However, it does crowd out in-state enrollment at the most selective public universities. Similarly, Shen (2016) also uses IPEDS and finds no crowd-out effect of foreign enrollment at public universities overall, but for higher-ranked public universities the crowd-out effect is significant.

enrollment crowds out resident enrollment at the point of entry (Anelli et al., 2016, is an exception—they study how foreign enrollment growth affects domestic major choice).

In this study, I use student-level administrative data of first-time, degree-seeking, full-time students who entered University of Missouri-Columbia (MU) between 2004 and 2014 as college freshmen to study the effect of compositional shifts in the student body by resident status on in-state student outcomes. MU is currently ranked 29th among state flagship universities by U.S. News and World Report.[7] Also, as of 2014, it had the 19th highest out-of-state enrollment share and the 25th highest foreign enrollment share among flagship universities.[8] MU's place in the middle of the distribution along these dimensions implies some degree of generalizability of my findings to a broad group of similar universities, particularly the 50 state flagships.

MU rapidly increased out-of-state enrollment beginning in fall-2008 and later expanded its recruiting efforts to foreign students in fall-2012. The characteristics and pre-entry qualifications of in-state students remain unchanged over the timespan of my data panel, as does the in-state share of high school graduates matriculating to MU. This suggests that the compositional shifts do not appear to hamper in-state students' access to MU, which is consistent with existing studies (Curs and Jaquette, 2017; Machin and Murphy, 2014; Shen, 2016), and facilitates my analysis of the effects of non-resident enrollment growth on in-state student outcomes during college.

To study the causal effects of non-resident enrollment growth on in-state student outcomes, I use continuous treatment differences-in-differences specifications that leverage within-major and cross-time variation in non-resident enrollment for identification. Validation tests of the identifying assumptions do not uncover evidence of violations. I also embed an instrument for the

---

[7] According to 2017 U.S. News and World Report Best Colleges Ranking.
[8] Based on the author's calculation using IPEDS data of 2014 first-time, degree-seeking freshmen.

non-resident enrollment share in each major in my differences-in-differences specification, based on the predicted major-level enrollment of three residency groups (i.e., in-state, out-of-state and foreign) prior to the non-resident enrollment "boom" at MU. The instrument addresses the possibility that academic departments' non-resident enrollment growth is endogenous.

I find no evidence of negative effects of non-resident enrollment growth on the third-year persistence or performance outcomes for in-state students at MU. This result is robust to a variety of different model specifications and sample modifications. Additionally, a comparison of treatment effects by gender and race suggests non-resident enrollment growth does not particularly benefit or hurt female or minority in-state students. To explore the potential for effect heterogeneity depending on the type of non-resident student, I also separate the total non-resident enrollment share into its out-of-state and foreign components. The results reveal no adverse effects of out-of-state domestic enrollment growth on in-state students, and some results show small positive effects. The evidence on foreign students rules out substantial adverse effects, especially on performance outcomes. However, although modest in magnitude, there is some evidence that increasing foreign enrollment has negative effects on the postsecondary persistence of in-state students.

My study contributes to the literature in the following ways. First, my detailed data allow me to evaluate the impact of non-resident enrollment growth on various educational outcomes of in-state students beyond the point of entry, which extends most studies in the literature. Additionally, to the best of my knowledge, this paper is the first to study out-of-state and foreign enrollment growth jointly. Descriptive statistics reveal substantial differences in the demographics, academic aptitude and initial major choice of students by residency status, especially between out-of-state and foreign students. This is consistent with the effect heterogeneity on in-state students implied by my analysis.

2. Non-resident enrollment growth at MU

MU rapidly increased out-of-state domestic enrollment beginning in fall-2008, and later expanded its recruiting efforts to foreign students in fall-2012. To promote the MU brand domestically, the university appointed regional representatives dedicated to recruiting high school students graduating out of specific geographic areas. The first two regional representatives were assigned in 2008 to cover two key areas in nearby states; now MU has more than ten regional representatives.[9] These representatives regularly meet with local high school principals and students to pitch the university. One particularly favorable policy MU leverages is the lenient Missouri residency requirement. According to the Missouri Student Residency Requirement originally effective in 1979, a non-resident student can establish Missouri residency as soon as 12 months after arrival (Missouri Department of Education, 2017). This would subsequently allow the student to pay the in-state tuition rate, reducing the total cost for an out-of-state student to earn a degree at MU.[10] Although the Missouri residency policy limits the maximum amount of tuition revenue that can be generated from out-of-state enrollment, MU still benefits financially from enrolling more out-of-state students.[11] More importantly, the policy makes MU more competitive on the domestic market of public universities, potentially swaying out-of-state students on the

[9] The two MSAs are Chicago, IL and Dallas, TX, according to the MU admission office.

[10] In the 2015/16 academic year, tuition and fees for non-resident students at MU are 2.6 times as much as those for in-state students. This is based on the author's calculation using IPEDS data on price of attendance for full-time, first-time undergraduate students (academic year programs) by student residency in the 2015/16 academic year.

[11] For instance, assuming an out-of-state freshman entered MU in 2012, converted to Missouri residency after freshman year, and graduated after four years, this student would have spent 1.4 times as much tuition and fees as an in-state student would have, who also entered MU in 2012 and graduated after four years. This is based on the author's calculation using IPEDS data on price of attendance for full-time, first-time undergraduate students (academic year programs) by student residency between the 2012/13 and 2015/16 academic year.

margin to come to MU.[12] Additionally, MU established merit-based scholarships exclusively for out-of-state students. Previous studies show that financial incentives significantly affect a student's decision on whether or not to enroll in an out-of-state university (Abraham and Clark, 2006; Burd, 2015).

For foreign student recruiting, MU established the office of international admissions in 2011 as part of the non-resident enrollment growth plan. It then began to regularly send out international recruiting representatives to foreign countries such as China, which exports a large number of students into the U.S.. Similar to recruiting out-of-state students, MU offers preferential financial incentives for foreign students. In addition to merit-based scholarships, MU also uses the same pricing for foreign and out-of-state students, although foreign students are not eligible for Missouri residency during their stay.[13] Foreign high schoolers are not required to take the ACT or SAT to apply to MU. Admission of foreign students depends on English-language tests and the most recent four years of coursework.[14] With these appealing features for foreign students, MU has experienced substantial growth in foreign enrollment since 2012. Based on a report from the MU International Center, the total number of foreign undergraduate students reached 1,000 for the first time during the 2015/16 academic year (MU International Center, 2016).

Figure 1 provides an overview of first-time, degree-seeking, full-time freshman enrollment at MU between fall-2004 and fall-2014. Total numbers of freshmen by year are shown in Panel A,

[12] For instance, a 2012 freshman out of Illinois who graduated after four or more years would have spent more on tuition and fees at the University of Illinois at Urbana-Champaign as an in-state student than she/he would have at MU if she/he converted to Missouri residency successfully after freshmen year. This is based on the author's calculation using IPEDS data on price of attendance for full-time, first-time undergraduate students (academic year programs) by student residency between the 2012/13 and 2015/16 academic year.

[13] Out-of-state students and foreign students often face different pricing scheme at public universities. Tuition and fees for foreign students are higher than for out-of-state students at institutions such as Iowa State University: http://financialaid.iastate.edu/cost/cost-of-attendance.php.

[14] Foreign students who do not meet the language test score requirement of MU participate in the Intensive English Program and are not fully admitted to MU.

and the data are further broken out by residency in three additional panels. The data demonstrate that the overall enrollment growth at MU between 2004 and 2014 is predominately driven by non-resident enrollment growth, and out-of-state enrollment growth in particular. Over the timespan of my data panel, out-of-state freshman enrollment shares grew from less than 20 percent to almost 40 percent. In terms of foreign students, Panel D shows their numbers and enrollment shares experience a minor increase in 2008, a dip in 2010, and significant growth since 2012.[15] In fact, foreign enrollment doubled over a 3-year period between 2012 and 2014.

Panel B of Figure 1 shows that the number of in-state students enrolling annually fluctuates around 3,800 over the data panel, while in-state enrollment shares decline significantly. It is unclear, however, if in-state students are crowded out at entry since findings in Figure 1 are conditional on enrollment at MU. To investigate the possibility of crowd-out at entry, which would have significant implications for my ability to estimate the effect of non-resident enrollment on in-state student outcomes during college, I compare the total number of freshmen at MU between 2004 and 2014 with the number of Missouri high school graduates from the previous academic year. As shown in Figure 2, the in-state share of high school graduates matriculating to MU is flat between 2004 and 2014. Furthermore, Figure 2 shows the shares by gender and race, which are also flat. Additionally, in Figure 3 I show that the pre-entry qualifications of in-state students remain unchanged over the timespan of my data panel. The empirical evidence suggests that the influx of non-resident students did not impact in-state admissions at MU.

[15] Per the MU office of international admissions, the moderate increase in the foreign enrollment that occurred in 2008 was likely the side effect of the initial recruiting efforts for out-of-state students around that time. MU did not target foreign enrollment growth at any time before the establishment of the office of international admissions.

3. Data

I use administrative data provided by the Missouri Department of Higher Education (DHE) for my empirical analysis. The data contain student-level information including pre-entry background characteristics, qualifications and in-college outcomes.[16] The data are updated annually, which allows me to track each student over time as long as she/he remains in the Missouri public system. This study focuses on first-time, degree-seeking, full-time students who entered MU between fall-2004 and fall-2014 as college freshmen.

I define three residency groups: in-state, out-of-state and foreign students. A student's residency is identified by the geographic origin of that student at the time of initial admission to MU. Table 1 shows the descriptive statistics for my sample. In-state students comprise my primary analytic sample, while out-of-state and foreign students—non-resident students—enter regression models as treatments. Although they are not part of the analytic sample, I report the descriptive statistics of out-of-state and foreign students in Table 1 to aid in the interpretation of my findings below.

Treatment is defined by exposure to non-resident students in an in-state student's prospective major. College students interact with their same-major peers most frequently, and non-resident enrollment growth most likely impacts in-state students through these interactions within

[16] The data include students' high school percentile rank and ACT scores, among other pre-entry qualification measures. According to previous studies, high school percentile rank and college entrance exam scores are strong predictors of a student's success in college (Arcidiacono and Koedel, 2014; Betts and Morrell, 1999). Therefore, including pre-entry qualifications in regression models is useful for removing selection bias that is caused by differential qualifications across individual students.

a major.[17] Overall, I identify 54 majors in the data.[18] The treatment variable is measured by the non-resident enrollment share of each in-state student's initially identified major; i.e., the major a student declares upon entry at MU.[19] Five third-year educational outcomes are assessed to evaluate the effect of exposure to non-resident enrollment on in-state students. The two performance measures, cumulative credit hours and cumulative GPA, are continuous variables. The three persistence measures, remaining enrolled in the same major at MU, remaining enrolled at MU, and remaining enrolled at any Missouri public system campus, are binary variables.[20] The outcome data are retrieved at the beginning of a student's third year in the Missouri public system.[21]

Using third-year outcomes instead of completion outcomes makes it possible to incorporate more cohorts of students into my analysis, including the most recent cohorts who have been exposed to the rapid foreign enrollment growth at MU.[22] It also increases the statistical power of the regression models by including more cohorts. Third-year data also offer a good indication of a student's path toward graduation. This is because transfers are more frequent among freshmen and

---

[17] I identify majors based on the Classification of Instructional Program (CIP), which is a taxonomic scheme developed by the U.S. Department of Education's National Center for Education Statistics (NCES). Specifically, I aggregate majors at the 4-digit CIP code level.

[18] Sparsely populated majors are dropped from the analytic sample, i.e., those with less than 50 total in-state students between 2004 and 2014. These majors are too small to draw accurate inferences from. This restriction removes 24 majors and 592 in-state students.

[19] The initially identified major upon entry is best described as an "intended" major in that students are not formally required to follow through with their initial major choice.

[20] There are 13 public university campuses in the state of Missouri.

[21] If a student's third-year data are unavailable due to early exit from the Missouri public system, her/his performance outcomes are retrieved instead from second-year data, or from first-year data if second-year records are also unavailable.

[22] The latest update that is made available by Missouri DHE includes the completion data of the 2015-16 academic year. This means that the 2010 freshman class is the last cohort that can be used to evaluate completion outcomes, assuming I follow the convention of considering students who graduate within six years. However, MU did not begin seeking foreign enrollment expansion until fall-2012. Therefore, there would be no in-state cohort exposed to the foreign enrollment growth at MU if I were to use completion outcomes.

sophomores, and most students have settled on a degree program by the beginning of their junior year.[23]

Descriptive statistics for the three residency groups are provided separately in Table 1, including demographics, pre-entry and in-college academic aptitude, initial STEM major share, and major-level enrollment. For the analytic sample—i.e., in-state students—I also report the sample averages for their third-year educational outcomes over the course of the full data panel. In terms of demographics, out-of-state students are more racially diverse than in-state students. Most notably, black representation among out-of-state students is 14 percent, which is twice as large as among in-state students. Although racial designation is not available for foreign students, who are simply coded as non-resident aliens in the data, supplementary data show that MU hosts foreign students from more than 100 countries around the world, which contributes to both geographic and racial diversity on campus.

In terms of pre-entry qualifications, out-of-state students mildly outperform in-state students on all three measures on average (ACT math scores, ACT English scores and high school percentile rank). Previous studies show similar results using institutional-level SAT data (Groen and White, 2004; Jaquette et al., 2016).[24] I also show comparisons of ACT scores and class ranks for foreign students, but as noted in the table, the vast majority of foreign students do not have any pre-entry qualification data (recall from above that MU is test-optional for foreign undergraduate

[23] Among ultimate bachelor degree recipients who entered MU between 2004 and 2010, 89 percent completed a degree in the major at MU in which they registered at the beginning of their third year.
[24] Groen and White (2004) use their results to demonstrate that public universities set differential admission criteria that favor in-state students. This is not true for MU, which has the same admission standard for all domestic, undergraduate students.

applicants). I do not draw strong inference from comparisons involving the small fraction of foreign students with pre-entry qualification data due to concerns about sample selection. [25]

Given the missing pre-entry qualification data for most foreign students, in Table 1 I also compare student preparedness by residency status using standardized first semester GPAs, which are available for most MU students including foreign students.[26] The GPA comparisons reveal that foreign students are by far the most positively selected among the three residency groups. Table 1 also shows differential major choice patterns among residency groups. Foreign students are more likely than domestic students to choose STEM majors initially, which is in line with national data (National Science Board, 2014).[27] Out-of-state students are less concentrated in STEM fields than in-state students; a potential explanation is that MU has several highly-regarded non-STEM majors that may draw broad interest (most notably Journalism).

Finally, Table 1 also reports statistical differences between the two non-resident groups. The statistical tests confirm the visually apparent differences in demographics (gender), academic aptitude, and initial major choice. This hints at the possibility of effect heterogeneity based on the type of non-resident student to which in-state students are exposed.

4. Empirical strategy

I leverage within-major and cross-time variation to identify the causal effects of changing non-resident enrollment on the outcomes of in-state college students. My main model is a continuous treatment differences-in-differences regression:

---

[25] Anelli et al. (2017) use the administrative data of a public university in California and show that foreign students have higher average SAT math scores and lower average SAT verbal scores than their domestic peers.
[26] Standardized First Semester GPA is the residual generated from regressing first semester GPA on major and year fixed effects.
[27] I match the CIP codes to the STEM Designated Degree Program list to recognize STEM and Non-STEM majors in the data (Department of Homeland Security, 2016).

$$Y_{ijt} = \beta_0 + \beta_1 ShareNR_{jt} + \mathbf{X_{ijt}\gamma} + \delta_j + \varphi_t + \varepsilon_{ijt} \quad (1)$$

In Equation (1), Y_{ijt} is an outcome variable for in-state student *i* who initially enters MU with major *j* in year *t*. As stated in Section 3, five third-year outcomes of in-state students are assessed using equation (1). Two performance measures, cumulative credit hours and cumulative GPA, are continuous variables; the three persistence measures at the major, university and system level, are binary variables.[28] $ShareNR_{jt}$ is the treatment variable. It measures the non-resident enrollment share in major *j* and year *t*. Specifically, $ShareNR_{jt} = \left(\frac{OOS_{jt} + F_{jt}}{IS_{jt} + OOS_{jt} + F_{jt}}\right) * 100$, where IS_{jt}, OOS_{jt} and F_{jt} denote the number of in-state, out-of-state and foreign students, respectively, in major *j* and year *t*. $\mathbf{X_{ijt}}$ is a vector of individual student characteristics for in-state student *i*, including gender and race indicators, ACT math and English scores, and the high school percentile rank. Female and white students are the omitted groups. The model also includes missing-value indicators in cases where ACT scores and/or high school rank are not available. δ_j and φ_t are major and year fixed effects and ε_{ijt} is an idiosyncratic error term. The standard errors are clustered at the major level to account for heteroscedasticity and within-major correlation of the errors.

The model relies on within-major variation over time in the non-resident enrollment share for identification. Major fixed effects eliminate bias from time-invariant factors of majors. At the same time, year fixed effects account for common shocks to all majors over time. The model provides credible estimates of treatment effects on in-state students as long as there are no dynamic biasing factors within majors. The coefficient of interest is β_1, which is the differences-in-differences parameter. Conceptually, it is important to recognize that the estimates from Equation

[28] For the persistence measures, Equation (1) is specified as a linear probability model.

(1) capture the "total treatment effects" of the exposure to non-resident students on the outcomes of in-state students; i.e., the estimates embody all of the systematic differences in educational experience that come with changes in non-resident enrollment.

Next I expand the model by separating total non-resident enrollment into the out-of-state and foreign enrollment shares. This allows me to explore the potential for effect heterogeneity. The expanded version of the main model is specified as follows:

$$Y_{ijt} = \gamma_0 + \gamma_1 ShareOOS_{jt} + \gamma_2 ShareF_{jt} + \mathbf{X_{ijt}}\boldsymbol{\rho} + \delta_j + \varphi_t + \epsilon_{ijt} \quad (2)$$

In Equation (2), the recurring variables follow the same definition as in Equation (1). The two treatment variables are $ShareOOS_{jt}$ and $ShareF_{jt}$, which measure the out-of-state and foreign enrollment shares at the major level, respectively. The identifying assumptions for Equation (2) are the same as in Equation (1).

There are three key endogeneity concerns with these models. First is the possibility that non-resident enrollment growth crowds out in-state students at the point of entry into MU. If matriculating more non-resident students affects which in-state students enroll, then the estimates from Equations (1) and (2) will be potentially biased by sample selection. But as noted above, there is no evidence of a change in the admissions of in-state students over the course of my data panel. Figures 2 and 3 show that in-state student characteristics and pre-entry qualifications remain unchanged over the course of the data panel, as does the share of Missouri high school graduates matriculating to MU.

The second concern is the potential for endogenous sorting of in-state students to majors in response to changing non-resident enrollment. Conceptually, such sorting seems unlikely. Incoming freshmen are required to specify a major before taking any classes on campus. Therefore, they should not possess information about peer composition, which is necessary for endogenous sorting prior to entry. To provide empirical evidence on observed dimensions, I follow Anelli et al. (2017) and Figlio and Ozek (2017) by performing validation tests to evaluate the correlation between in-state student characteristics and major-level non-resident enrollment. Specifically, I replace the in-state student outcomes in Equation (1) with observable characteristics that should not change in the absence of endogenous sorting to majors based on non-resident enrollment growth, and estimate the model with major and year fixed effects. The results are reported in Table 2. Overall, there is one coefficient that is estimated to be significantly different from zero across eleven student characteristics. Using this result as evidence for endogenous sorting of in-state students can be misleading, because statistical significance could happen purely by chance with multiple hypothesis testing. Therefore, I follow Cullen et al. (2006) and Koedel et al. (2017) by performing a "randomized-inference test" to determine the probability of observing at least one statistically significant estimate by chance in this exercise.[29] The overall p-value from this test is 0.74, as reported in Table 2, which indicates that the likelihood of observing at least one statistically significant estimate at the 10 percent level by chance is quite high.[30] Thus, in addition to being intuitively unlikely, there is no empirical evidence of in-state student sorting to majors at entry in response to changes in non-resident enrollment.

[29] Specifically, I divide the data vertically into two subsets. The first subset contains major-level non-resident enrollment share, and the other subset contains in-state student characteristics. Then the order of the first subset is reshuffled and reconnected to the second subset so that each in-state student is randomly re-assigned with a major-level non-resident enrollment share. Covariance structure between student characteristic variables is kept unchanged in the second subset so that results generated by a reconstructed sample are comparable with the real data. I then perform validation tests for a reconstructed sample and store the number of statistically significant estimates at the 10 percent level. I repeat this procedure 3,000 times to construct an empirical distribution of statistical significance.

[30] For completeness, I also perform the validation tests for Equation (2) and discover no relationship between in-state student characteristics and major-level out-of-state or foreign enrollment. The results are reported in Appendix Table A.1, where each column shows results from a regression of an in-state observable student characteristic on the major-level out-of-state and foreign enrollment shares as well as major and year fixed effects. Only one coefficient out of 22 is statistically significant, and the "randomized inference test" suggests the overall p-value is 0.94.

The third endogeneity concern relates to academic departments. It is possible that some departments at MU were better positioned to absorb non-resident students as the university was expanding non-resident enrollment. The estimates from Equations (1) and (2) could be biased if major-level variation in non-resident enrollment growth is partly attributed to endogenous responses of departments. To address this concern, I exploit the initial distribution (i.e., the pre-2008 period) of students across majors by residency (i.e., in-state, out-of-state and foreign). Specifically, I instrument for the actual non-resident enrollment share in each major from 2008 onward by allocating total enrollment growth to the three residency groups in proportion to their major-level presence in the pre-2008 period, which is before the ramp-up in non-resident enrollment at MU. To create these instruments, I first predict the number of in-state students in major *j* and year *t* by $IS'_{jt} = IS_{j0} * \left(\frac{IS_t}{IS_0}\right)$. IS_{j0} is the average number of in-state students in major *j* over the pre-2008 period, denoted as the initial period by *t=0*. The growth factor of in-state students across all majors at MU between the initial period and year *t* is represented by $\left(\frac{IS_t}{IS_0}\right)$. Similarly, the numbers of out-of-state and foreign students in major *j* and year *t* are predicted by $OOS'_{jt} = OOS_{j0} * \left(\frac{OOS_t}{OOS_0}\right)$ and $F'_{jt} = F_{j0} * \left(\frac{F_t}{F_0}\right)$, respectively.

Then, using two-stage least squares (2SLS), I estimate the following regressions:

$$ShareNR_{jt} = \alpha_0 + \alpha_1 IS'_{jt} + \alpha_2 OOS'_{jt} + \alpha_3 F'_{jt} + \mathbf{X_{ijt}}\boldsymbol{\theta} + \delta_j + \varphi_t + \mu_{ijt} \quad (3)$$

$$Y_{ijt} = \zeta_0 + \zeta_1 \widehat{ShareNR}_{jt} + \mathbf{X_{ijt}}\boldsymbol{\psi} + \delta_j + \varphi_t + \omega_{ijt} \quad (4)$$

Again, in Equations (3) and (4) the recurring variables follow the same definition as in Equation (1). Because treatment in the instrumental variables (IV) model is predicted by major-level enrollment before university policy changes, the estimates will not be biased by endogenous responses of academic departments along unobserved dimensions during the boom period of non-resident enrollment growth.

The IV model is closely related to the shift share approach used by Card (2001), Card and DiNardo (2000), and Peri et al. (2015). The validity of the instruments relies on the assumption that the pre-2008 distribution of students across majors does not affect educational outcomes of in-state students in the post-2008 period through channels other than by affecting future major-level non-resident enrollment, conditional on other controls in the model.[31] Unfortunately this assumption is not directly testable, but it is intuitive that the initial distribution of students across majors has no direct impact on in-state students who enter MU in later years conditional on the major and year fixed effects.

5. Results

Table 3 shows the effects of changing non-resident enrollment on the outcomes of in-state students, estimated separately by the continuous treatment differences-in-differences model (Panel A) and the IV model (Panel B). Each column shows the effect of a one-percentage-point increase in the non-resident enrollment share on in-state student outcomes, as measured at the beginning of the third year after college entry. The results of the first-stage regression of the IV model are reported in Appendix Table A.2. The coefficients for student characteristics in the *X*-vector are omitted for brevity. Full output from Panel A is reported in Appendix Table A.4.

The coefficients for the non-resident enrollment effects in Panel A are small in an absolute sense and none are statistically significant at conventional levels. Note that the statistical insignificance is not due to lack of precision, as the standard errors are sufficiently small to detect

[31] The post-2008 period includes 2008 and later years.

meaningful effects. For example, the estimate for persistence in the same major at MU, if taken at face value, suggests that a one-standard-deviation increase in the non-resident enrollment share (17 percentage points) decreases the likelihood of in-state students remaining in the same major at MU by just 1.4 percentage points (i.e., -0.0008*17=-0.0136). The sample average of this outcome over the course of the full data panel is reported in Table 1, which is 38 percent. The same increase in non-resident enrollment nominally increases the likelihood of persistence at the university and system levels by 0.7 and 0.2 percentage points, respectively. The sample means of these outcomes are 77 and 86 percent. The insignificant point estimates for cumulative credit hours and GPA are similarly small. Overall, there is no evidence to suggest that changing non-resident enrollment affects in-state student outcomes.

Panel B of Table 3 shows that the IV model yields similar null results, although the estimates are much less precise. The loss of precision is expected given that the model leverages less identifying variation and the instruments are not particularly strong.[32] That said, like Panel A, the results are generally small in magnitude and none are statistically significant. The comparison between Panels A and B suggests endogenous responses of academic departments to university-wide changes in non-resident enrollment are unlikely. If better-positioned academic departments endogenously took up more non-resident students, estimates from the IV model should be more negative than the main results, but this is not the case.[33]

[32] Appendix Table A.2 shows that the first-stage F-statistic is 13.23, which is below the Stock and Yogo (2005) weak identification threshold value of 22 (10% maximal IV size).

[33] In Panel A of Appendix Table A.5 I report the results from analogous continuous treatment model using data from the same years as in the IV model, i.e., 2008-2014 subsample. I also replicate the results from the IV model in Panel B for ease of comparison. Like Table 3, the IV results are not consistently more negative in Appendix Table A.5.

In Table 4 I expand the main model by separating total non-resident enrollment into out-of-state and foreign components.[34] As discussed in Section 3, out-of-state and foreign students differ substantially along observed dimensions. This motivates an assessment of whether there are heterogeneous treatment effects on in-state students, which could have important policy implications. To better gauge the magnitude of effect heterogeneity, I report results from statistical tests of equal effects, i.e., H_0: $\gamma_1=\gamma_2$.

The estimates in Table 4 for exposure to out-of-state domestic enrollment align closely with the main results in Panel A of Table 3. This is unsurprising because most non-resident enrollment at MU is out-of-state domestic enrollment. Specifically, the coefficients on the out-of-state enrollment share in all five models are small and statistically insignificant. For exposure to foreign enrollment the coefficients are invariably negative. The estimates for cumulative credit hours and GPA are small and insignificant, implying that changes in foreign enrollment do not negatively impact in-state students along these dimensions. But the effects on all three persistence measures are negative and statistically significant. For example, a one-standard-deviation increase in the foreign enrollment share (5 percentage points) decreases the likelihood of in-state students remaining enrolled in the same major at MU by 2.5 percentage points. The same increase in foreign enrollment also decreases in-state students' likelihood of persistence at the university and system levels by 1.2 and 1.0 percentage points, respectively. These effects are of limited consequence at MU because the foreign enrollment shares across majors are low (about 1 percent on average). However, the potential for meaningful adverse effects cannot be ruled out if foreign enrollment were to continue to expand.

[34] Having additional endogenous regressors in the IV model further undermines the predictive power of the instrumental variables. Therefore, I do not expand the IV model along this line.

Previous studies have discussed two mechanisms through which non-resident enrollment influences in-state college students (Anelli et al., 2017; Bound et al., 2016; Groen and White, 2004; Jaquette and Curs, 2015; Rizzo and Ehrenberg, 2004; Shen, 2016). One is that the influx of non-resident students brings stronger competition and makes in-state students worse off. The competition effects are likely reflected by the negative coefficients on the foreign enrollment share, considering that foreign students are positively selected (per Table 1). Another mechanism is that non-resident enrollment increases tuition revenue, which can benefit in-state students by improving per-student resources. To further explore changes in per-student resources at MU, in Appendix Table A.3 I compare the numbers and average salaries of faculty between majors that experienced the most and the least out-of-state enrollment growth over the timespan of my data panel. Both the numbers of faculty and the average salaries grew at comparable rates between the groups of majors. Thus, out-of-state enrollment growth does not appear to have significantly improved per-student resources disproportionately in majors that experienced the most growth.[35] This is consistent with the null results for changes in out-of-state domestic enrollment.

6. Robustness

In Table 5 I test the robustness of the main results to specification and sample modifications. For ease of comparison, I reproduce the main estimates from Panel A of Table 3 in Column (1). The first robustness test in Column (2) examines model sensitivity by modifying the preferred specification to include time-varying characteristics of majors. Specifically, I include in-state enrollment, race and gender shares, average ACT math and English scores, and the average

[35] It is important to acknowledge the possibility that in-state students might have benefitted from other types of resource improvement that are not reflected by the measures used in Appendix Table A.3.

high school percentile rank. The results are broadly similar to the main results in Column (1), indicating that the main results are robust to including the time-varying major characteristics.

A related specification adjustment is to drop individual student characteristics from the model. As discussed in Section 4, there is no evidence that in-state students sort to majors at entry in response to changes in non-resident enrollment. Therefore, the coefficients of interest should not vary significantly depending on whether student characteristics are included when major and year fixed effects are included. This is verified by the results in Column (3), as they do not differ substantially from the main estimates in Column (1). In sum, these two robustness tests show that the main results are not sensitive to including or excluding major and student characteristics, which is consistent with identification resting on the primary differences-in-differences assumptions unconditionally.

Next I consider robustness to modifying the sample. Namely, I drop students who initially enroll in MU's Interdisciplinary Studies major. As discussed in Section 4, incoming freshmen are required to declare a major before taking any classes on campus. For those who intend to enter undecided, MU places them in the Interdisciplinary Studies major, along with students who actively declare this major.[36] Initial enrollment in the Interdisciplinary Studies major accounts for 13 percent of the analytic sample. A concern with including these students in the analysis is that they are likely to interact less with their same-major peers, which in my context would effectively mean a weaker treatment. Column (4) of Table 5 reports estimates from the main model after dropping students who initially enroll in the Interdisciplinary Studies major. The results align

[36] Empirically, it effectively serves as a substitute for undecided major at MU, as most of the students who were in the major initially transferred out during the first two years (86 percent).

closely with the main results, suggesting Interdisciplinary Studies students do not drive my findings.

7. Extensions

7.1 Effect Heterogeneity by the Gender and Race of In-State Students

Changes in non-resident enrollment could differentially affect in-state students depending on their gender and race. To examine this possibility, I add interaction terms between the non-resident enrollment share and gender and race indicators to Equation (1). The results are shown in Table 6. Male and white in-state students are the omitted groups, and thus the effects for all other groups are estimated relative to them. The baseline estimates are small and insignificant for white males. For female and minority in-state students, the results are mixed in sign and small in magnitude. Of the fifteen coefficients, only three are statistically significant at the 10 percent level and none are significant at the 5 percent level. Overall, the results in Table 6 provide no evidence of meaningful effect heterogeneity by the gender and race of in-state students.

7.2 Binned Model

Instead of using continuous treatment variables, the differences-in-differences identification strategy can also be executed within a more standard framework using the following binned model:

$$Y_{ijt} = \eta_0 + \eta_1 Post_t^{OOS} Q_j^{OOS} + \eta_2 Post_t^F Q_j^F + \mathbf{X_{ijt}}\boldsymbol{\tau} + \delta_j + \varphi_t + \upsilon_{ijt} \qquad (5)$$

In Equation (5), the recurring variables follow the same definition as in Equation (2). $Post_t^{OOS}$ is an indicator set to one for 2008 and later years to represent the post-treatment period for out-of-state enrollment growth. Similarly, $Post_t^F$ is an indicator set to one for 2012 and later years for foreign enrollment growth.[37] Q_j^{OOS} is a binary variable that indicates if major *j* is in the top quartile of out-of-state enrollment growth between the pre-2008 and post-2008 periods; similarly, Q_j^F is set to one if major *j* is in the top quartile of foreign enrollment growth between the pre-2012 and post-2012 periods.

The identifying assumptions for Equation (5) are the same as in Equation (2). However, the binned model facilitates larger contrasts in out-of-state and foreign enrollment "treatments" by isolating top quartile majors and comparing them to other majors. Additionally, the model relaxes the linear treatment effect assumption in Equation (2). By comparing majors that experienced more pronounced differences in out-of-state and foreign enrollment growth, the model is able to pick up non-linear treatment effects that the continuous treatment model cannot.

The results are presented in Table 7. For out-of-state enrollment growth, all five point estimates are positive and two are statistically significant. The implied effect sizes remain small, but the results in Table 7 give at least some indication that expanded out-of-state domestic enrollment improves the outcomes of in-state students.

For foreign enrollment growth, the findings are qualitatively consistent with Table 4. Specifically, the point estimates are invariably negative and two out of three estimates for the persistence measures are statistically significant. Table 7 also reports p-values from statistical tests of the null hypothesis that the effects of out-of-state and foreign enrollment growth are equal using estimates from the new model, i.e., H_0: $\eta_1=\eta_2$. The results affirm the general pattern in Table 4. The differences between the out-of-state and foreign treatment effect estimates are more

[37] Binned model is well-suited for splitting total non-resident enrollment into out-of-state domestic and foreign components since MU began seeking for out-of-state domestic and foreign enrollment growth at different points of time. For the same reason, I do not expand Equation (1) along this line as the post-periods are different for out-of-state and foreign enrollment growth in the standard differences-in-differences framework.

pronounced in Table 7 when isolating top-quartile majors, especially for the persistence measures.[38]

7.3 Effects on Graduation Outcomes

The analysis thus far has focused on third-year educational outcomes of in-state students. Using third-year outcomes instead of graduation outcomes allows me to incorporate more cohorts of students who have been exposed to the recent influx of foreign students. However, a concern is that over the first two years of college there is not as much cross-major variation in interactions with same-major peers, as freshmen and sophomores tend to take general education courses in addition to courses that are required on the paths to their respective majors. To further investigate the possibility that the findings are influenced by a lack of meaningful variation in exposure to non-resident students across majors, I replace the outcomes in the preferred specification by graduation outcomes and focus on a restricted sample of cohorts from 2004-2010, for whom I can track 6-year graduation outcomes with my data panel.[39] If in-state students have limited exposure to non-resident students initially, I would expect the estimates using graduation outcomes to be subject to less attenuation bias because same-major peers should increasingly overlap later in the college career.

The results are reported in Appendix Table A.6. Overall, the coefficients are small in an absolute sense and none are statistically significant at conventional levels, indicating the changes

[38] The estimates in Table 7 can be converted to a form that is comparable to the estimates reported in Table 4. For instance, the difference in out-of-state enrollment growth between top quartile majors and the other majors is 12 percentage points. Thus, the point estimate for persistence at MU in Table 7 can be translated to an effect size of 0.14 percentage points for a one-percentage-point increase in the out-of-state enrollment share, i.e. 0.0162/12=0.0014. Overall, if I attempt to linearize the estimated effects from the model in Table 7, the implied magnitudes of the translated estimates are about twice the size of the corresponding estimates reported in Table 4, suggesting the treatment effects on in-state students may not be linear.

[39] The last year of my data panel is for the 2015-16 academic year, which means that the 2010 freshman class is the last cohort that can be used to evaluate 6-year graduation outcomes.

in overall non-resident enrollment do not significantly affect 6-year graduation outcomes for in-state students. Importantly, the estimates reveal no evidence of more pronounced effects on in-state students, compared to my primary estimates in Table 3. The similarity of results implies that a lack of variation in the exposure to non-resident students during the first two years at MU is unlikely to bias my findings.

8. Concluding Remarks

The political debate about whether public universities should limit non-resident enrollment growth depends critically on how non-resident enrollment growth affects the educational outcomes of in-state college students. I use student-level administrative data of first-time, degree-seeking, full-time students who entered the University of Missouri-Columbia (MU) between 2004 and 2014 as college freshmen to study the effect of compositional shifts in the student body by resident status on in-state student outcomes. Descriptive analysis shows that the rapid expansion of non-resident enrollment at MU did not crowd out in-state students at entry, and it has enhanced both geographic and racial diversity on campus. I leverage within-major and cross-time variation to estimate the causal effect of non-resident enrollment growth on five third-year outcomes of in-state students and find no evidence of negative effects of exposure to total non-resident enrollment on persistence or performance outcomes among in-state students. Moreover, a comparison of treatment effects by gender and race indicates that non-resident enrollment growth does not particularly benefit or hurt female or minority in-state students.

I also separate total non-resident enrollment into out-of-state domestic and foreign components and discover some evidence of effect heterogeneity. Specifically, the results suggest no adverse effects of out-of-state domestic enrollment growth on in-state students, and some results show marginally positive effects. The evidence on the influx of foreign students rules out substantial adverse effects, especially on performance outcomes, but there is evidence of modest negative effects of foreign enrollment growth on the persistence of in-state students in their majors, at MU, and in the Missouri public university system. The adverse effects are not meaningful substantively at MU given the currently small foreign enrollment share, but could be more problematic in the future if they persist and foreign enrollment growth continues.

References:

Abraham, Katharine G. and Melissa A. Clark. 2006. Financial Aid and Students' College Decisions Evidence from The District of Columbia Tuition Assistance Grant Program. *Journal of Human Resources*, 41(3), 578-610.

Anelli, Massimo, Kevin Y. Shih and Kevin M. Williams. 2017. Foreign Peer Effects and STEM Major Choice. Working Paper.

Anderson, Nick and Danielle Douglas-Gabriel. 2016. Nation's Prominent Public Universities Are Shifting to Out-of-State Students. The Washington Post. Retrieved on 08.30.2017 from URL:
https://www.washingtonpost.com/local/education/nations-prominent-public-universities-are-shifting-to-out-of-state-students/2016/01/30/07575790-beaf-11e5-bcda-62a36b394160_story.html?utm_term=.bf2210e44c11.

Arcidiacono, Peter and Cory Koedel. 2014. Race and College Success: Evidence from Missouri. *American Economic Journal: Applied Economics*, 6(3), 20-57.

Bellows, Kate. 2017. Out-of-State Admissions, Financial Aid under Debate at General Assembly. The Cavalier Daily. Retrieved on 08.30.2017 from URL:
http://www.cavalierdaily.com/article/2017/01/out-of-state-admissions-financial-aid-under-debate-at-general-assembly.

Betts, Julian. 1998. Educational Crowding out: Do Immigrants Affect the Educational Attainment of American Minorities? in *Help of Hindrance? The Economic Implications of Immigration for African-Americans, 253-281*. New York: Russell Sage Foundation.

Betts, Julian R., and Robert W. Fairlie. 2003. Does Immigration Induce 'Native Flight' from Public Schools into Private Schools? *Journal of Public Economics*, 87(5), 987-1012.

Betts, Julian R., and Darlene Morrell. 1999. The Determinants of Undergraduate Grade Point Average: The Relative Importance of Family Background, High School Resources, and Peer Group Effects. *Journal of Human Resources*, 34(2), 268-293.

Bird, Kelli and Sarah Turner. 2014. College in the States: Foreign Student Demand and Higher Education Supply in the US. EdPolicyWorks Working Paper Series No. 23, University of Virginia.

Borjas, George J. 2007. Do Foreign Students Crowd Out Native Students from Graduate Programs? in *Science and the University*. Madison, WI: University of Wisconsin Press.

Bound, John, Breno Braga, Gaurav Khanna, and Sarah Turner. 2016. A Passage to America: University Funding and International Students. NBER Working Paper No. w22981.

Bound, John, and Sarah Turner. 2007. Cohort Crowding: How Resources Affect Collegiate Attainment. *Journal of public Economics*, 91(5), 877-899.

Bound, John, Sarah Turner and Patrick Walsh. 2009. Internationalization of U.S. Doctorate Education, in *Science and Engineering Careers in the United States: An Analysis of Markets and Employment*. Chicago, IL: Chicago University Press.

Stock James H and Motohiro Yogo. 2005. Testing for Weak Instruments in Linear IV Regression, in *Identification and Inference for Econometric Models.* New York, NY: Cambridge University Press.

Burd, Stephen. 2015. The Out-of-State Student Arms Race. *New America*. Retrieved on 08.30.2017 from URL: https://www.newamerica.org/education-policy/policy-papers/out-of-state-student-arms-race/.

Card, David. 2001. Immigrant Inflows, Native Outflows, and the Local Labor Market Impacts of Higher Immigration. *Journal of Labor Economics*, 19(1), 22-64.

Card, David, and John DiNardo. 2000. Do Immigrant Inflows Lead to Native Outflows? *American Economic Review*, 90(2), 360-367.

Cooke, Thomas J., and Paul Boyle. 2011. The Migration of High School Graduates to College. *Educational Evaluation and Policy Analysis,* 33(2), 202-213.

Coudriet, Cater. 2016. Should U.S. Public Colleges Accept More International Students, Or Not? Forbes. Retrieved on 08.30.2017 from URL: https://www.forbes.com/sites/cartercoudriet/2016/11/11/should-u-s-public-colleges-accept-more-international-students-or-not/#20aa2dc61ce4.

Curs, Bradley R., and Ozan Jaquette. 2017. Crowded Out? The Effect of Nonresident Enrollment on Resident Access to Public Research Universities. *Educational Evaluation and Policy Analysis*, 39(4), 644-669.

Cullen, Julie Berry, Brian A. Jacob and Steven Levitt. 2006. The Effect of School Choice on Participants: Evidence from Randomized Lotteries. *Econometrica*, 74(5), 1191-1230.

Department of Homeland Security. 2016. STEM Designated Degree Program List. Retrieved on 08.30.2017 from URL: https://www.ice.gov/sites/default/files/documents/Document/2016/stem-list.pdf.

Figlio, David N, and Umut Ozek. 2017. Unwelcome Guests? The Effects of Refugees on the Educational Outcomes of Incumbent Students. NBER Working Paper No. w23661.

Groen, Jeffrey A., and Michelle J. White. 2004. In-State versus Out-of-State Students: The Divergence of Interest between Public Universities and State Governments. *Journal of Public Economics,* 88(9), 1793-1814.

Hoxby, Caroline M. 1997. How the Changing Market Structure of US Higher Education Explains College Tuition. NBER Working Paper No. w6323.

Huguelet, Austin. 2017. Greitens' Alternative to Raising Tuition Doesn't Fit Missouri Model. St. Louis Post-Dispatch. Retrieved on 08.30.2017 from URL:

http://www.stltoday.com/news/local/education/greitens-alternative-to-raising-tuition-doesn-t-fit-missouri-model/article_4ba8a6cc-e597-5aeb-8b11-c34c0e7558c8.html.

Jaquette, Ozan, and Bradley R. Curs. 2015. Creating the Out-of-State University: Do Public Universities Increase Nonresident Freshman Enrollment in Response to Declining State Appropriations? *Research in Higher Education*, 56(6), 535-565.

Jaquette, Ozan, Bradley R. Curs, and Julie R. Posselt. 2016. Tuition Rich, Mission Poor: Nonresident Enrollment Growth and the Socioeconomic and Racial Composition of Public Research Universities. *The Journal of Higher Education*, 87(5), 635-673.

Kato, Takao and Chad Sparber. 2013. Quotas and Quality: The Effect of H-1B Visa Restrictions on the Pool of Prospective Undergraduate Students from Abroad. *Review of Economics and Statistics*, 95(1), 109-126.

Koedel, Cory, Jiaxi Li, Matthew G. Springer and Li Tan. 2017. The Impact of Performance Ratings on Job Satisfaction for Public School Teachers. *American Educational Research Journal*, 54(2), 241-278.

Loudenback, Tanza. 2016 International Students Are Now 'Subsidizing' Public American Universities to the Tune of $9 Billion A Year. Business Insider. Retrieved on 08.30.2017 from URL:
http://www.businessinsider.com/foreign-students-pay-up-to-three-times-as-much-for-tuition-at-us-public-colleges-2016-9.

Machin, Stephen and Richard Murphy. 2014. Paying out and Crowding out? The Globalisation of Higher Education. Working Paper.

Missouri Department of Higher Education. 2017. Rules of Department of Higher Education, 6 CSR 10-3.010. Retrieved on 08.30.2017 from URL:
http://www.sos.mo.gov/cmsimages/adrules/csr/current/6csr/6c10-3.pdf.

MU International Center. 2016. Open Doors Mizzou: Fast Facts. Retrieved on 08.30.2017 from URL: https://international.missouri.edu/documents/open-doors-mizzou-fast-facts.pdf.

National Science Board. 2014. Science and Engineering Indicators 2014. Arlington, VA: National Science Foundation (NSB 14-01).

Peri, Giovanni, Kevin Shih and Chad Sparber. 2015. STEM Workers, H-1B Visas, and Productivity in US Cities. *Journal of Labor Economics*, 33(3), 225-255.

Powell, Farran. 2016. Out-of-State Enrollment Rises at State Flagship Universities. U.S. News & World Report. Retrieved on 08.30.2017 from URL:
https://www.usnews.com/education/best-colleges/articles/2016-06-13/out-of-state-enrollment-rises-at-state-flagship-universities.

Rizzo, Michael, and Ronald G. Ehrenberg. 2004. Resident and Nonresident Tuition and Enrollment at Flagship State Universities, in *College Choices: The Economics of Where to Go, When to Go, and How to Pay for It*. Chicago, IL: University of Chicago Press.

Rosenzweig, Mark R. 2006. Global Wage Differences and International Student Flows, in *Brookings Trade Forum*. Washington DC: Brookings Institution Press.

Shen, Ying. 2016. The Impacts of the Influx of New Foreign Undergraduate STUDENTS ON U.S. Higher Education. Working Paper.

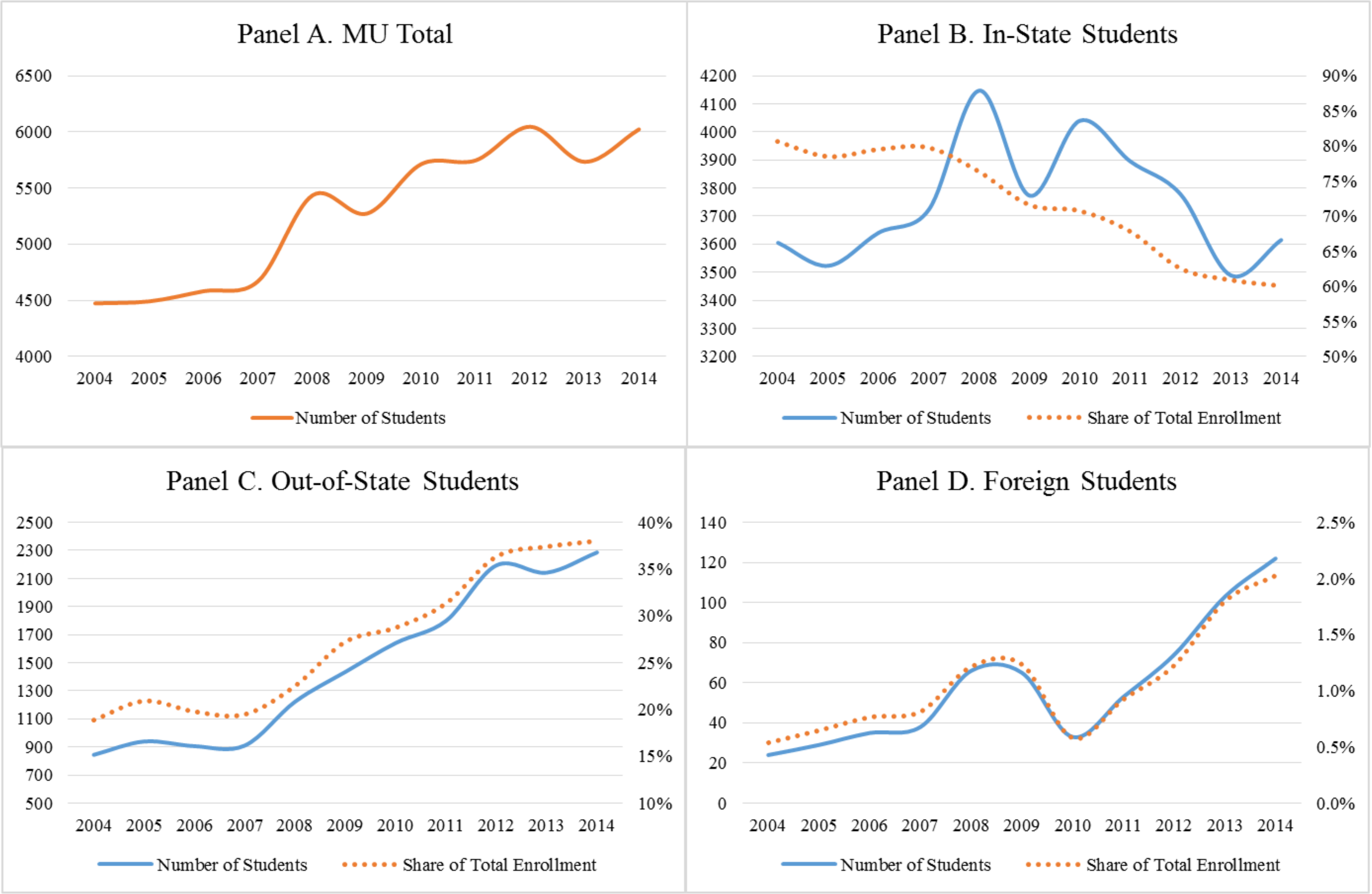
Shih, Kevin Y. 2015. Do International Students Crowd-Out or Cross-Subsidize Americans in Higher Education? Working Paper.

Shih, Kevin Y. 2016. Labor Market Openness, H-1B Visa Policy, and the Scale of International Student Enrollment in the U.S. *Economic Inquiry*, 54(1), 121-138.

Watanabi, Teresa. 2017. UC Proposes Its First Enrollment Cap — 20% — on Out-of-State Students. Los Angeles Times. Retrieved on 08.30.2017 from URL: http://www.latimes.com/local/lanow/la-me-ln-uc-limit-nonresident-students-20170306-story.html.

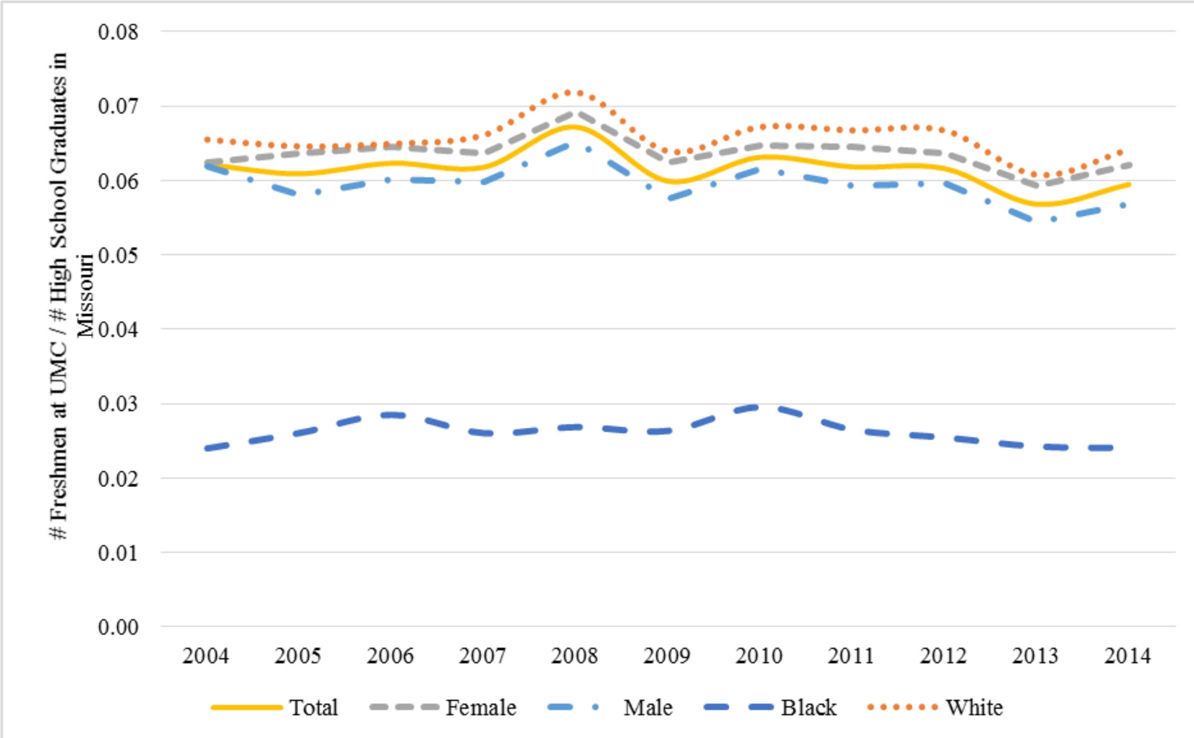
Western Interstate Commission for Higher Education. 2016. Knocking at the College Door: Projections of High School Graduates. Retrieved on 08.30.2017 from URL: www.wiche.edu/knocking.

Figure 1. Freshman Enrollment Trends at MU by Residency Status.



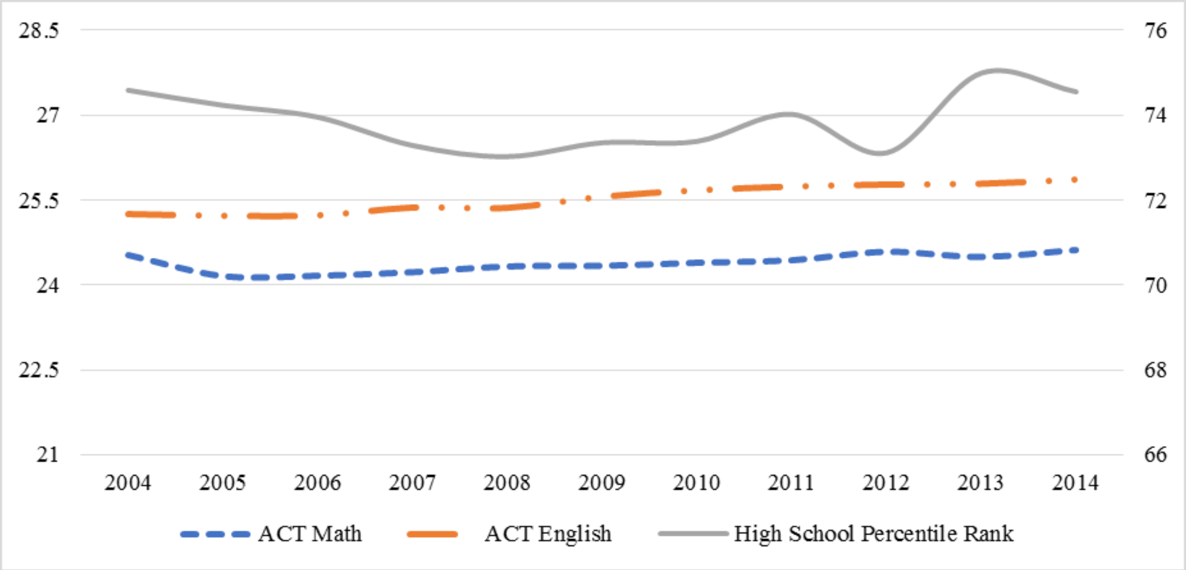
Notes: This graph displays enrollment trends at University of Missouri-Columbia (MU) by residency status using data of first-time, degree-seeking, full-time students entering MU as college freshmen from 2004 to 2014. Left axis in each panel corresponds to Number of Students. In Panel B, Panel C and Panel D, right axis corresponds to Share of Total Enrollment.

Figure 2. Comparison between In-state Freshman Enrollment at MU and Number of High School Graduates in Missouri.



Notes: This graph depicts time trend of the ratio of number of first-time, degree-seeking, full-time in-state students at MU to number of high school graduates in Missouri. Solid line represents the ratio for all in-state students. Dashed lines show the ratio separately for each gender and race. The data for high school completers is retrieved from Knocking at the College Door: Projections of High School Graduates (Western Interstate Commission for Higher Education, 2016). Total number of high school graduates in Missouri includes both public and private schools; by-gender and by-race data is only available for public schools in Missouri. Asian/ Pacific Islander, Hispanic and Other Races are omitted because small sample size of these groups causes their trend to be susceptible to noise. The data for public schools is based on actual numbers from 2004 to 2013, and based on projection in 2014; the data for private schools is based on actual numbers from 2004 to 2011, and based on projection from 2012 to 2014.

Figure 3. Pre-entry Qualifications of In-State Freshman Students at MU.



Notes: This graph depicts time trend of three pre-entry qualifications of first-time, degree-seeking, full-time in-state students at MU from 2004 to 2014, i.e., ACT math score, ACT English score and high school percentile rank. Left axis corresponds to ACT math score and ACT English score, right axis corresponds to high school percentile rank.

Table 1. Descriptive Statistics of Each Residency Group.

	In-State Students Mean (St Dev)	Out-of-State Students Mean (St Dev)	Foreign Students Mean (St Dev)
Female	0.52 (0.50)	0.58 (0.49)	0.51 (0.50) **
Male	0.48 (0.50)	0.42 (0.49)	0.49 (0.50) **
Asian/ Pacific Islander	0.02 (0.15)	0.02 (0.14)	-
Black	0.07 (0.25)	0.14 (0.35)	-
Hispanic	0.01 (0.11)	0.02 (0.14)	-
White	0.85 (0.36)	0.75 (0.43)	-
Other Races	0.05 (0.21)	0.07 (0.25)	-
ACT Math	24.39 (4.10)	24.83 (3.64)	24.87 (2.03)
ACT Math Missing Indicator	0.01(0.09)	0.10 (0.30)	0.83 (0.38) **
ACT English	25.53 (4.51)	26.11 (4.08)	25.43 (2.30) **
ACT English Missing Indicator	0.01 (0.09)	0.10 (0.30)	0.83 (0.38) **
High School Percentile Rank	73.81 (18.10)	71.56 (17.24)	72.79 (7.21) *
High School Percentile Rank Missing Indicator	0.19 (0.39)	0.31 (0.46)	0.90 (0.30) **
Standardized First Semester GPA	-0.00 (0.81)	0.00 (0.74)	0.10 (0.84) **
First Semester GPA Missing Indicator	0.02 (0.13)	0.02 (0.12)	0.05 (0.23) **
STEM Major	0.27 (0.45)	0.16 (0.37)	0.40 (0.49) **
Third-year Outcomes:			
Remaining Enrolled in the Same Major at MU	0.38 (0.49)	-	-
Remaining Enrolled at MU	0.77 (0.42)	-	-
Remaining Enrolled at Any System Campus	0.86 (0.34)	-	-
Cumulative Credit Hours	58.83 (24.29)	-	-
Cumulative GPA	2.91 (0.74)	-	-
Major-level Enrollment	69.23 (126.64)	27.44 (69.02)	1.07 (2.88)
N	40,638	16,108	627

Notes: Racial designation is not available for foreign students as they are coded as "Non-Resident Alien" in the administrative data. Other Races combine students identified as “American Indian/Alaska Native”, “Two or More Races” and “Other/Unknown” in the data. Standardized First Semester GPA shown in the table is the residual generated from regressing first semester GPA on major and year fixed effects. * Indicates statistically significant differences between out-of-state and foreign statistics at the 10 percent level or better. ** Indicates statistically significant difference between out-of-state and foreign statistics at the 5 percent level or better.

Table 2. Validation Tests of Endogenous Student Sorting.

	Male	Asian	Black	Hispanic	Other Races	ACT Math	ACT Math Missing	ACT English	ACT English Missing	HS. Pctile. Rank	HS. Pctile. Rank Missing
Non-Resident Enrollment Share	0.0011	-0.0001	0.0006*	-0.0000	0.0000	-0.0090	0.0001	-0.0071	0.0000	-0.0287	0.0006
	(0.0007)	(0.0001)	(0.0004)	(0.0001)	(0.0002)	(0.0085)	(0.0001)	(0.0104)	(0.0001)	(0.0402)	(0.0005)
Overall P-value	0.74										
Major Fixed Effects	X	X	X	X	X	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X	X	X	X	X	X
R-squared	0.20	0.01	0.01	0.01	0.01	0.14	0.01	0.08	0.01	0.07	0.06
N	40,638	40,638	40,638	40,638	40,638	40,638	40,638	40,638	40,638	40,638	40,638

Notes: This table displays estimates from validation tests of endogenous student sorting. Female and white are the omitted groups. Robust standard errors in parentheses are clustered at the major level. Significance levels: ** 5 percent level, * 10 percent level.

Table 3. Estimates of the Effects of Non-Resident Enrollment Growth on Third-Year Outcomes for In-State Students.

	Enrolled in the Same Major at MU	Enrolled at MU	Enrolled at Any System Campus	Cum. Credit Hrs.	Cum. GPA
Panel A. Continuous Treatment Differences-in-Differences Model					
Non-Resident Enrollment Share	-0.0008	0.0004	0.0001	0.0228	0.0006
	(0.0016)	(0.0004)	(0.0003)	(0.0280)	(0.0007)
R-squared	0.13	0.06	0.04	0.21	0.30
N	40,638	40,638	40,638	40,638	40,638
Panel B. IV Model					
Non-Resident Enrollment Share	-0.0050	0.0008	0.0016	-0.0633	0.0004
	(0.0164)	(0.0019)	(0.0013)	(0.0716)	(0.0052)
R-squared	0.15	0.06	0.04	0.21	0.28
N	26,368	26,368	26,368	26,368	26,368
Major Fixed Effects	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X
Student Characteristics	X	X	X	X	X

Notes: Major fixed effects, year fixed effects and student characteristics are included in the continuous treatment differences-in-differences model and the IV model. The coefficients for student characteristics are excluded for brevity. Robust standard errors in parentheses are clustered at the major level. Significance levels: ** 5 percent level, * 10 percent level.

Table 4. Continuous Treatment Differences-in-Differences Model Estimates of the Effects of Out-of-State and Foreign Enrollment Growth on Third-Year Outcomes for In-State Students.

	Enrolled in the Same Major at MU	Enrolled at MU	Enrolled at Any System Campus	Cum. Credit Hrs.	Cum. GPA
Out-of-State Enrollment Share	-0.0004	0.0006	0.0003	0.0265	0.0010
	(0.0017)	(0.0004)	(0.0003)	(0.0284)	(0.0007)
Foreign Enrollment Share	-0.0050**	-0.0024*	-0.0019*	-0.0216	-0.0034
	(0.0025)	(0.0014)	(0.0010)	(0.0626)	(0.0021)
H_0: γ_1=γ_2					
P-Value	0.144	0.039	0.030	0.434	0.037
Major Fixed Effects	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X
Student Characteristics	X	X	X	X	X
R-squared	0.13	0.06	0.04	0.21	0.30
N	40,638	40,638	40,638	40,638	40,638

Notes: H_0: γ_1=γ_2 is in reference to Equation (2), the null hypothesis is that the coefficients on out-of-state and foreign enrollment shares are equal. The coefficients for student characteristics are excluded for brevity. Robust standard errors in parentheses are clustered at the major level. Significance levels: ** 5 percent level, * 10 percent level.

Table 5. Robustness Tests for the Main Estimates of the Effects of Non-Resident Enrollment Growth on Third-Year Outcomes for In-State Students.

	(1)	(2)	(3)	(4)
Enrolled in the Same Major at MU	-0.0008 (0.0016)	-0.0007 (0.0013)	-0.0009 (0.0017)	-0.0007 (0.0015)
Enrolled at MU	0.0004 (0.0004)	0.0002 (0.0004)	0.0001 (0.0005)	0.0004 (0.0004)
Enrolled at Any System Campus	0.0001 (0.0003)	-0.0000 (0.0004)	-0.0001 (0.0004)	0.0001 (0.0004)
Cum. Credit Hrs.	0.0228 (0.0280)	0.0193 (0.0269)	-0.0101 (0.0447)	0.0257 (0.0281)
Cum. GPA	0.0006 (0.0007)	0.0006 (0.0007)	-0.0005 (0.0015)	0.0006 (0.0007)
Major Fixed Effects	X	X	X	X
Year Fixed Effects	X	X	X	X
Major Characteristics		X		
Student Characteristics	X	X		X
Data	Analytic Sample	Analytic Sample	Analytic Sample	Excluding Interdisciplinary Studies Students
N	40,638	40,638	40,638	35,398

Notes: The coefficients for major and student characteristics are excluded for brevity. Robust standard errors in parentheses are clustered at the major level. Significance levels: ** 5 percent level, * 10 percent level.

Table 6. Continuous Treatment Differences-in-Differences Model Estimates of the Effects of Non-Resident Enrollment Growth on Third-Year Outcomes for In-state Students, by Gender and Race.

	Enrolled in the Same Major at MU	Enrolled at MU	Enrolled at Any System Campus	Cum. Credit Hrs.	Cum. GPA
Non-Resident Enrollment Share	-0.0014	0.0001	-0.0001	0.0098	0.0002
	(0.0019)	(0.0004)	(0.0004)	(0.0291)	(0.0008)
Non-Resident Enrollment Share*Female	0.0013	0.0006	0.0004	0.0301*	0.0009*
	(0.0008)	(0.0004)	(0.0003)	(0.0174)	(0.0005)
Non-Resident Enrollment Share*Black	0.0005	-0.0002	0.0001	-0.0282	0.0005
	(0.0010)	(0.0005)	(0.0003)	(0.0317)	(0.0009)
Non-Resident Enrollment Share*All Other Races	-0.0006	-0.0006	0.0002	0.0021	-0.0010*
	(0.0010)	(0.0004)	(0.0004)	(0.0244)	(0.0005)
Major Fixed Effects	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X
Student Characteristics	X	X	X	X	X
R-squared	0.13	0.06	0.04	0.21	0.30
N	40,638	40,638	40,638	40,638	40,638

Notes: All Other Races combines in-state students identified as Asian/ Pacific Islander, Hispanic and Other Races in Table 1, due to small sample size of these racial groups. White and male are the omitted groups in the regressions. Estimates for Non-Resident Enrollment Share are for the baseline group, i.e., white male in-state students. The coefficients for student characteristics are excluded for brevity. Robust standard errors in parentheses are clustered at the major level. Significance levels: ** 5 percent level, * 10 percent level.

Table 7. Binned Model Estimates of the Effects of Out-of-State and Foreign Enrollment Growth on Third-Year Outcomes for In-State Students.

	Enrolled in the Same Major at MU	Enrolled at MU	Enrolled at Any System Campus	Cum. Credit Hrs.	Cum. GPA
Top Quartile Out-of-State*Post Out-of-State	0.0137	0.0162**	0.0065	0.4386	0.0260*
	(0.0347)	(0.0070)	(0.0049)	(0.4001)	(0.0144)
Top Quartile Foreign*Post Foreign	-0.0528	-0.0251*	-0.0280**	-0.4031	-0.0190
	(0.0476)	(0.0134)	(0.0115)	(0.6839)	(0.0175)
H_0: η_1=η_2					
P-Value	0.280	0.003	0.006	0.266	0.054
Major Fixed Effects	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X
Student Characteristics	X	X	X	X	X
R-squared	0.13	0.06	0.04	0.21	0.30
N	40,638	40,638	40,638	40,638	40,638

Notes: Post Out-of-State is for year 2008 and after; Post Foreign is for year 2012 and after. H_0: η_1=η_2 is in reference to Equation (5), the null hypothesis is that the coefficients on out-of-state and foreign enrollment interaction terms are equal. The coefficients for student characteristics are excluded for brevity. Robust standard errors in parentheses are clustered at the major level. Significance levels: ** 5 percent level, * 10 percent level.

Appendices

Appendix A
Supplementary Tables

Appendix Table A.1. Validation Tests, Splitting Non-Resident Enrollment Share into Out-of-State and Foreign Enrollment Share.

	Male	Asian	Black	Hispanic	Other Races	ACT Math	ACT Math Missing	ACT English	ACT English Missing	HS. Pctile. Rank	HS. Pctile. Rank Missing
Out-of-State Enrollment Share	0.0011	-0.0001	0.0006	-0.0000	0.0001	-0.0072	0.0001	-0.0045	0.0001	-0.0208	0.0007
	(0.0007)	(0.0001)	(0.0004)	(0.0001)	(0.0002)	(0.0083)	(0.0001)	(0.0101)	(0.0001)	(0.0407)	(0.0006)
Foreign Enrollment Share	0.0001	0.0007	0.0007	-0.0001	-0.0013**	-0.0299	-0.0002	-0.0376	-0.0002	-0.1231	-0.0005
	(0.0013)	(0.0005)	(0.0017)	(0.0005)	(0.0006)	(0.0282)	(0.0005)	(0.0321)	(0.0005)	(0.1096)	(0.0013)
Overall P-value	0.94										
Major Fixed Effects	X	X	X	X	X	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X	X	X	X	X	X
R-squared	0.20	0.01	0.01	0.01	0.01	0.14	0.01	0.08	0.01	0.07	0.06
N	40,638	40,638	40,638	40,638	40,638	40,638	40,638	40,638	40,638	40,638	40,638

Notes: This table displays estimates from validation tests of endogenous student sorting. Female and white are the omitted groups. Robust standard errors in parentheses are clustered at the major level. Significance levels: ** 5 percent level, * 10 percent level.

Appendix Table A.2. Full Output from the First-Stage Regression of the IV Model.

	Coefficient (Standard Error)
Predicted In-State Enrollment	-5.727** (1.782)
Predicted Out-of-State Enrollment	-3.606** (0.779)
Predicted Foreign Enrollment	-3.391 (25.388)
Male	0.021 (0.053)
Black	0.166 (0.111)
Asian	-0.121 (0.091)
Hispanic	0.301 (0.216)
Other Races	-0.119 (0.112)
ACT Math	-0.007 (0.009)
ACT Math Missing Indicator	-0.302 (0.960)
ACT English	-0.010 (0.009)
ACT English Missing Indicator	0.278 (0.961)
High School Percentile Rank	-0.002 (0.002)
High School Percentile Rank Missing Indicator	0.094 (0.061)
Constant	77.300** (18.018)
Major Fixed Effects	X
Year Fixed Effects	X
F-statistic	13.23
R-Squared	0.91
N	26,368

Notes: Robust standard errors in parentheses are clustered at the major level. Significance levels: ** 5 percent level, * 10 percent level.

Appendix Table A.3. Comparison of Number and Annual Salary of Faculty between Top and Bottom Quartile Majors of Out-of-State Enrollment Growth.

Year	Average Number of Tenure-Track Faculty		Average Number of Teaching Faculty		Average Salary of Tenure-Track Faculty		Average Salary of Teaching Faculty	
	Top Quartile Majors	Bottom Quartile Majors	Top Quartile Majors	Bottom Quartile Majors	Top Quartile Majors	Bottom Quartile Majors	Top Quartile Majors	Bottom Quartile Majors
2004	15.88	16.60	0.50	0.07	71421.96	78363.48	7912.36	3118.33
2005	16.31	16.47	0.50	0.27	73579.52	80650.68	20835.04	12202.27
2006	16.38	16.27	0.50	0.33	75145.45	82831.83	22050.30	15915.20
2007	16.69	16.69	2.44	0.69	76764.34	87053.77	22381.50	16511.49
2008	16.38	16.63	3.25	1.88	82314.09	92105.11	22009.24	33125.92
2009	16.13	16.81	3.31	2.25	82551.22	92249.22	25923.98	33541.68
2010	16.88	16.69	3.88	2.63	81424.96	91833.96	30042.68	40380.43
2011	16.63	17.38	4.50	2.94	86524.39	95731.51	35574.30	42801.54
2012	16.94	17.75	5.56	3.31	90301.09	100125.20	37734.71	47445.38
2013	16.75	17.75	6.19	3.56	92526.06	100467.00	37704.91	48020.75
2014	16.81	18.31	5.88	3.88	96450.16	102813.00	35129.68	52393.53

Notes: Both top and bottom quartile of out-of-state enrollment growth distribution consists of 13 majors. Only full-time tenure-track and teaching faculty are included. Faculty salary is represented by annual salary in dollars. Data source is University of Missouri System Annual Salary Report from 2004 to 2014.

Appendix Table A.4. Full Output from Panel A in Table 3.

	Enrolled in the Same Major at MU	Enrolled at MU	Enrolled at Any System Campus	Cum. Credit Hrs.	Cum. GPA
Non-Resident Enrollment Share	-0.0008 (0.0016)	0.0004 (0.0004)	0.0001 (0.0003)	0.0228 (0.0280)	0.0006 (0.0007)
Male	0.0431** (0.0156)	-0.0227** (0.0074)	-0.0194** (0.0051)	-3.9971** (0.3447)	-0.1547** (0.0175)
Black	0.0024 (0.0251)	-0.0623** (0.0127)	-0.0510** (0.0119)	-8.1222** (0.5253)	-0.2949** (0.0178)
Asian	0.0394 (0.0304)	-0.0098 (0.0178)	-0.0020 (0.0148)	-0.6953 (0.8856)	-0.0529** (0.0168)
Hispanic	-0.0320** (0.0117)	-0.0168 (0.0168)	-0.0051 (0.0137)	-2.0100** (0.6318)	-0.0612** (0.0226)
Other Races	-0.0062 (0.0125)	-0.0430** (0.0131)	-0.0378** (0.0107)	-3.0618** (0.6595)	-0.0921** (0.0202)
ACT Math	0.0062** (0.0019)	0.0080** (0.0008)	0.0041** (0.0007)	0.8484** (0.0578)	0.0301** (0.0019)
ACT Math Missing Indicator	-0.1560** (0.0738)	0.0891 (0.0913)	0.1193 (0.0918)	-2.9422 (3.2948)	0.0980 (0.1805)
ACT English	0.0007 (0.0013)	0.0031** (0.0008)	0.0013** (0.0005)	0.4220** (0.0385)	0.0214** (0.0009)
ACT English Missing Indicator	0.1230* (0.0684)	-0.1478* (0.0857)	-0.1866** (0.0913)	-2.3706 (3.5072)	-0.1538 (0.1973)
H.S. Percentile Rank	0.0021** (0.0007)	0.0040** (0.0002)	0.0026** (0.0002)	0.4135** (0.0174)	0.0143** (0.0005)
H.S. Percentile Rank Missing Indicator	0.0230** (0.0093)	0.0333** (0.0095)	0.0160** (0.0059)	-1.2514* (0.6640)	0.0294 (0.0217)
Constant	0.1812* (0.1067)	0.2246** (0.0250)	0.5678** (0.0228)	-0.9354 (2.3570)	0.6676** (0.0714)
Major Fixed Effects	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X
R-squared	0.13	0.06	0.04	0.21	0.30
N	40,638	40,638	40,638	40,638	40,638

Notes: Robust standard errors in parentheses are clustered at the major level. Significance levels: ** 5 percent level, * 10 percent level.

Appendix Table A.5. Estimates of the Effects of Non-Resident Enrollment Growth on Third-Year Outcomes for In-State Students, Using 2008-2014 Subsample.

	Enrolled in the Same Major at MU	Enrolled at MU	Enrolled at Any System Campus	Cum. Credit Hrs.	Cum. GPA
Panel A. Continuous Treatment Differences-in-Differences Model					
Non-Resident Enrollment Share	-0.0027*	0.0001	0.0005	0.0155	0.0010
	(0.0015)	(0.0005)	(0.0004)	(0.0360)	(0.0011)
R-squared	0.15	0.07	0.04	0.21	0.28
N	26,368	26,368	26,368	26,368	26,368
Panel B. IV Model					
Non-Resident Enrollment Share	-0.0050	0.0008	0.0016	-0.0633	0.0004
	(0.0164)	(0.0019)	(0.0013)	(0.0716)	(0.0052)
R-squared	0.15	0.06	0.04	0.21	0.28
N	26,368	26,368	26,368	26,368	26,368
Major Fixed Effects	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X
Student Characteristics	X	X	X	X	X

Notes: Panel B replicates the results from Panel B in Table 3. Major fixed effects, year fixed effects and student characteristics are included in the continuous treatment differences-in-differences model and the IV model. The coefficients for student characteristics are excluded for brevity. Robust standard errors in parentheses are clustered at the major level. Significance levels: ** 5 percent level, * 10 percent level.

Appendix Table A.6. Continuous Treatment Differences-in-Differences Model Estimates of the Effects of Non-Resident Enrollment Growth on 6-Year Graduation Outcomes for In-State Students, Using 2004-2010 Subsample.

	Graduated in the Same Major at MU	Graduated at MU	Graduated at Any System Campus	Cum. Credit Hrs.	Cum. GPA
Non-Resident Enrollment Share	0.0015	0.0006	0.0001	0.1728	-0.0016
	(0.0012)	(0.0007)	(0.0007)	(0.1053)	(0.0015)
Major Fixed Effects	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X
Student Characteristics	X	X	X	X	X
R-squared	0.18	0.10	0.10	0.27	0.17
N	26,140	26,140	26,140	26,140	26,140

Notes: The coefficients for student characteristics are excluded for brevity. Robust standard errors in parentheses are clustered at the major level. Significance levels: ** 5 percent level, * 10 percent level.