4-1-2010

Academic Performance of Native and Transfer Students

John M. Krieg
Western Washington University

Academic Performance of Native and Transfer Students

Report 2010-02

John M. Krieg

April, 2010

Office of Survey Research
Western Washington University

Table of Contents

I. Acknowledgments

Thanks to Sharon Schmidtz and Chris Stark for providing and organizing the data used in this paper. Steve Henson deserves special acknowledgment for his help in writing a Stata program that identifies the multiple student transitions in and out of the university.

II. Executive Summary

In the Fall quarter of 2009, Western Washington University enrolled about 900 transfer students, one-third of the incoming freshmen class that quarter. More transfers were later admitted in the winter and spring quarters. Given the large numbers of transfer students attending Western and the likelihood of increased reliance upon transfers in the future, it is important to understand what, if any, performance differences exist between transfer and native students.

This report compares academic success of natives and transfers using two measures: grades earned after achieving 90 credits and earning a Western degree. In order to make as precise comparisons as possible, this paper pools transfers and native (non-running start) students over a 7 year period (Fall, 2002 through Fall, 2009). To make transfers and natives as comparable as possible, excluded are all natives who fail to earn 90 credits and all transfers who arrive at Western with less than 90 credits. The remaining 23,951 observations of students are at roughly the same place in their academic careers; both groups need to earn about 90 credits to graduate and both should begin to be focusing on their major and upper division coursework.

Basic descriptive statistics suggest that natives hold a significant advantage over transfers in their probability of graduating. Of the 11,784 native students who achieved 90 credits at Western, 64.6% eventually graduated while 51.6% of transfer students who came to Western with 90 or more credits graduated. On average, native students also earn higher GPAs than transfers. In courses taken after their 90th credit, natives average GPAs of 3.13 while transfers who come to Western with 90 credits average a GPA of 3.02. However, if one restricts the sample to students who attempt 30 credits at Western (after earning their 90th), native and transfer GPAs are statistically identical (3.15 v. 3.14). What appears to be happening over those first 30 credits is that transfers perform significantly worse than natives and many transfers dropout. Those that remain perform as well as natives.

The differences in overall GPA also occur in selected "gateway" courses. Fourteen courses were chosen by Institutional Research as being courses which are required for large numbers of students to enter into one or many majors. In six of these fourteen courses natives hold a statistical edge in GPA relative to transfers. In the other eight, transfers and natives are statistically indistinguishable.

While both measures of academic success suggest a native-transfer difference in GPAs, one must take care when making these types of comparisons. As a group, transfers differ significantly from natives in ways other than academic performance. Transfers to Western are 50% more likely to be first generation college students than natives. Transfers are older, more likely to be from disadvantaged racial groups, are less sure of their field of study, and are interested in different academic fields than natives who completed 90 or more Western credits. Given these differences, this paper explores if academic success is driven by a true native-transfer difference or if transfers

underperform relative to natives because they have different backgrounds (for instance, they are more likely to come from environments that undervalues higher education). After controlling for these observables using various statistical methods, there is no evidence to suggest that transfers and natives differ in their conditional performance in either the fourteen gateway courses or in their overall Western GPA. Said another way, despite natives averaging higher GPAs and performing better in select gateway courses, these differences are explained by the fact that transfers are more likely to be first generation (among other categories) and, after accounting for these initial differences, transfers and natives average similar GPAs.

Despite the similarity in native and transfers average GPAs, this does not mean that the distribution of GPAs is the same across both groups. This paper provides evidence that past academic performance is positively correlated with GPAs earned. However, the relationship between past performance and Western GPA differs between natives and transfers. Specifically, natives earning a high GPA on their first 90 credits average a significantly higher GPA on their subsequent 90 credits than does a transfer student who earned the same high initial GPA at their prior institution. Interestingly, students transferring to Western with a low GPA earn higher Western GPAs than natives earning the same initial low GPA. A few hypotheses strike me as plausible and, in order to save space, I suggest only one here: strong natives may more quickly identify their field of study and, because of their interest in this field, earn higher grades than similarly strong transfer students.

Even though average GPAs are no different between natives and transfers, a large difference in the likelihood of graduating exists between natives and transfers even after controlling for observables like first generation status. One might expect that this occurs because a new transfer student, unused to the rigors of Western and its attendant stresses, would be likely to dropout shortly after arriving at Western. Yet, even after excluding transfers who failed to attempt 30 credits at Western (their 120th higher education credit), the probability of a native student graduating is 9.9% higher than that of a transfer. This native advantage remains even after controlling for a student's background, prior academic performance, and field of study.

Not only are natives more likely to graduate than transfers, they are likely to do so faster. After controlling for observables, natives are 23.4% more likely to graduate within 2.5 years of earning their 90th credit than are transfer students. A number of factors may contribute this including the ability to gain direction during a native's early years on campus, greater difficulty encountered among transfer students when obtaining necessary courses to declare a major, and a higher propensity among transfer students to dropout of the university after receiving poor grades early after obtaining their 90th credit.

In addition to comparing native and transfer academic performance, the data used in this paper provides the opportunity to compare transfer students by their originating institution. Among community college students, there are large differences in performance upon arrival at Western, as measured both by GPA and likelihood to graduate. For instance, North Seattle Community College students average a 3.24

Western GPA while Bellingham Tech students average a 2.53. Half of Spokane Community College students graduate from Western while over 82% of Lower Columbia Community College students do. However, after controlling for observables, there are few community colleges that produce students who perform better or worse than others upon arriving at Western. Nor are there differences between 2-year public community college students and students who transfer from 4-year public or private schools. The one group of students to consistently underperform at Western are those who arrive from 2-year private schools. Yet, even these students are primarily products of one institution: the Northwest Indian College. Distinguishing between the success of students from this particular college and their peers from other 2-year private schools is beyond the scope of this work.

III. Preliminaries

III.A. Data and Definitions

I define a "**native**" student as one who began at Western as a true Freshmen. This definition excludes running start students and students who transferred to Western from another institution. While this does exclude transfer students, it does not mean that a native student have no college credits when they first arrive at Western. Students earning AP credits or those who received college credit while simultaneously taking college courses can be native students. These students are coded as cohort "F" in Western's student data systems.

Transfer students are non-running start students who transfer from another institution to Western. This includes "traditional" transfer students (those starting their collegiate careers somewhere else) and also may include a running-start student who, after high school graduation, continued at their community college. Basically, a transfer student is any student who enrolled in college after graduating from high school. These students are coded as cohort "T" in Western's student data systems.

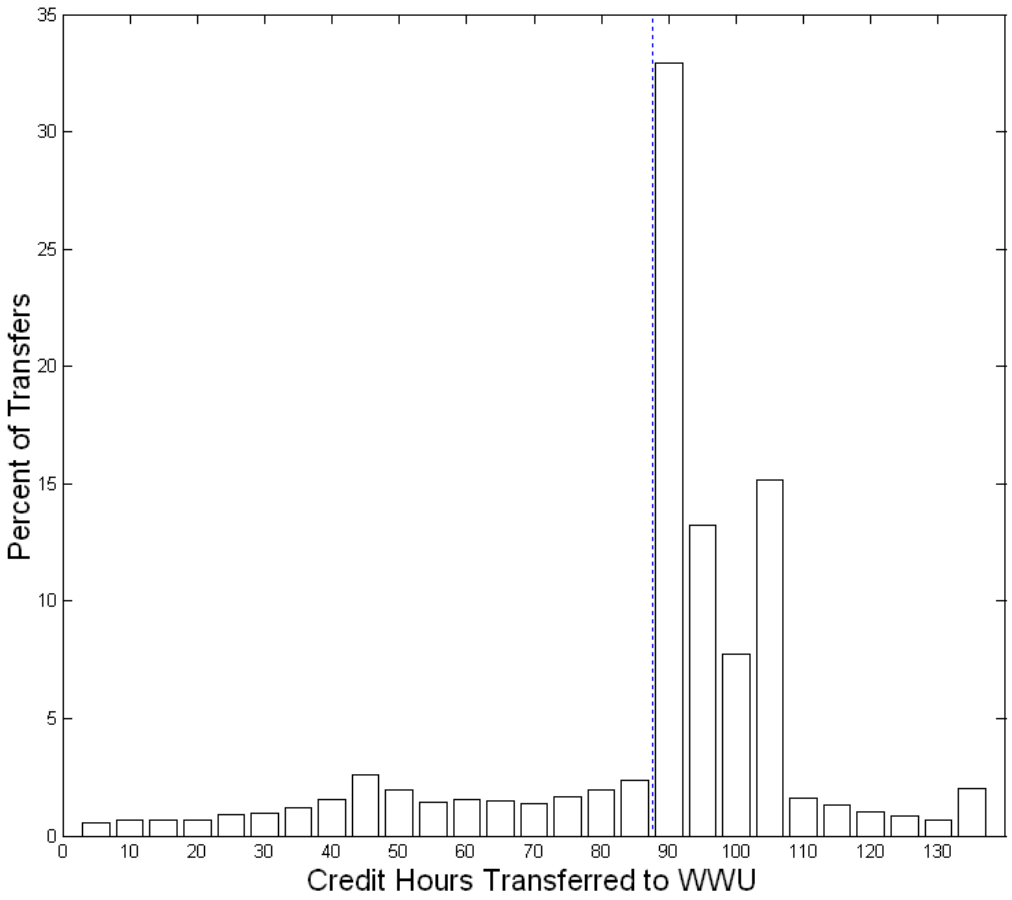
The data employed in this paper consists of all transfer students whose first quarter on Western's campus occurred between Fall quarter 2002 and Fall quarter 2009. This sample consists of 12,167 observations of transfer students. Of those students, 8,303 (68.2%) transferred to Western with at least 90 credits; Figure 1 displays the distribution of credits received by transfer students prior to enrolling at Western. In this figure, the 8,303 students who entered Western with more than 90 credits are to the right of the vertical, dashed blue line. Throughout this paper I focus on transfer students entering Western with 90 or more credits.

The data also consist of observations of 11,784 native students. In order to make comparisons of native students to transfers as clear as possible, natives are included in this data only after receiving their 90th credit at Western (this is their 90th cumulative credit so it may also include credits transferred to Western while they were a high school student). It is important to recognize that this sample excludes native students who drop out prior to achieving their 90th credit. Only native students who reach their 90th credit in the Fall of 2002 or later are included in this sample.[1]

This data was provided by Western's Office of Institutional Research (IR) and includes demographic information, academic performance prior to achieving their 90th credit (for native students), academic performance at their prior institution (for transfer students), WWU outcomes (GPA, graduation status, graduation honors), and performance in specific gateway courses identified by IR. Some measures were missing for individuals and, in these cases, those observations were excluded from the analysis. I note where this happens.

[1] This means that many early observations of native students began their Western careers prior to Fall, 2002.

Figure 1: Distribution of Credit Hours Earned Prior to Transferring to WWU



Notes: N= 12,167 transfer students.

Throughout this paper I focus on two measures of GPA: **Post90GPA** and **Pre90GPA**. Post90GPA measures the Western GPA earned by students in classes taken after achieving their 90th credit. For transfer students, this is identical to their Western GPA if they transferred to Western with 90 or more credits. Pre90GPA measures the grade point average earned in courses prior to a student's 90th credit. In the case of transfer students who come to Western with 90 or more credits, Pre90GPA is the GPA they transferred to Western (typically the cumulative GPA from their prior institution).

III.B. Sample Selection Issues

As already mentioned, throughout this paper I limit the exploration of transfer students to those who come to Western with 90 or more credits. This partly is done because IR has provided data on natives only after they achieved 90 credits; comparing transfers who start with fewer than 90 credits with natives who have more would likely lead to biased estimates. In short, comparing students who have obtained a similar number of credits limits the influence of credits on academic performance and all of the measures that go with it (difficulty of courses, courses within/outside of major, etc.).

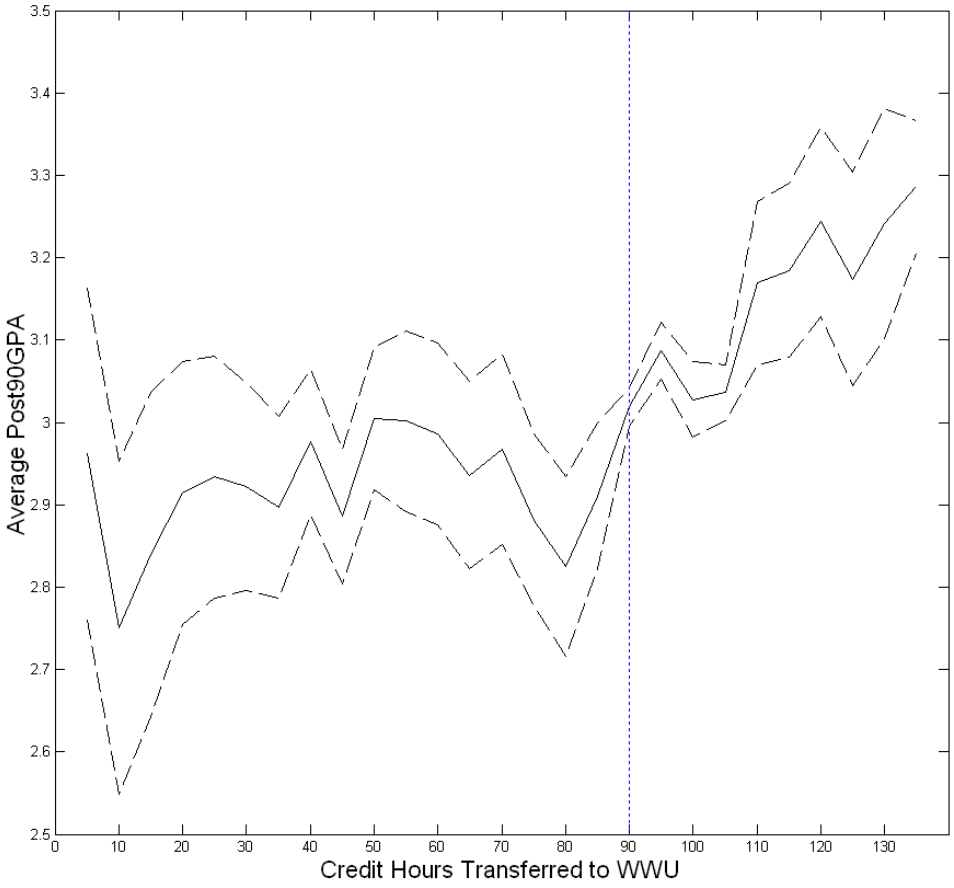
While limiting the analysis to transfers who come with 90 or more credits makes comparisons with natives more appropriate, excluding transfers with less than 90 credits can distort the overall image of transfer student performance. As shown in Figure 2, there is a positive correlation between the average Post90GPA and the number of credits a transfer student brings to Western. Students transferring to Western with less than 90 credits average lower GPAs during their last 90 credits than students who transfer to Western with at least 90 credits.[2] This fact has important implications on the information contained in the rest of this paper. To preview later findings, in many cases it is shown that transfers with at least 90 prior credits perform as well as natives with 90 prior credits. Given that lower performing (on average) transfer students with less than 90 credits are excluded, we cannot assume that all transfers perform as well as natives. Indeed, Figure 2 suggests that this may not be the case.

Examining only native students who obtain 90 credits at Western also introduces a sample selection issue. In the freshmen class that entered in the Fall of 2007, 7% failed to register for courses the following spring and only 79% began their third year on campus.[3] Since native dropouts prior to 90 credits are not included in these comparisons, one must take care when comparing natives versus transfers. Like the case of excluding transfers, when I report that natives and transfers perform equally, I am comparing only those who earned 90 or more credits. It is likely that the (roughly) 20% of natives dropping out before their 90th credit are systematically different from other natives and all transfers. I leave these issues to a later work.

[2] This ignores the attrition which is likely to happen to students transferring to Western with less than 90 credits. For instance, if a transfer student comes to Western with 60 credits, fails their first quarter, and then drops out, they are not recorded in Figure 2. Only students who are successful enough to get to 90 credits are represented in Figure 2.

[3] See "Freshmen Who Plan to Transfer", OSR Research Report at www.wwu.edu/socad/osr/documents/FreshmenwhoPlantoTransfer.pdf.

Figure 2: Average Post90GPA for Transfer Students, by Credits Transferred to Western



Notes: N = 12,167 transfer students. Dashed lines represent 95% confidence intervals for the mean.

IV. Question 1: How Does Academic Performance Compare Between Native and Transfer Students?

To answer this question, I look at three broad measures of academic performance: Post90GPA, the GPA earned in specific "gateway" courses, and whether or not the student graduated from Western. I describe the approach used for each in the following sections.

IV.A.1: Performance as Measured by WWU GPA

To compare Post90GPA of transfer and native students, I first exclude all transfer students who begin at Western prior to earning their 90th credits (that is, I exclude all observations to the left of the blue line in Figure 1). This exclusion makes native and remaining transfers relatively more comparable; after 90 credits both groups should be focusing on similar courses (i.e. upper division courses and courses within their major). The similarity in courses makes GPA comparisons more controlled than comparing 90+ credit native students with all transfers. However, one can imagine native students continuing to enroll in lower division courses even after achieving 90 credits which, compared to transfer students who may be less likely to enroll in these courses, could lower native Post90GPAs.[4]

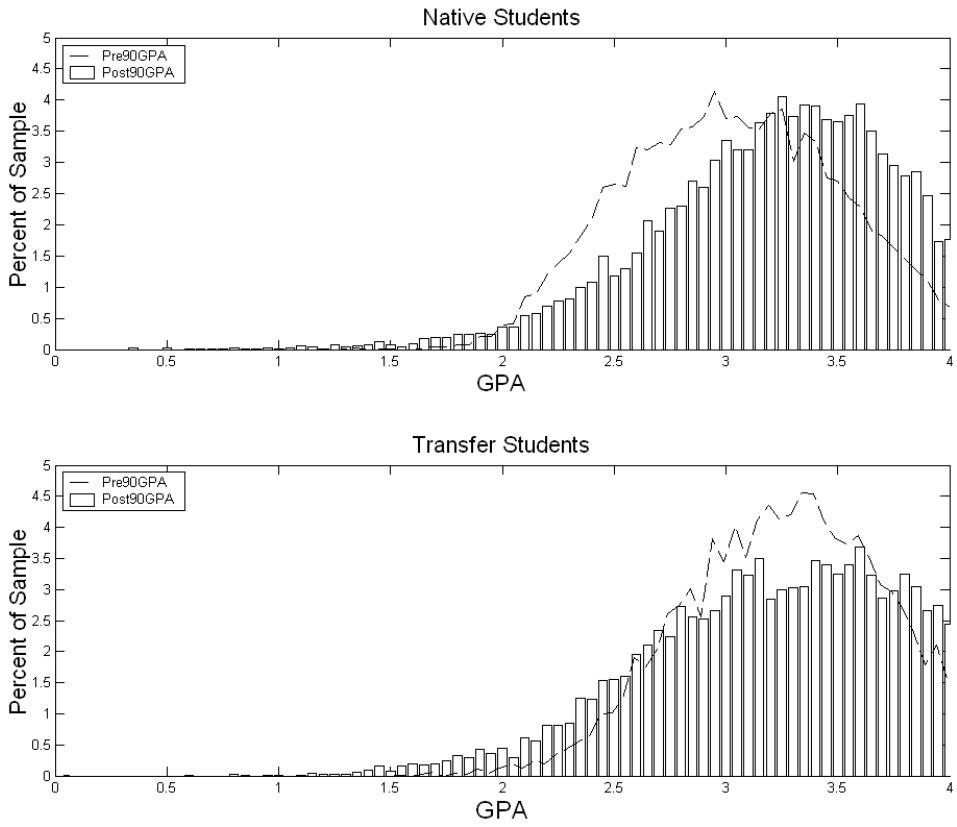
I further exclude all students who, after achieving their 90th credit, fail to attempt to take 30 additional Western credits. By dropping students who attempt a small number of credits after their 90th, I hope to exclude the very lowest Post90GPAs that occur when a student enrolls in only one quarter, performs poorly, and as a result leaves Western. Since native students have experienced significant transition issues prior to their 90th credit, excluding students failing to take 30 credits after their 90th credit disproportionately eliminates transfer students who are experiencing a new school during this time. If transfers perform poorly upon entering Western, they may dropout prior to attempting their 30th Western credit. When these students are excluded from the analysis, one would observe that the remaining transfer students average higher GPAs and erroneously conclude that all transfers do better than they really do.[5]

Figure 3 presents histograms of Pre90GPA and Post90GPA of native and transfer students who attempted at least 30 credits at Western after achieving their 90th credit. Two immediate observations present themselves. First, the Post90GPA mean of native students (mean = 3.155, st. dev. = .523, N = 10,128) is statistically identical to the Post90GPA mean of transfer students (mean = 3.149, st. dev. = .557, N = 6,586). This similarity in averages suggests little academic difference between natives and transfers. Second, the Pre90GPA of natives (mean = 2.99, st. dev. = .467) is considerably lower

[4] I speculate that it would lower native Post90GPAs relative to transfer Post90GPAs based upon the fact that the average grade given at Western in 200-level courses is lower than that given in 300- and 400-level courses.

[5] Indeed, the average Post90GPA of all transfer students who come to Western with 90 or more credits is 3.01, a significantly lower average than the Post90GPA of transfers who attempt at least 30 credits.

Figure 3: GPA Distribution of Students Who Attempted at Least 30 WWU Credits



Notes: For natives, N = 10,063, for transfers N = 6,567.

than that of transfers (mean = 3.20, st. dev. = .428). A few possibilities may account for this second fact. Most obviously, to be admitted to Western, transfer students must have good GPAs from their prior school; those with low GPAs aren't admitted and won't be part of the distribution in Figure 3. However, given that transfer and native students average similar Post90GPAs, the fact that transfer students have significantly higher Pre90GPAs suggests that the underlying process that transforms Pre90GPAs into Post90GPAs differs between transfer and native students. This would occur if the originating transfer schools assign higher Pre90 grades to their students than Western does. If this is the case, then a transfer student, with an identical Pre90GPA, would not perform as well as a native Western student. Another possibility is that the composition of transfer students and native students differs in systematic ways that account for differences in prior GPAs. I explore each of these possibilities in the following sections.

One possibility is that the composition of transfer and native students differs in such a way as to mask existing GPA differences. For instance, imagine if transfer students were more likely to study a particular subject than natives and this subject, on average, gave higher grades to its students than the Western average. This would tend to inflate transfer Post90GPA averages relative to natives and, based upon the comparisons of Figure 3,

Figure 4: Transfer and Natives with at Least 30 WWU Credits, Descriptive Statistics			
	Natives		Transfers
Post90GPA	3.155 (.523)	=	3.149 (.557)
Pre90GPA	2.994 (.466)	<	3.201 (.428)
Credits Earned	97.03 (5.84)	<	97.28 (10.19)
Age (years)	24.41 (1.83)	<	28.67 (7.23)
Male (=1 if male, 0 otherwise)	.424 (.494)	=	.438 (.496)
Black (=1 if black, 0 otherwise)	.020 (.141)	=	.017 (.130)
Hispanic (=1 if Hispanic, 0 otherwise)	.031 (.174)	<	.039 (.192)
Asian (=1 if Asian, 0 otherwise)	.089 (.285)	>	.059 (.234)
Indian (=1 if Indian, 0 otherwise)	.015 (.122)	<	.029 (.169)
AA (=1 if earned AA, 0 otherwise)	0 (0)	<	.827 (.378)
First Generation (=1 if first generation, 0 otherwise)	.297 (.457)	<	.466 (.498)
Interest[6] (=0 if has definite field of study; 1 if has interest in an area)	.612 (.487)	<	.808 (.393)
N	10,063		6,567
Notes: > < represent statistical differences at the 95% level. = represents no statistical difference. The means and standard deviations of Post90GPA and Pre90GPA differ slightly from those presented in the text because this Figure presents the averages of those variables only if all other variables contained non-missing data.			

would cause one to erroneously conclude that transfer students perform as well as natives.

Figure 4 presents descriptive statistics of common demographic information by native and transfer students who attempt at least 30 WWU credits after completing their 90th credit. On average, transfer students begin their post-90 credit Western careers with

[6] In this work, students are categorized in one of three ways: being a declared major, having indicated to Western (usually through the application process) that they have an interest in a major, and being undecided. A student with an interest in a major has yet to declare a major and is likely to be less certain of their field of study. In the regression work to follow, I distinguish between declared majors, interest, and undecideds.

slightly more credits than natives, are almost 5 years older, more likely to be Hispanic or American Indian, less likely to be Asian, and about 50% more likely to be first generation. Further, at the time of admission 80.8% of transfers show an interest in a field (as opposed to a definite field of study or being undecided) while 61.2% of natives are at the interest level.[7] Not surprisingly given the additional time spent on campus, conditional upon achieving 90 credits natives are more certain of their field of study than are transfers. There are also significant differences in desired fields of study. For example, at the time of admission 9.0% of natives want to study education versus 15.9% of transfers. 2.7% of natives and .6% of transfers want to study pre-med, 4% of natives and 7.2% of transfers hope to study psychology, and 2.2% of natives and 3.6% of transfers want to study communications. Taken as a whole, these demographic and academic differences may mask actual performance differences of transfer students relative to native students.

A common method for controlling for the impact of observables on a single dependent variable is to employ ordinary least squares (OLS). OLS estimates the impact on a dependent variable (in this case Post90GPA) of each observable independent variable. OLS can then be used to "remove" the estimated impact of these observables on Post90GPA leaving a predicted Post90GPA that would occur if both groups (natives and transfers) had identical observables. In essence, OLS allows a researcher to ask what the difference in Post90GPA would be between transfers and natives if each group had the identical composition of observable variables.

Figure 5 reports the results of numerous OLS estimates each using a slightly different set of control variables. For instance, when no control variables are included, row 1 of Figure 5 indicates that native students are expected to score .006 GPA points higher than transfer students. This is the exact difference that appears between natives and transfers in Figure 4. When basic demographic observables are controlled for such as age, numbers of credits previously earned, gender, and race, natives are expected to score .015 GPA points better. This is a small difference and is not estimated precisely enough to statistically differ from zero.

However, when indicators for preferred field of study are included as control variables, native students are expect to earn a GPA of .058 units higher than transfer students. This lends evidence supporting the previously mentioned hypothesis that transfer students are more likely to be interested in subjects at Western that grade easier and thereby tend to inflate the average transfer Post90GPA relative to native students.

Another potential reason that may alter the average GPAs of transfer and native students are that these students enter Western as part of different cohorts of students. During some years, Western is more competitive than others and in any given year may be more (or less) selective in who is admitted. Because of this, some marginal natives (and transfers) may be part of one cohort but, an identical student applying in a different year

[7] To be clear, this means that 19.2% of transfers are either undecided or have declared a major and 38.8% of natives are either undecided or have declared a major. Indeed, 2.7% of all transfers are undecided as are 18.9% of natives.

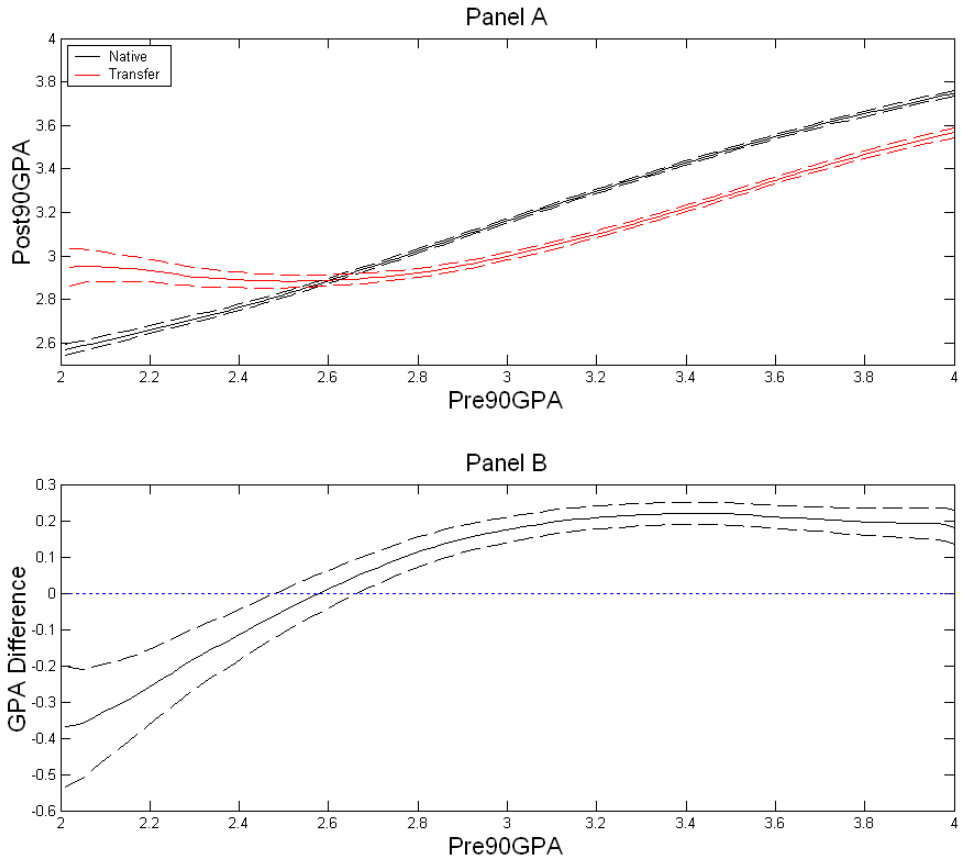
Figure 5: Post90GPA Native/Transfer Conditional Differences	
Control Variables	Estimated Native – Transfer Post90GPA Difference
None	.006 (.008)
A: Age, Age^2, Credits Earned, Credits Earned^2, Male, Black, Hispanic, Asian, Indian, AA, First Generation	.015 (.017)
B: Set A + indicator variables for intended field of study[8]	.058*** (.017)
C: Set B + indicator variables for quarter that student earned their 90th credit	.093*** (.018)
Notes: Robust standard errors in parenthesis. *** represents statistically different from zero at the 99% level. Regression results from these four regressions are presented in Appendix A.	

may not be admitted. This seemingly random difference in cohort quality could impact grading of professors (because they experience varying student quality over time) or it could help students succeed (if there are positive peer effects and they happen to be in a strong cohort). In order to partially control for this type of effect, variables indicating which quarter a student earned their 90th credit were included.[9] In effect, including these indicator variables in an OLS regression creates a fixed-effects estimator. In other words, the native-transfer comparison is made against other students in their own cohort rather than across many different cohorts. When these indicator variables are included, native students score .093 Post90GPA points higher than transfer students in their same cohort. Taken as a whole, despite native and transfer students averaging almost identical Post90GPAs, native students appear stronger than transfer students after controlling for demographic, field and cohort effects. Overall, these differences are small (almost one-tenth of a Post90GPA) but precisely enough measured to be statistically different than zero at the 99th percent level.

While Figure 5 concentrates on the importance of demographic and background variables in determining Post90GPA, it excludes an obvious measure of potential academic success: Pre90GPA. Students doing well in the past will likely do well in the future and excluding this source of variation from OLS can bias its findings. Panel A of Figure 6 presents the average Post90GPA as a function of Pre90GPA for both transfers and natives. To be clear, the average Post90GPA of a transfer student who earned a Pre90GPA of 3.0 is 2.99 while the average Post90GPA of a native student who earned the same Pre90GPA is a 3.17. Panel A demonstrates that the average Post90GPA of transfers relative to natives depends upon their grades earned on their first 90 credits. "Weak" transfers, that is transfer students earning a Pre90GPA less than 2.5 actually average higher Post90GPAs than "weak" native students. However, "strong" native

[8] A students intended field of study is typically determined by the response a student makes on an application for admission to the question regarding what majors in which they might have an interest.
[9] For transfer students coming to Western with 90+ credits, the quarter they earned their 90th credit is identical to their first quarter at Western.

Figure 6: Average Post90GPA of Transfer and Native Students



Notes: 95% confidence intervals for the average Post90GPA in dashed lines. Panel A is constructed using kernel-weighted local polynomial smoothing.

students, that is natives who earn a Pre90GPA of about 2.7 or higher, do significantly better than similarly situated transfer students. For each Pre90GPA, the average difference between native and transfer students was computed and displayed in Panel B of Figure 6. From this it is clear that native students average higher Post90GPAs than transfers only if they scored higher Pre90GPAs.

As pointed out in Figure 5, Post90GPA performance is a function of other observables and possibly, the differences displayed in Figure 6 are a function of these other observables and not prior academic performance. For instance, if "strong" transfer students are more likely to enroll in difficult academic courses and "strong" native students do not, then one might find Figure 6 does not occur because of an innate native-transfer difference but instead because of non-random distribution of course difficulty across natives and transfers. Further, recall from Figure 3 that transfer Pre90GPA is considerably higher than native Pre90GPA leading to the possibility that schools transfers arrive from grade easier than does Western. One can use OLS to control for these effects. To control for these possibilities, consider equation (1):

$$(1) \qquad \text{Post90GPA}_i = \beta_0 + \sum_{j=1}^{m} \beta_j \, \text{Pre90GPA}^j + \boldsymbol{\alpha}\mathbf{X}$$

where i indexes individual students, **X** is a matrix of control variable listed in Appendix B, **α** is a vector of coefficients estimated with OLS, and m is determined by minimizing the Akaike Information Criterion. Equation (1) uses OLS to estimate the non-linear impact of Pre90GPA on Post90GPA holding the variables **X** constant. The variables **X**, listed in the Appendix, include the same demographic variables employed in Set C of Figure 5 and the college of origin (for transfer students). Equation (1) is estimated separately for both transfer and native students and each student's Post90GPA is estimated given their Pre90GPA. The resulting estimates are best thought of as a best guess at any particular student's Post90GPA holding the observable **X**'s constant. These estimates are displayed in Figure 7.

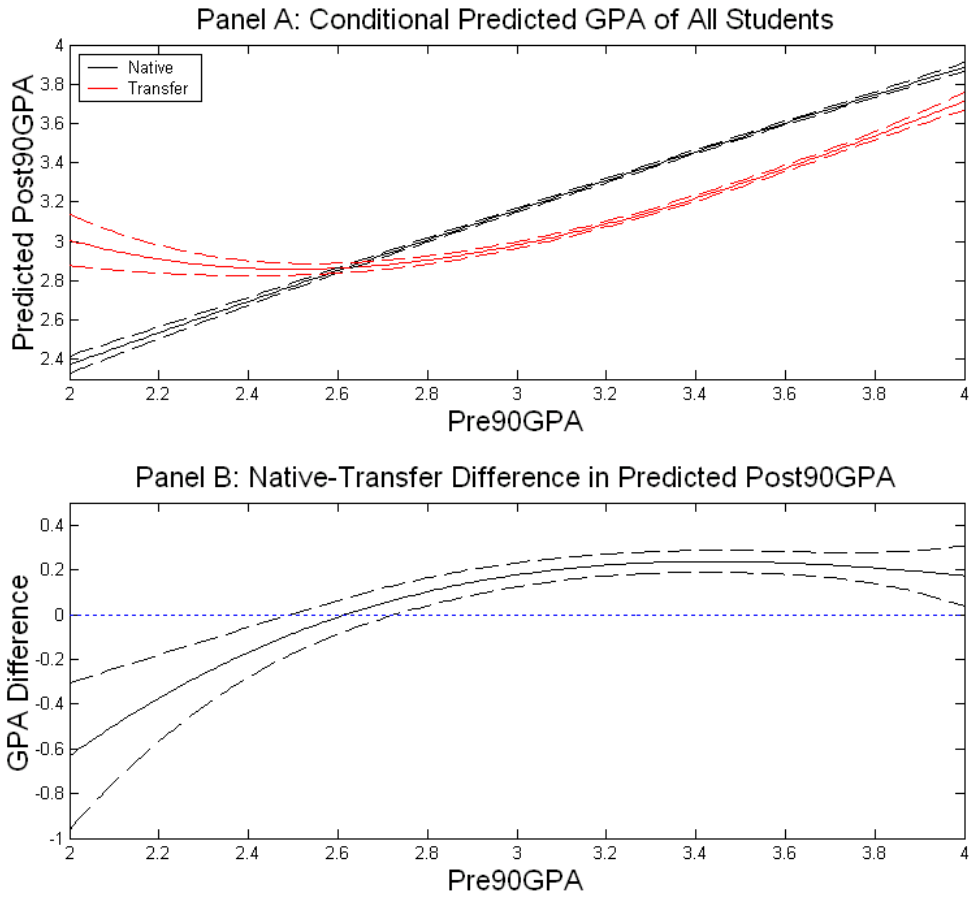
What is immediately apparent from Figure 7 is the high degree of similarity between it and the unconditional Post90GPAs presented in Figure 6. In short, this means that the relationship between Pre90GPA and Post90GPA demonstrated in Figure 6 is not caused by native/transfer differences in the many control variables included in the OLS estimation routine. Put another way, the fact that "strong" native students outperform similarly "strong" transfer students is not an artifact of demographic differences, cohort membership, field of intended study, or school of origin for transfer students.

Taken as a whole, Figures 4 through 7 imply that transfer students score almost one-tenth of a GPA lower than native students but this difference is not constant across ability as measured by Pre90GPA. Indeed, native students scoring about a 3.4 GPA on their first 90 credits at Western are expected to score about .2 GPA units higher than a transfer student who scored a 3.4 GPA at their prior institution (see Panel B of Figure 7). This positive difference occurs for ranges of Pre90GPA above (about) 2.7 and is counterbalanced by better performance of transfer students at lower ranges of Pre90GPA.

One possible objection to the analysis of Post90GPAs is that the sample concentrates on students who attempted at least 30 credits as Western students. What differences in the analysis would occur if one examined only students who eventually graduated? Certainly, there are likely to be differences between students who eventually graduated and those who attempted at least 30 credits after achieving 90. If these differences systematically impact GPA, then one might confuse these differences with the transfer/native impact. In order to examine this, I reduce the sample to only those students who eventually graduate from Western and repeat the analysis of Figures 3 through 7. In order to save room in the text, I produce these graphs in Appendix C and will use this space to comment on the results.

Appendix C presents Figure C1 which displays histograms of Pre90GPA and Post90GPA for both transfers and natives. Like the larger sample, the Pre90GPA difference between transfers and natives is large, with transfers averaging about .22 grade points more than natives. However, the Post90GPA difference is much smaller with transfer holding a small but statistically significant advantage of .023 grade points ($t = 3.06$, $p = .002$).

Figure 7: Conditional Predicted Post90GPA by Pre90GPA



Notes: Dashed lines indicate 95% confidence intervals. The native-transfer difference is defined as the native line in panel A less the transfer line in the same panel. Each conditional regression in Panel A also includes the control variables listed in Appendix B.

While transfer students hold a small Post90GPA advantage over natives, the composition of transfer students differs from natives. Using OLS, Figure 8 provides estimates of the native-transfer Post90GPA conditional upon observables and successful degree completion. One benefit of examining graduates relative to any student completing 30 upper division credits is that graduates declared and completed a major. Thus, rather than controlling for the stated field of study at time of admission as Figure 5 does, Figure 8 controls for the actual completed major. Because of the large differences in average GPAs earned in some majors relative to others, controlling for major allows for much greater precision in the native-transfer Pos90GPA difference.

Unlike Figure 5, the results of Figure 8 indicate that there is no statistically significant difference in native-transfer average GPAs after controlling for observables. The estimate which includes the most control variables, set C, indicates that natives hold a Post90GPA advantage over transfers of .002 grade points, a small difference both

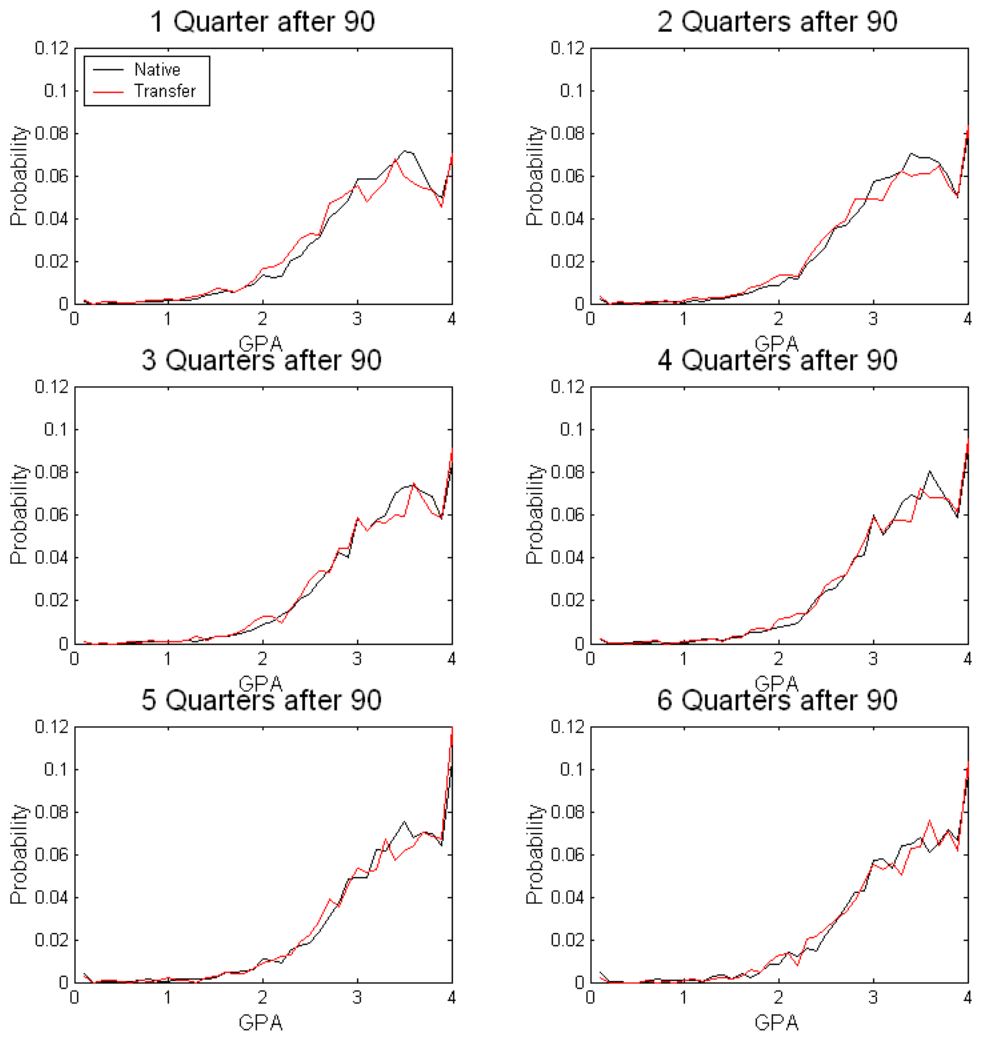
Figure 8: Post90GPA Native/Transfer Conditional Differences on Graduated Students	
Control Variables	Estimated Native – Transfer Post90GPA Difference
None	-.023*** (.007)
A: Age, Age^2, Credits Earned, Credits Earned^2, Male, Black, Hispanic, Asian, Indian, AA, First Generation	-.019 (.012)
B: Set A + indicator variables for major field of study	-.018 (.011)
C: Set B + indicator variables for quarter that student earned their 90th quarter	.002 (.011)
Notes: Standard errors in parenthesis. *** represents statistically different from zero at the 99% level. Regression results from these four regressions are presented in Appendix A.	

statistically and practically.

The difference in conclusions based upon Figure 5, which examines all 90+ credit students who take 30 or more Western credits, and that of Figure 8, which examines only graduates, requires some explanation. The most likely candidate this difference is that students new to the university experience initial difficulties that prevent some from proceeding to graduation. If these transitions issue negatively impact the GPA of transfer students, then initially weaker transfer students may earn lower grades and drop out prior to graduation. If this is the case, then one would expect the larger sample of students to have lower transfer GPAs than a sample that contains just students who eventually graduate.

Figure 9 helps to explore the "transition-shock" hypothesis by presenting histograms of GPAs earned by transfer and native students by quarter after earning their 90th credit. In this case, the sample includes all transfer and native students conditional upon enrolling in at least 12 credits per quarter. Two important observations come from Figure 9. First, in each of their first two quarters on campus, transfer students are more likely to populate the lower portion of the GPA distribution. For the first quarter on campus, 1.73% of transfer students earned a GPA between 2.0 and 2.1 while only 1.23% of natives did. While this may appear small in absolute terms, a similar positive, significant difference exists for each tenth of GPA between 1.7 and 2.9. The cumulative impact is that about one-out-of-ten of transfer students earn a GPA less than 2 while about one-in-twenty natives do so. This fact is important when considering the propensity to dropout. Of the 2,348 transfer students who scored a GPA of 2 or lower during their first Western quarter, 1,231 (52.4%) failed to register for courses the very next quarter. For native students in their first quarter after 90 credits who scored a GPA of 2 or lower, 38.5% dropped out. Taken as a whole, the greater proportion of low GPAs during their initial courses coupled with a higher propensity for low GPAs to cause transfer dropout gives reason for the differences between Figures 4 and 7. Specifically, transfer students that survive the first

Figure 9: GPA Distribution by Quarter After Achieving 90 Credits



Notes: The sample is all transfer and native students who have completed 90 credits and, in each quarter, attempted 12 WWU credits.

few quarters perform similarly to natives and the differences in average GPAs between Figures 4 and 7 are driven by transfer students who do not make it to graduation.

The second important observation in Figure 9 which supports the similarity of native and transfer student GPAs is the high degree of conformity in the GPA histograms of each group in later quarters. In the third, fourth, fifth, and sixth quarters after earning 90 credits, there are no extended blocks of GPAs where natives outscore transfer students. This suggests that either transfer students, upon acclimation to Western, become similar to natives and/or transfers that do not, drop out. Whatever the case, the combination of

Figures 8 and 9 suggest there are little or no differences in average GPAs of graduating natives and transfers.

While there may be no difference in average GPAs, it is still possible that Pre90GPA translates into Post90GPA differently for natives than transfers. This was explored for the larger sample in Figures 6 and 7. In the larger sample, transfer students coming to Western with low GPAs from their former institutions performed at a higher Post90GPA than did native students with the same low Pre90GPA. On the other hand, students with a high transfer GPA did not perform as well as natives with similar high Pre90GPAs. To what extent is this driven by the fact that Figures 6 and 7 concentrated on all 90+ credit students who completed at least 30 WWU credits? Appendix Figures C2 and C3 reproduce Figures 6 and 7 using the sample of students who graduated from Western. Like the earlier results, there is a significant difference in the transformation of Pre90GPAs into Post90GPAs of native students relative to transfers. Indeed, this pattern follows almost identically that of the earlier analysis. Low Post90GPA transfers do relatively better in Post90GPAs than similarly situated natives but high Post90GPA transfers do worse.

To summarize this section, the average Post90GPA of transfers is similar to that of natives. When demographic and cohort factors are accounted for, transfer students average a lower Post90GPA than natives but this appears to be due to weak transfer students who do not achieve graduation. When only students who do graduate are observed, there is no difference in average Post90GPAs between natives and transfers. However, while there may be no difference in average Post90GPA performance, there is evidence to suggest that the process which translates Pre90GPA performance into Post90GPA performance differs for transfer students than natives. One possible explanation is that transfer students and natives are equivalent but schools transfers come from grade more generously leading to lower conditional expected performance for transfers than natives (especially at the higher grade distributions). A second possibility is that the most talented students enter college as native students and, because of their talent, are more likely to do well in upper division courses given their good performance in their first 90 credits.

IV.A.2: Performance as Measured by GPA in WWU Gateway Courses

One drawback of analyzing average GPAs is that students non-randomly select into different courses. If this non-random selection is correlated with their transfer status, then it is possible that comparing average overall GPAs by transfer status is misleading. For instance, if transfers are likely to enroll in easier courses, then one might find transfers earn better grades than natives. One way to partially deal with this is to compare transfer and native performance in individual courses. A drawback of this approach is that native students have greater opportunity to learn about the grading styles of particular professors and may be able to select into higher grading courses than transfers. Despite this possibility, in this section I concentrate on the average

performance in fourteen courses identified by the IR as "gateway" courses which are required for large numbers of students or groups of majors.

Figure 10 identifies these gateway courses and provides the average GPA earned by both transfers and natives in each course. To make transfers as comparable to natives as possible, grades in gateway courses were measured only if they were taken after the student achieved 90 credits.[10] By doing this, I am not making comparisons between a native who took a gateway course as a freshmen and a transfer student who, with considerable academic experience at the time of course enrollment, may outperform the freshmen native. The grades measured in these gateway courses are those earned in a student's first attempt at the course.[11]

Figure 10 shows that in twelve of the fourteen courses natives average higher GPAs than transfers. Of these twelve, six of the differences are statistically different. In neither of the two courses in which transfers outperform natives is the difference statistically significant. While these differences in averages are suggestive that native students perform better in some gateway courses than transfers, like the case of Post90GPA, the differences in average course grades could be caused by differences in the composition of students rather and not a native/transfer difference. Figure 11 presents conditional GPA differences for each gateway course based upon different sets of control variables.

To facilitate explanation of Figure 11, I will focus on the DSCI 205 column. DSCI 205 is a required course for most CBE majors. The first row of Figure 11 presents the native/transfer GPA difference without controlling for any observables. In the case of DSCI 205, native students average .186 grade points higher than transfer students. This difference is statistically significant and large in a practical sense—about half of the difference between a A- and B+ for example. Because one might expect the performance in any gateway course to be correlated with the student's initial academic interest [12], row A includes a binary indicator if the gateway course is required for a student to complete a major in their area of interest. In the case of DSCI, this binary variable is equal to one if the student expressed an initial interest in "business," economics, or accounting.[13] Including this control variable does little to alter the estimated native/transfer grade point difference for DSCI 205 in particular, and makes little difference in the other courses as well. Row B of Figure 11 addresses the possibility that natives and transfers differ demographically and these demographic differences drive the observed differences in course performance. Included in the control variable of Row B are variables measuring students' age and its square, the number of prior college credits earned and its square and binary indicators for race, gender, and the prior acquisition of an AA degree. The

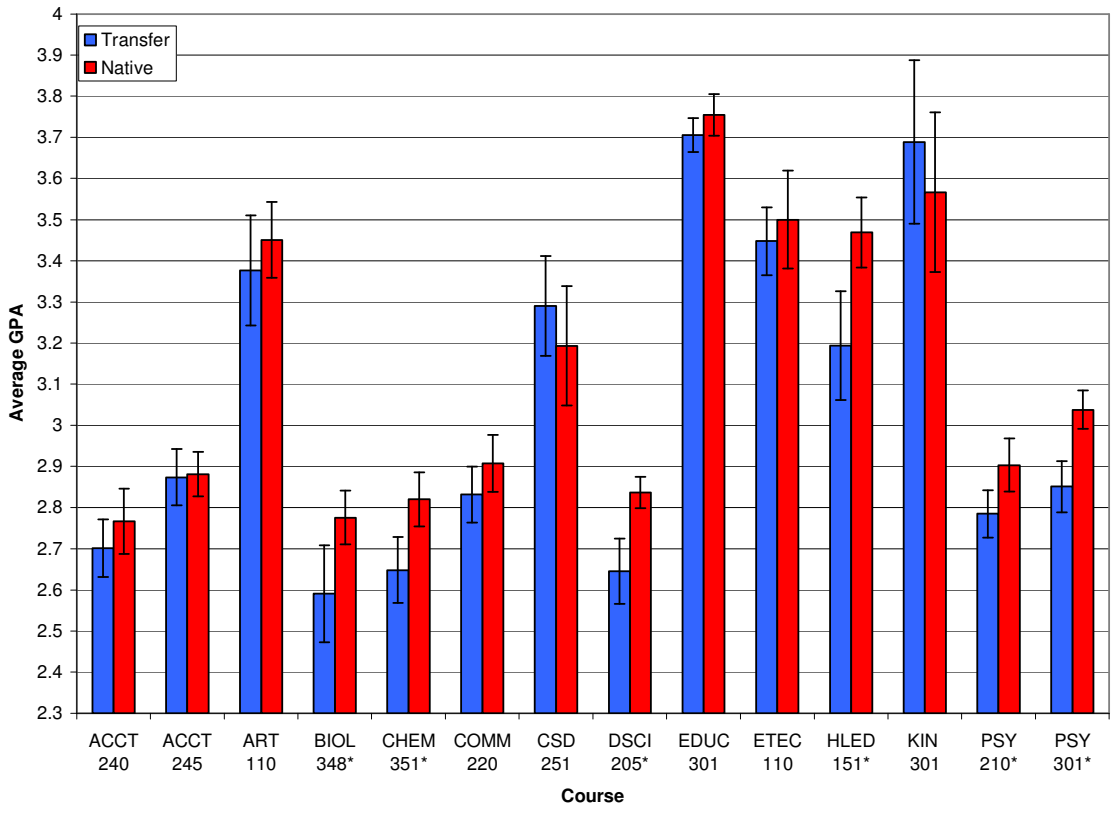
[10] Unlike the earlier case of overall GPA, I include in this sample students that did not attempt 30 or more Western credits after their 90th overall credit. Thus, some of the native-transfer difference may be due to the transitional shock expected of transfer students. I attempt to control for that in my regression estimates in two ways: a control variable for taking a gateway course in their first credit on campus and restricting the sample to 30 or more credits.

[11] This is the student's first attempt at Western. It is possible either natives or transfers took a gateway course earlier at another institution.

[12] As listed on their application for admission.

[13] No other CBE majors were listed by incoming freshmen as their initial interest.

Figure 10: Gateway Course Performance by Transfer and Native Students



Notes: * denotes a statistically significant difference in Average GPAs between Transfer and Native students. The error bars represent a 95% confidence interval for the average GPA in each course.

inclusion of these control variables does little to alter the estimated native/transfer performance difference for DSCI 205. Nor does the inclusion of these control variables reduce the native/transfer difference for any of the other five gateway courses which originally had statistical significance. However, their inclusion does cause two courses, ACCT 240 and EDUC 301 to be statistically different. Given this, native students appear to perform better in eight courses than transfer students after one controls for the observables included in row B.

One major difference between transfers and natives demonstrated in Figure 4 is that transfers are 50% more likely to be first generation college students. If being first generation causes a student to perform worse, then the grade disadvantage that appears to occur in some gateway courses may occur not because of a student's transfer status but instead because transfer students are also likely to be first generation students. Row C adds one variable to Row B: a binary variable indicating if a student is first generation. The inclusion of this variable is striking. All estimated differences in native/transfer performance other than in HLED 151 become statistically no different than zero. This suggests that the apparent transfer disadvantage is due not to being a transfer student, but

Figure 11: Conditional GPA Differneces Between Native and Transfer Students in Selected Gateway Courses														
Control Variables	Acct 240	Acct 245	Art 110	Biol 348	Chem 351	Comm 220	CSD 251	DSCI 205	EDUC 301	ETEC 110	HLED 151	KIN 301	PSY 210	PSY 301
None	.065 (.054)	.007 (.044)	.074 (.083)	.184*** (.068)	.171*** (.052)	.075 (.049)	-.096 (.096)	.191*** (.044)	.049 (.033)	.052 (.073)	.275*** (.080)	-.122 (.141)	.118*** (.044)	.186*** (.039)
A	.077 (.054)	.026 (.045)	.115 (.083)	.218*** (.069)	.171*** (.053)	.100* (.055)	.041 (.110)	.186*** (.047)	.079** (.036)	.085 (.084)	.341*** (.085)	.-.074 (.142)	.216*** (.048)	.241*** (.046)
B	.132** (.056)	.025 (.045)	.123 (.086)	.207*** (.069)	.181*** (.055)	.092 (.057)	-.006 (.106)	.193*** (.047)	.087** (.036)	.074 (.089)	.327*** (.089)	-.051 (.164)	.213*** (.050)	.258*** (.048)
C	.094 (.104)	-.105 (.086)	.218 (.159)	.093 (.148)	.003 (.102)	.013 (.112)	-.187 (.145)	.019 (.099)	.062 (.069)	-.026 (.132)	.379** (.177)	-.100 (.101)	.112 (.101)	-.070 (.109)
D	.033 (.113)	-.102 (.089)	.282* (.167)	.014 (.153)	-.049 (.105)	.013 (.16)	-.162 (.158)	-.010 (.104)	.118 (.073)	-.011 (.144)	.304* (.181)	-.134 (.229)	.097 (.102)	-.078 (.110)
D^{+}	.020 (.116)	-.101 (.092)	.327* (.178)	-.004 (.167)	-.056 (.107)	.001 (.124)	-.188 (.159)	-.053 (.107)	.093 (.074)	.011 (.149)	.284 (.194)	#	.094 (.107)	-.121 (.114)

Notes: Robust standard errors presented in parenthesis. Control variable set A includes an indicator if the gateway course is required for the student's intended field of study. Control variable set B contains set A and hours earned, hours earned squared, age, age squared, and binary indicators for race, gender, and prior receipt of an AA degree. Control variable set C contains set B and indicators for being a first generation college student. Control variable set D includes set C and an binary variable indicating if the transfer student took the gateway course their first quarter on Western's campus. *** (**) [*] indicate statistical significance at the 99 (95) [90] percent level. $^{+}$ The sample was restricted to exclude all students who fail to attempt 30 credits after achieving their 90^{th}. # too few observations to compute this relationship.

instead because a greater proportion of transfer students are the first in their families to attend college.

A final control variable included in row D of Figure 11 is a simple indicator that measures if the gateway course was taken during a student's first quarter on Western's campus. As suggested earlier, students may experience an academic shock during their initial experience on Western's campus. Including this variable alters the estimated coefficients only marginally.

The final row of Figure 11 restricts the sample to students who attempt at least 30 credits at Western; the same sample used in the overall GPA comparisons of the prior sections. This restriction excludes students who drop out of school early (perhaps as a result of a poor grade in a gateway course). This restriction does little to alter the estimated native-transfer difference.

Taken as a whole, transfer students do not perform as well in the selected gateway courses. However, this is not because of their transfer experience per se. Instead, transfer students appear to underperform native students because they are more likely to be first generation college students.

IV.A.3: Summary of GPA Evidence

The evidence on Post90GPA presented suggests a two-part story. First, for all courses taken after 90 credits in which students attempted at least 30 credits, there is almost no difference in GPA earned by transfer and native students. After differences in individual characteristics, most notably the intended field of study and cohort membership are accounted for, natives hold a GPA advantage of about .093 units. Yet, even this advantage disappears when only students who eventually graduate are examined. The lesson from this is that immediately after transferring to Western, transfers do somewhat worse than natives and within a quarter or two, this difference disappears most likely because the weakest transfer students leave the university and possibly because those transfers who remain learn to do better.

While the conditional performance of transfer and natives who eventually graduate is similar, this does not mean that transfers do equally well in the same classes as natives. In almost half of the gateway courses examined, natives earn better grades than transfers. While this may be thought of as evidence for the superiority of natives over transfers, ultimately the fact that transfers are much more likely to come from weaker academic backgrounds (as defined as a first generation college student) explains all of the native-transfer performance difference in these particular courses.

The second part of the Post90GPA story is that there is a significant difference in the performance of natives and transfers at different points on the Pre90GPA distribution. For both the large sample and the sample of students who eventually graduate, a native student who earned a high Pre90GPA is expected to do considerably better than a transfer

student earning the same high Pre90GPA at their prior institution. This relationship is reversed at the low end of the Pre90GPA distribution; low-Pre90GPA native students end up doing worse than a transfer student with the same Pre90GPA.

IV.B.1: Performance as Measured by WWU Graduation

While GPAs are an indicator of student success, ultimately a goal of the university is to produce graduates. This section examines differences in native and transfer students' propensity to graduate.

Before describing the analysis, it is important to note two changes made to the sample relative to the previous section. First, when attempting to predict which students graduate, it is not necessary to restrict the sample to students who attempted 30 or more credits at Western. Instead, this section includes all natives who earned 90 or more credits and all transfers who came to Western with 90 or more credits. Because the goal will be to examine which students graduated, this section excludes all students who started at Western in the Summer quarter of 2007 or later. This restriction provides at least 10 quarters during which the observations can graduate (the last quarter observed is Fall, 2009).

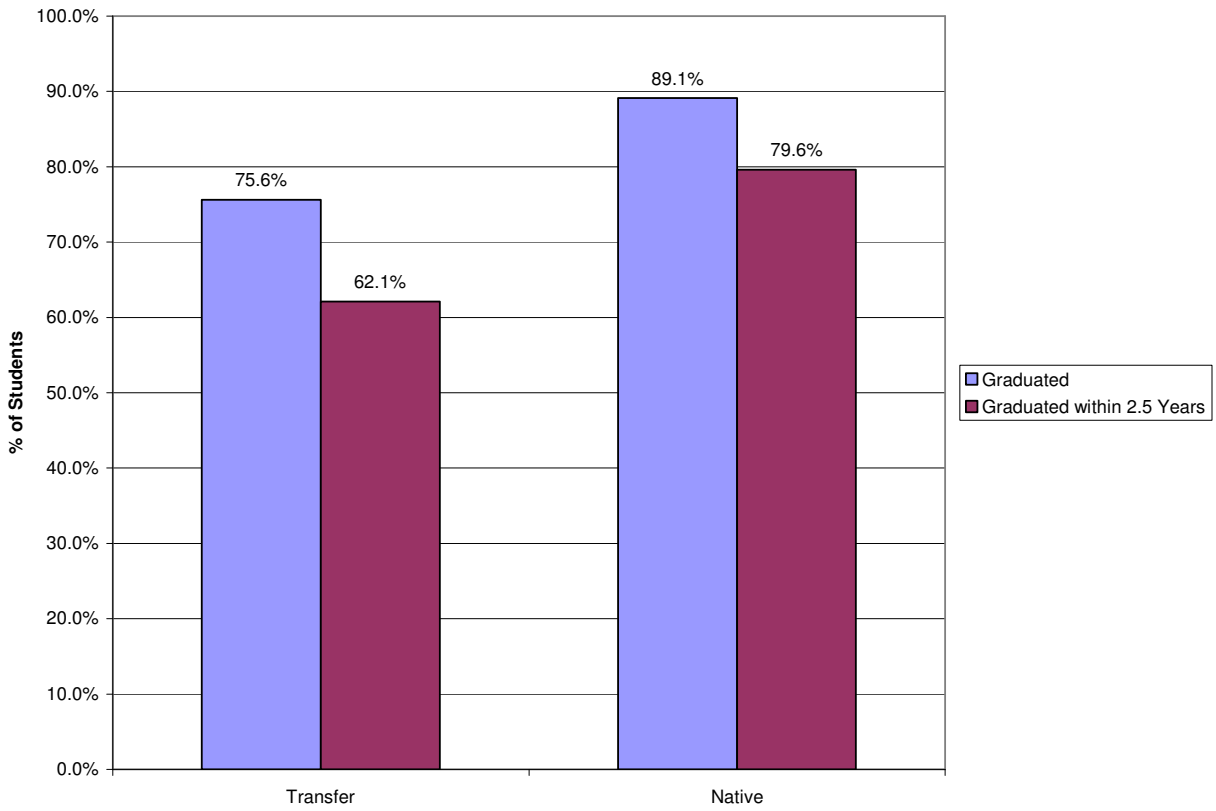
Because the university is not only interested in graduating students but also in the timely graduation of students, in many cases I introduce a measure of graduating within 2.5 years of earning their 90th credit. In a sense, this is connected to taking 5 years to graduate; 2.5 years before the 90th credit and 2.5 years afterwards.

Figure 12 shows the percentage of natives and transfers who graduate from Western. Natives hold a significant advantage over transfers. Of all natives who achieve 90 credits at Western, 89.1% graduate; 79.6% do so within 2.5 years of achieving their 90th credit.[14] Only 75.6% of transfers who came to Western with 90 or more credits graduate[15]; 62.1% of transfers graduate within 2.5 years. This difference is especially surprising in light of the fact that many transfers come to Western with significantly more than 90 credits (see Figure 1).

Like the case of GPAs, graduation is impacted by a wide range of variables. First generation students, without the benefit of a familial higher education tradition, may be less motivated to graduate as might be racial minorities. A large economics literature exists that helps explain the tendency for women to attend college and graduate at a higher rate than men. The differences in GPA caused by cohort membership, academic interest, AA degree, and other observables may also account for differences in graduation rates.

[14] The most recent computed 5-year graduation rate for native freshmen is 63%. The difference between 63% and those reported in the text is that many native freshmen dropout prior to achieving their 90th credit.
[15] I focus on transfers who arrive at Western with 90 or more credits. However, the graduation rate of all transfers (including those who come to Western with less than 90 credits) is 51.5%. Thus, focusing on 90+ credit transfers actually overstates the likelihood of transfer graduation.

Figure 12: Percent of Students Graduating



Notes: Only students achieving their 90th credit prior to Summer, 2007 were included.

probit model can be used to Unlike the case of GPA, the appropriate technique to predict a binary outcome (to graduate or not to graduate) is a probit model. A probit model is a non-linear maximum likelihood estimation technique that functions similarly to OLS. In essence, a probit estimates the contribution an observable variable has to the probability of graduation. A "remove" this estimated impact and provides a conditional impact on the graduation probability of being a native versus a transfer. The correct way to interpret conditional probit estimates is in terms of observables; the probit allows one to estimate the difference in graduation probabilities of natives and transfers as if natives and transfers had the same observable characteristics.

Figure 13 presents probit estimates for both the probability of graduating and the probability of graduating with 2.5 years. In the case of graduation, controlling for age, prior credits earned, gender, race, residency, first generation, and academic interest fail to alter the unconditional estimates of the native/transfer difference in graduation probabilities. In other words, the observed difference in graduation probability of 13.5% is not caused by differences in these observed variables between natives and transfers. However, when cohort codes are included, the difference in graduation probabilities rise to 16.5% suggesting that the unconditional estimates

Figure 13: Probit Estimates of the Native-Transfer Probability Difference		
Control Variables	Native-Transfer Difference in Graduation Probability	Native-Transfer Difference in 2.5 Year Graduation Probability
None	13.5%*** (.65%)	17.5%*** (.77%)
A: Male, Black, Hispanic, Asian, Indian	13.4%*** (.66%)	17.5%*** (.78%)
B: A + Age, Age^2, Credits Earned, Credits $Earned^2$, AA, WA State Resident	13.9%*** (1.28%)	18.1%*** (1.56%)
C: B + First Generation	13.6%*** (1.28%)	17.9%*** (1.56%)
D: C + Academic Interest Codes and indicator if showed initial academic interest	13.9%*** (1.35%)	19.2%*** (1.67%)
E: D + Codes for quarter the 90^{th} credit was earned	16.5%*** (1.41%)	23.4%*** (1.71%)
Notes: Standard errors in parenthesis. *** represents statistical significance at the 99% level. Probabilities of graduation are evaluated at the means of the observables.		

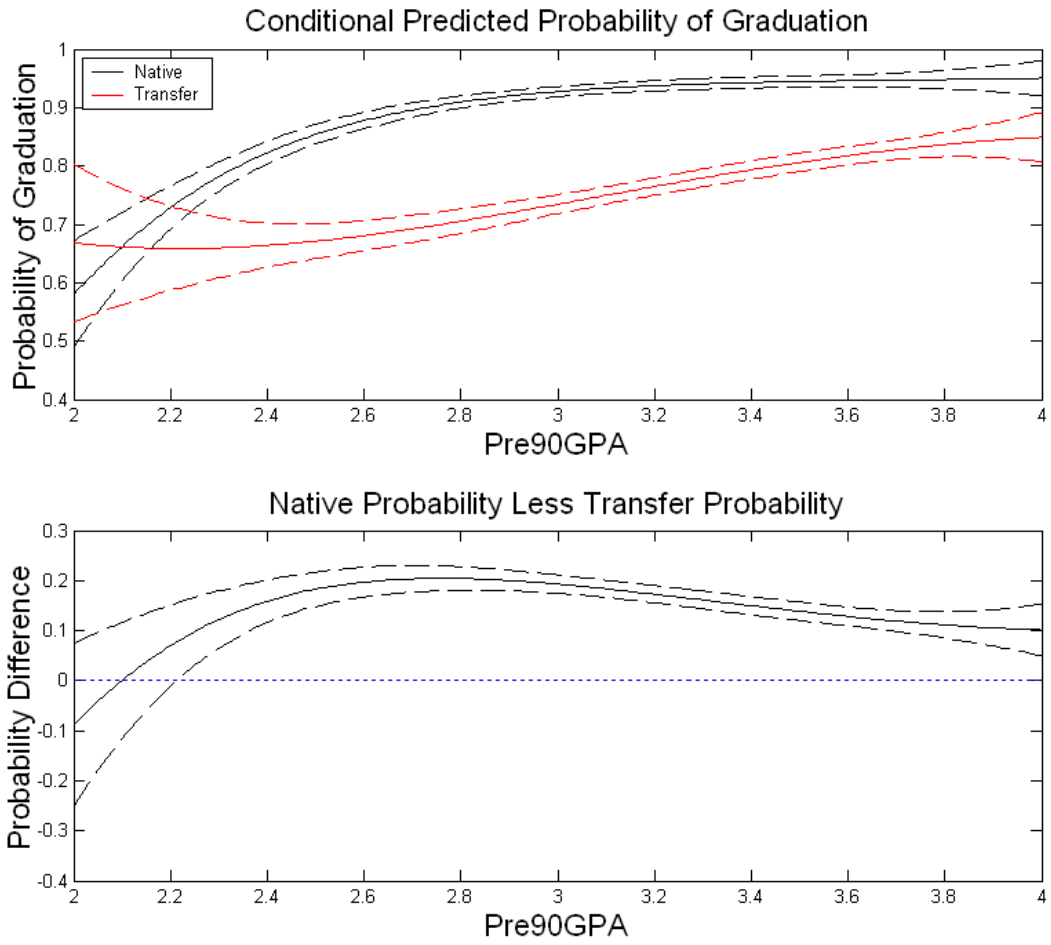
may actually mask some of the difference in graduation probabilities.[16] In the case of graduating within 2.5 years, the addition of observables increases the estimated probability difference between natives and transfers. When all observables are included, transfers are expected to graduate within 2.5 years at a 23.4% rate lower than natives. Taken together, both probit models suggest a large and significant difference in graduation probabilities between natives and transfers that is unexplained by differences in the composition of observed variables. In short, it appears that transfers are at a significant disadvantage to natives in their probability of graduation.

Unmeasured in any of the control variables of Figure 13 are Pre90GPAs of students. One would expect that students performing well during their first 90 credits would be more likely to graduate. Given the non-linear relationship that Pre90GPA has with Post90GPA, I proceed to estimate Pre90GPA's impact on graduation probability with by allowing it to interact non-linearly with graduation probability in a probit model. Given this non-linear relationship, rather than presenting a single number that describes the native-transfer difference in graduation probabilities, I reproduce the non-linear probit models in Appendix D and summarize the resulting estimates in Figure 14.

Figure 14 demonstrates the importance of Pre90GPA on graduation probability. Just under 60% of natives earning a GPA of 2.0 on their first 90 Western credits are be expected to graduate. This conditional probability rises to 92.7% for GPAs of 3.0 and 94.5% for GPAs of 3.5. For

[16] As mentioned earlier, an appropriate way to think of the cohort codes are as a fixed effect. In other words, by adding cohort codes one is making comparisons of natives and transfers with students that are in the same cohort. Thus, among a native and transfer student both earning their 90^{th} credit in the same quarter, the native student is 16.5% more likely to graduate than the transfer.

Figure 14: Native and Transfer Conditional Predicted Graduation Probabilities, by Pre90GPA

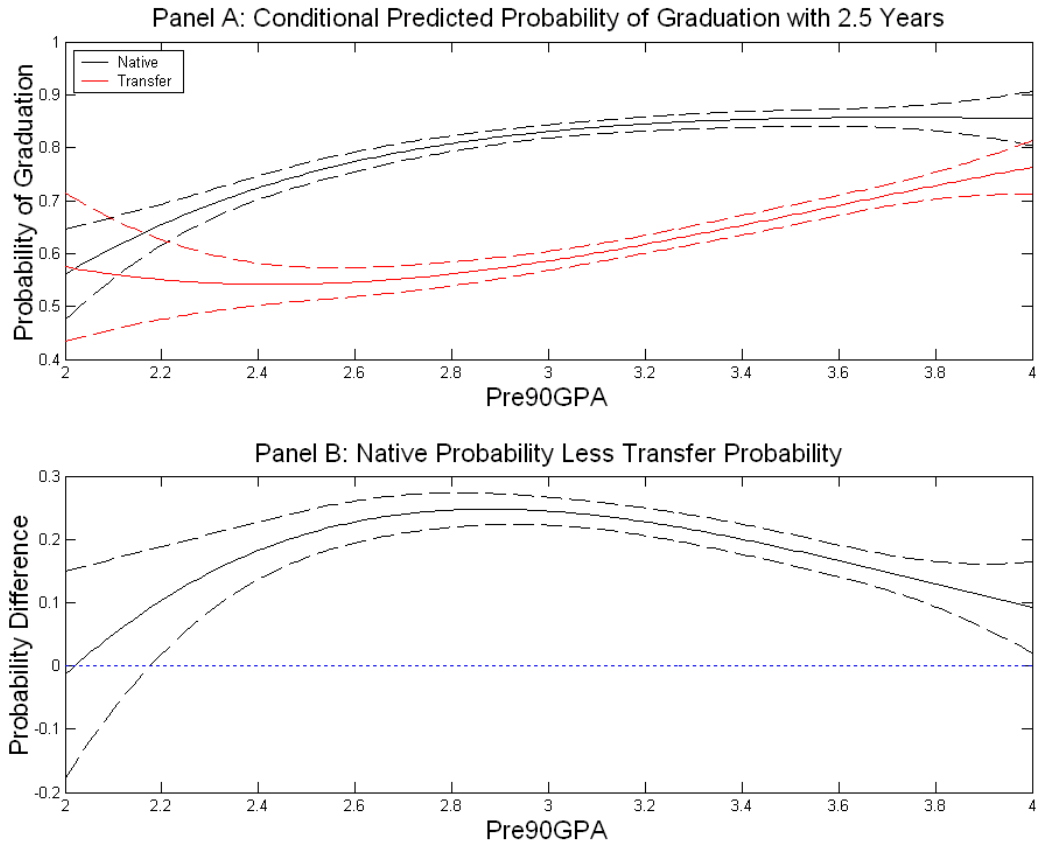


Notes: Dashed lines indicate 95% confidence intervals. The native-transfer difference is defined as the native line in panel A less the transfer line in the same panel. Each conditional regression in Panel A also includes the control variables listed in Appendix D.

transfer students who arrive at Western with at least 90 credits, these probabilities are much lower across the bulk of Pre90GPAs. Conditional upon their observables, transfers earning a GPA of 3.0 at their prior institution are expected to graduate only 73.4% of the time and those with a 3.5 prior GPA are expected to graduate 80.6% of the time. The difference between native and transfer probabilities are plotted in Panel B of Figure 14. Other than the very lowest GPAs, natives expect to graduate much more frequently across all GPAs. In short, this evidence suggests that GPA differences between transfers and natives do not account for the higher probability of natives graduating.

Figure 15 repeats the analysis of Figure 14 for graduation within 2.5 years. While there are numerical differences between this figure and Figure 14, the basic story remains the same. The 2.5 year graduation advantage natives hold over transfers exists even after controlling for differences in Pre90GPA and the control variables of set E in Figure 13. Native students earning

Figure 15: Native and Transfer Conditional Predicted 2.5 Year Graduation Probabilities, by Pre90GPA



Notes: Dashed lines indicate 95% confidence intervals. The native-transfer difference is defined as the native line in panel A less the transfer line in the same panel.

all but the very lowest Pre90GPAs are expected to graduate with significantly higher probability than transfers.

One might argue that the native-transfer difference in graduation probabilities is driven by transfer students who dropout shortly after arriving at Western. Like native students during their freshmen year, transfer students embarking upon a new, and potentially more stressful, college experience would be more likely to dropout simply because they are facing something new and uncertain. To test for this possibility, I restrict the sample to transfers who attempt at least 30 credits at Western (and compare them to natives who attempt at least 30 credits after earning their 90th credit). After controlling for the observables in set E of Figure 13, natives continue to hold a 9.9% graduation advantage over transfers (results available in Appendix E).

IV.B.2: Graduation Probability Conclusions

Native Western students hold a significant advantage in their likelihood to graduate from Western relative to students who transfer. This advantage exists after controlling for prior academic success (Pre90GPA), demographic characteristics including first generation status, academic interest, and Western cohort. All but the very weakest native students, as measured by GPA on their first 90 credits earned, are significantly more likely to graduate than transfer students.

Taken together with the earlier GPA analysis, I can speculate to the reason why natives hold such a large graduation advantage over transfers. Recall that transfers scoring a low GPA in their first quarter at Western are almost twice as likely to dropout in the subsequent quarter as natives with the same GPA. Thus, poor performance early in a transfer's Western career can account for some of the graduation difference. However, this does not account for all of the difference. Figures 14 and 15 clearly demonstrate that even transfers with a very high Pre90GPA are still less likely to graduate than natives. The data is less clear on what causes this difference. One potential reason is that transfers are less connected to Western and by being less connected, more likely to transfer again or dropout. Another may be that transfer students, upon arriving at Western, need certain prerequisite courses to enter their major. If transitional issues reduce their performance in these prerequisites, then transfer students will have a more difficult time entering their major, and as a result, could get discouraged and possibly fail to graduate.

Question 2: Does WWU Academic Performance Depend on the School a Student Transferred From?

The data used in this work identifies a transfer student's most recent prior college attended. In this section I explore differences in Western performance of transfer student by the type of school they transferred from and by the particular school they transferred from.

V.A.1: WWU GPA Performance, by School Type

To begin exploration of transfer school type on Western Post90GPA, I focus on four types of schools: public 2-year colleges, private 2-year colleges, public 4-year colleges, and private 4-year colleges. I restrict the sample to transfer students who attempted at least 30 Western credits after transferring.

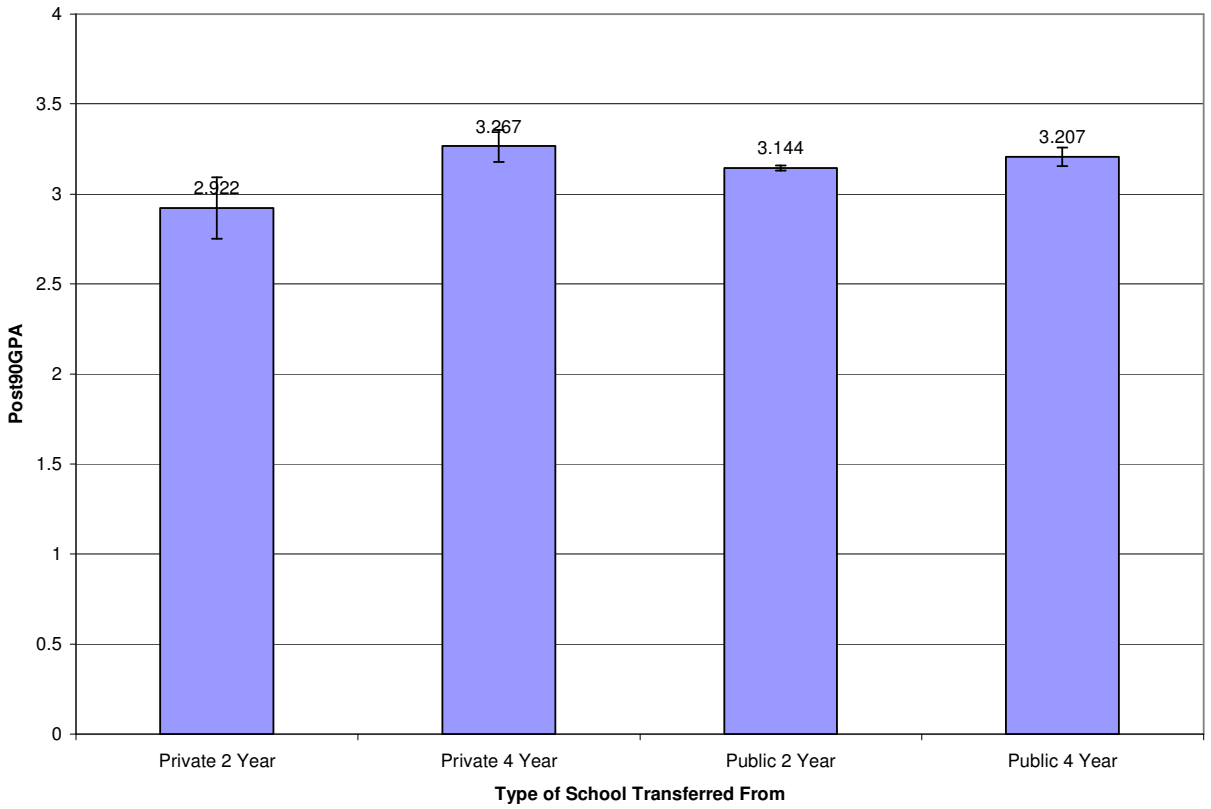
Figure 16 presents the average Post90GPAs of transfer students by school type. Students originating from private 2-year schools average significantly (both practically and statistically) lower Western GPAs than do students from the other three types of schools.[17] The average Post90GPA of a student from a private 2-year school is about one-third of a grade point lower than students originating from a private 4-year school. There is a smaller but still statistically significant difference between students who attended private and public four year schools and those who attended a public two year school. Students who attended four year schools score about one-tenth of a Post90GPA higher than students who attended a two year public school.

Given the large differences in public and private schools and simultaneous large difference between 2-year and 4-year institutions, one might expect that the differences in average Post90GPA by institution type are driven by non-random characteristics of students that selected into these institution types. For instance, if better students were first admitted to a four year school and weaker students into a two year school, then when they transfer to Western one wouldn't be surprised to find higher Post90GPAs for students coming from a four year school. I explore this possibility using OLS to control for observables that include Pre90GPA and its square, prior credits earned, age and its square, gender, race, earning of an AA degree, Western campus location, and academic interest variables.[18] The OLS results from this regression are presented in Appendix F. The conditional expected Post90GPA of students who attended a private 4-year institution is .03 grade points higher than those who attended a public 2-year institution (by far the most common type of transfer student at Western). This difference is small practically and insignificant statistically. Students attending a four year public institution are

[17] 106 students attended a private 2-year college. Of these, 82 were from the Northwest Indian College, 7 from Cottey College, 3 from the University of Phoenix, 3 from Landmark College and the rest from individual schools. Given the large proportion of students from the Northwest Indian College, the 2-year private results are highly similar to those that would be obtained if one were comparing students from the Northwest Indian College with the average transfer student.

[18] If better students are admitted to four year schools than those admitted to two year schools, then the control variables I use here only partially will control for student quality. A better set of control variables would be observables at the time of students' high school graduation (and before they enter either the 2- or 4-year institution). Western does not gather many high school variables for transfer students so I use the suboptimal control scheme of observables after high school.

Figure 16: Average WWU GPA of Transfer Students, by Transfer School Type



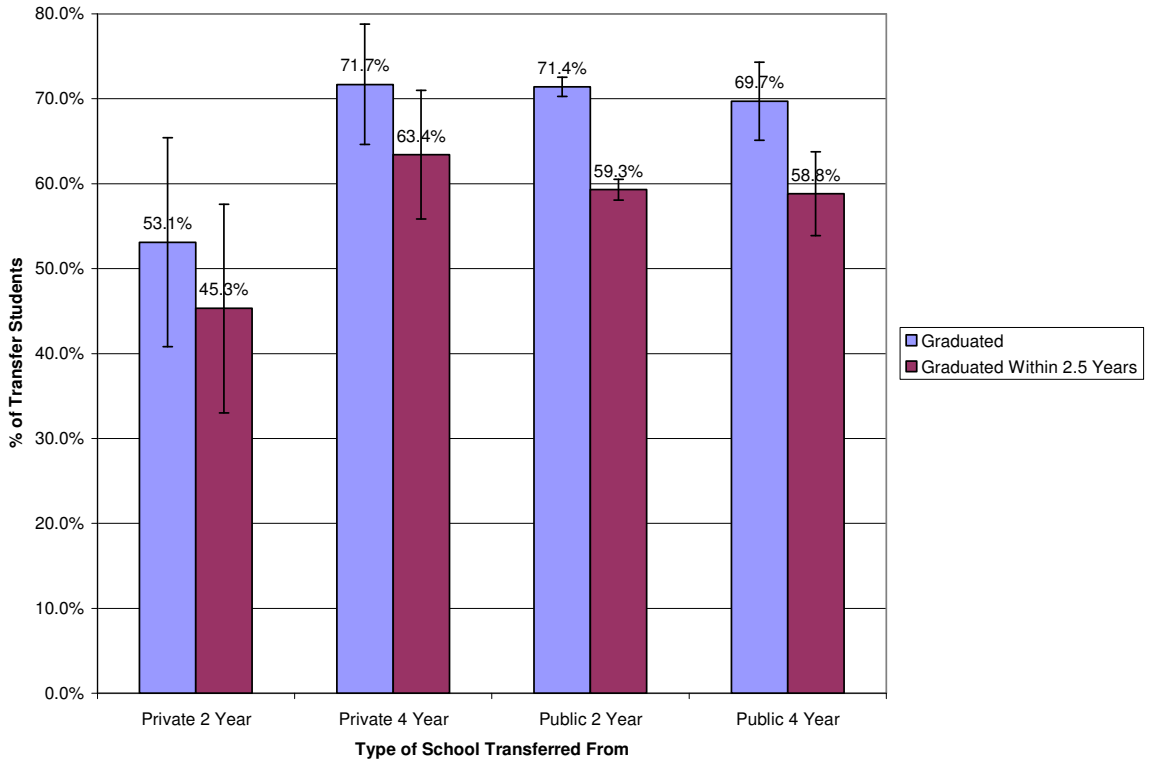
Note: Error bars represent 95% confidence intervals of the mean Post90GPA. The number reports the actual Post90GPA averages.

expected to score .008 grade points lower than those who attended a public 2-year school. Again, this difference is small and statistically not different than zero. However, students attending a private 2-year institution are expected to perform about two-tenths of a grade point lower than public 2-year students. This is large both practically and statistically and occurs even after controlling for observables.

While the data does not provide identifiable reasons as to why private 2-year students perform worse than other transfers, I speculate on two reasons why this difference occurs. First, almost 80% of students attending private 2-year institutions attended the Northwest Indian College. If this one school does a poor job of preparing students (or if the students who attend it are not well prepared upon entering), then because it makes up a bulk of the private 2-year observations, the estimated impact of all private 2-year institutions would be lower.[19] A second potential explanation is that students initially choosing 2-year schools are likely very different from other students in unobservable ways. Given that Western data does not contain high school characteristics or performance for a majority of transfer students, I cannot control for basic

[19] Note that racial indicators are included in the OLS results so this argument is not based upon race but instead upon the performance of students from private 2-year schools holding race constant.

Figure 17: Probability of Transfer Students Graduating from WWU, by Transfer School Type



Note: Error bars represent 95% confidence intervals of the mean graduation percentage.

differences that may arise prior to attending Western. Thus, it is my speculation that private 2-year students are likely weaker students and the origin of their weakness remains unobserved but correlated with their attendance at a private 2-year school.

V.A.2: WWU Graduation Probability, by School Type

Not only does GPA differ significantly by school type, so do average graduation rates. Figure 17 provides graduation rates for students from different school types. 53.1% of 2-year private students graduate from Western. Compared to 71.7%, 71.4%, and 69.7% of private 4-year, public 2-year, and public 4-year students it is clear that private 2-year students perform worse than other transfers. A similar difference occurs when computing the 2.5 year graduation rate; private 2-year students perform much worse. Unlike the conditional GPA case, when a probit is used to control for observables, students from each college type are no different than any other. In other words, it appears that the differences in graduation probabilities that appear in Figure 17 are driven by heterogeneity in the observables and not an innate difference in Western performance by school types.

V.A.3: WWU GPA, by Community College

Almost 80% of all transfer's most recent school attended was a Washington community college and, while it appears that there is little GPA difference between public two year college students and their four year counterparts, it is possible that students from particular Washington community colleges do better at Western than others. To investigate this, Figure 18 shows average Post90GPA by specific Washington community college.[20]

Of the 29 different Washington community colleges presented in Figure 18, a handful produce students who perform at a statistical advantage or disadvantage relative to the overall average Post90GPA of Washington community college students of 3.06 (standard deviation = .670). Students attending Big Bend, Clark, Edmonds, Everett, North Seattle, Olympic, Skagit and Whatcom Community Colleges perform statistically better than the average community college student. Those attending Grays Harbor, Green River, Highline, and Pierce Community College average lower Post90GPAs than the average.

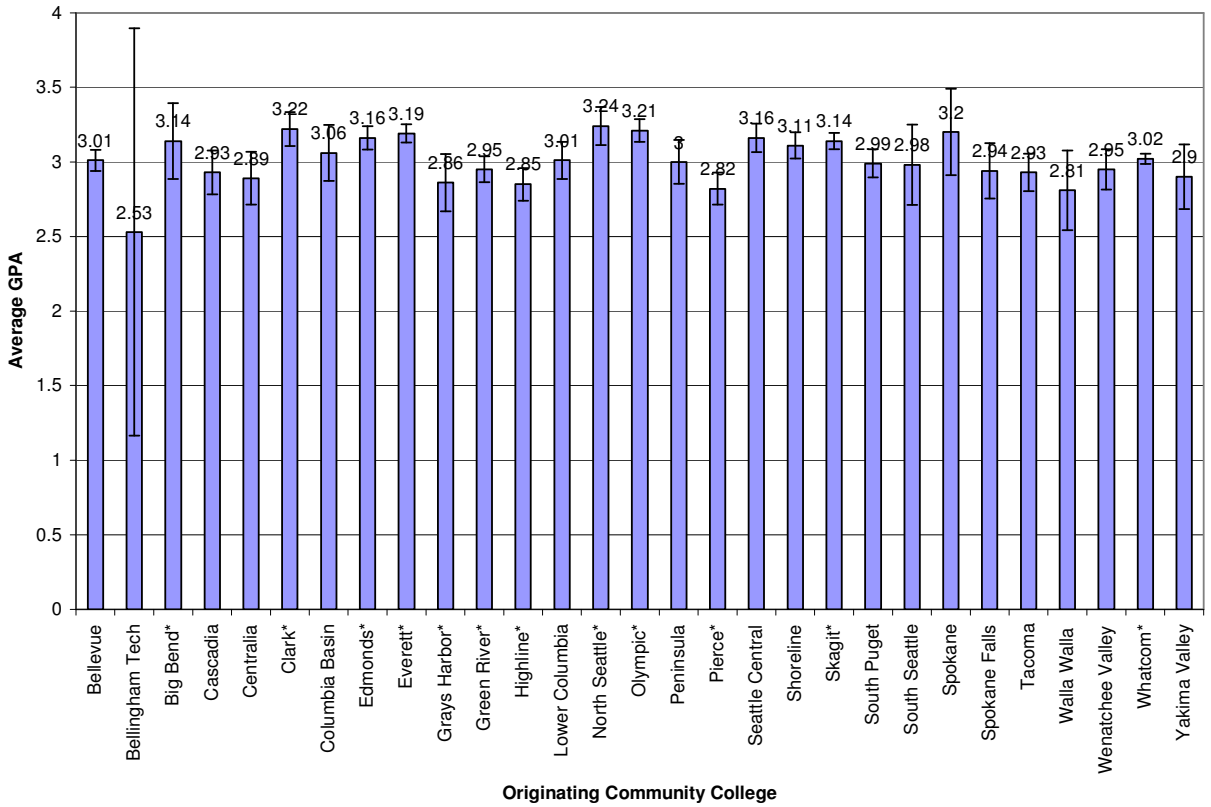
Because of the large differences found in Post90GPAs of 30+ credi Western students relative to those that graduate from Western, I reproduce the averages of Figure 18 for only students who eventually graduate from Western in Figure 19. Like the case of the larger sample, students from particular community colleges average higher Post90GPAs than the overall sample average (of 3.24, standard deviation of .470). However, this list of schools differs from the larger sample. Students who attended Everett, North Seattle, Olympic and Whatcom Community Colleges perform better than the average Washington community college student. Those who attended Centralia, Green River, Highline, Lower Columbia, Pierce, South Puget, and Walla Walla Community Colleges perform worse.

The most likely explanation for the differing performance of community college students between Figures 18 and 19 is attrition. If students non-randomly leave Western prior to graduating then they are likely to appear in Figure 18 and not Figure 19. This non-random attrition is addressed in the next section.

Prior to discussing attrition, it should be noted that the differences in average GPAs by community college are likely influenced by other observables. For instance, it may be easier for older students who are more tied to their communities to attend Whatcom and then Western. If older students perform better than younger ones, one might assume that the high GPA average of Whatcom students is caused by the institution rather than the composition of the students. This type of situation can be controlled with OLS. However, another type of non-random selection is more difficulty to control. If Western's Office of Admissions gives preferential treatment (purposefully or inadvertently) to students from one institution over another, then one might find average GPAs biased because the admitted students from the preferential institution differ from those from other institutions. OLS can only control for observed student characteristics. If students are admitted for unobserved

[20] Because of its proximity to Western, I included students from Bellingham Technical College in this portion of the study.

Figure 18: Average Post90GPA at WWU of Transfer Students with 30+ WWU Credits, by Community College

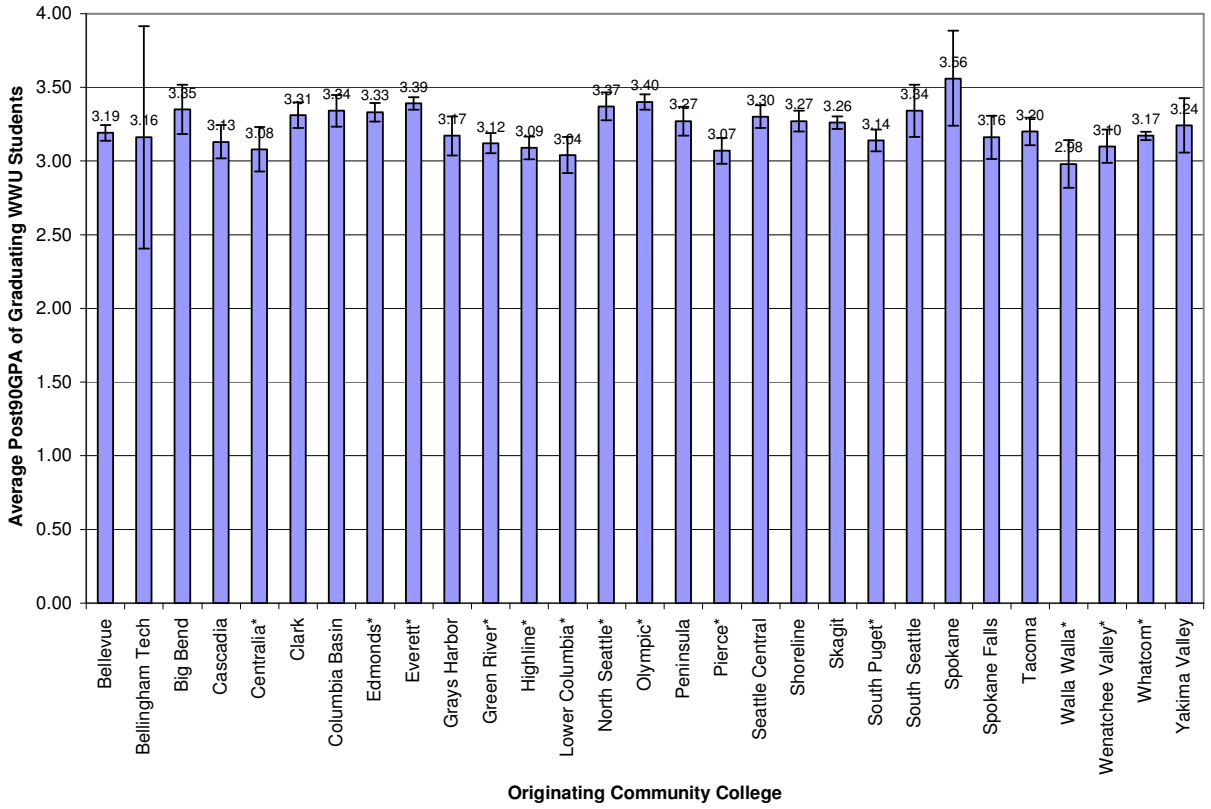


* indicate an average Post90GPA that is statistically different than the overall Post90GPA of Washington community college students at the 95% level.

reasons, then OLS will attribute this non-random student performance incorrectly to the community college of origin.

Focusing on Figure 18 first, after controlling for demographics, age, first generation status, Western campus, Pre90GPA, and credits earned, no community college had students which averaged statistically lower GPAs than the overall mean. In other words, all of the differences in average GPAs by institution are explainable by the composition of students rather than the schools themselves. In the case of Figure 19 only one institution, Walla Walla CC, has students who average significantly worse than the average (nearly one-third of one grade point). However, I would point out that most students attending Walla Walla CC also originate from a considerable distance from Western. It is possible that the conditional GPA difference of Walla Walla CC students is driven not by the fact that they are from that school but instead because they are a considerable distance from a familial support system.

Figure 19: Average Post90GPA at WWU of Graduating Transfer Students, by Community College



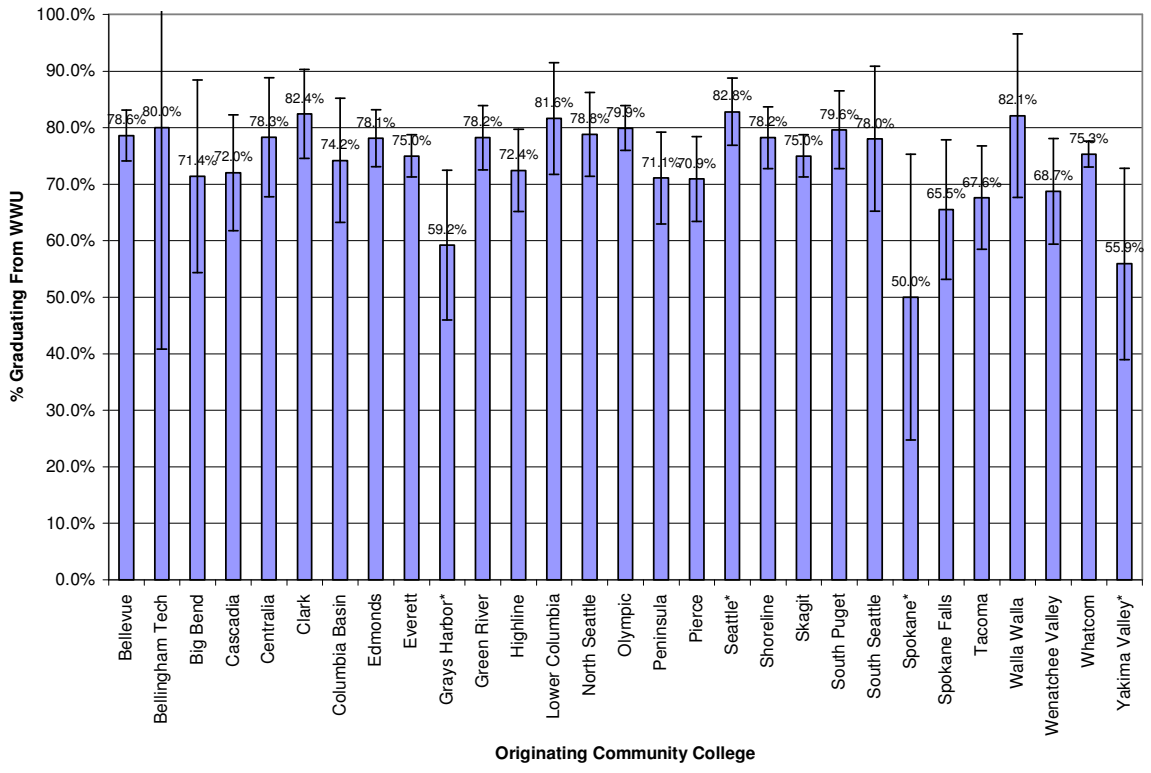
* indicate an average Post90GPA that is statistically different than the overall Post90GPA of Washington community college students at the 95% level.

V.A.4: WWU Graduation, by Community College

Like the case of GPAs, there is substantial variation in the probability of graduating based upon the originating community college. Overall, 75.7% of Washington community college students who attend Western eventually graduate.[21] However, as shown in Figure 20, some community colleges produce students that are substantially more or less likely to graduate from Western than the average. Focusing only on cases that are statistically different than the average, students originating from Seattle CC are more likely to graduate from Western than the average Washington community college student. Those coming from Grays Harbor, Spokane, and Yakima Valley Community College are less likely to graduate from Western. After controlling for the same observables as used in the community college GPA analysis, relative to the average, the conditional probability of graduating is 12.3% less for Spokane Falls CC students, 16.3% less

[21] This percentage differs slightly from that reported in Figure 17 because Figure 17 contained out-of-state 2-year college students and it excluded students who took less than 30 credits after arriving at Western (which facilitates comparison with GPAs).

Figure 20: % of Transfer Students Graduating from WWU, by Community College



* indicate a average graduation rates that is statistically different than the overall graduation rates of Washington community college students at the 95% level

for Grays Harbor CC students, 20.3% less for Yakima Valley CC students, and 24.8% less for Spokane CC students. All other community colleges conditional graduation rates were statistically equal to the overall average community college graduate rate.[22] When examining this list of "underperforming" community colleges, it is important to note their distance from Western. All of these schools except for Grays Harbor are located on the eastside of the state and even Grays Harbor is a difficult driving trip to and from Bellingham. Because of this, one must take great care in attributing the lower rate of graduating from Western to these colleges. Instead of a college-effect, it might be that students from great distance are less likely to graduate from Western.

V.A.5: College Origin Summary

This section presents evidence that students who originate from private 2-year schools are less likely to be successful, both in terms of Western GPA and likelihood of graduating, than are transfers from other types of schools. However, given the high proportion of private 2-year students who transferred from the Northwest Indian College, it is hard to disentangle the impacts

[22] Regression Results for this probit are available upon request.

of being a private 2-year student versus those of being a Northwest Indian College Student. In other words, the lower performance of 2-year students is either due to a 2-year effect or a NIC effect; Western's data does not allow us to know which.

The performance at Western of 2-year public students is also important. While there are large unconditional differences in Western GPA and graduation rates by students who attended different community colleges, these differences are largely an artifact of differences in student observables. After accounting for these observables, only one community college (Walla Walla CC) produces students that are statistically below the conditional average Western GPA, and only a handful of schools (Spokane Falls CC, Grays Harbor CC, Yakima Valley CC, and Spokane CC) produce students who, upon coming to Western, are less likely to graduate from Western than the average. No community colleges produces students who are statistically better than the community college average.

VI: Discussion and Conclusions

That transfer students underperform relative to native students is a commonly accepted fact at Western (and most other universities the author has interacted with). At Western, the average transfer earns a lower GPA, often performs worse in select individual courses, and is less likely to graduate than a native student. What are much less clear are the reasons for this underperformance. Two broad perspectives can be given: the education received at a transfer institution is inferior to that obtained at Western allowing equally competent natives to outperform transfers in upper division courses or there is something innately different about native and transfer students such that, despite no difference in prior education, natives outperform transfers due to these innate differences. The evidence presented in this work predominately, but not completely, supports the second of these two reasons; transfer students appear to be innately different than natives.

When considering grades, the average GPA earned in courses taken after their 90th credit is 3.01 for transfer students and 3.15 for natives. When transfer students who fail to attempt 30 Western credits are excluded, the average transfer GPA is statistically identical to that of natives. In short, the low GPA of transfer students appears to occur because of poor performance upon first arriving at Western; a fact is also true among natives as well. However, natives and transfers differ in observable ways; most notably in transfer students propensity to take different types of courses than natives and the greater likelihood that transfer students come from backgrounds that are likely to be less supportive of higher education. After accounting for these observables, there is no detectable statistical difference between transfer and native GPAs either overall or within fourteen gateway courses. However, even after controlling for these observables, there are differences in the performance of natives and transfers along the Pre90GPA dimension. In short, natives who do well early in their academic careers expect to earn higher Post90GPAs than transfers who did equally well early. Transfers doing poorly early (conditional upon being admitted to Western), achieve higher Post90GPAs than natives who initially performed equally poorly.

While little difference appears in the averages of Western GPAs, there is a significant advantage in the probability of graduating, and graduating relatively quickly, that natives hold over transfers. As a whole, natives who achieve 90 credits expect to graduate 89.1% of the time. Transfers coming to Western with 90 or more credits expect to graduate 75.6% of the time. After controlling for observables, including first generation status which impacts GPAs considerably, the native-transfer gap grows rather than shrinks. In other words, conditional upon their observables, natives continue to graduate at a higher rate than transfers. While much of this difference can be explained by transfers leaving the university shortly upon entering, there remains a 9.9% increased likelihood of natives graduating relative to transfers conditional upon both groups attempting at least 30 credits. In other words, even among transfers who do not succumb to "transfer shock" early in their Western careers, there is a lower probability of graduating. Nor is this difference due to natives having stronger academic backgrounds than transfers. When Pre90GPA is accounted for, natives continue to graduate at higher rates than transfers.

The fact that transfers graduate less often than natives but graduating transfer students earn similar GPA as natives suggests that the distribution of transfer ability (defined broadly) is wider than that of natives who have earned 90 credits. At one level this should be obvious, the distribution of native ability amongst those who successfully obtain 90 credits is certainly narrower than incoming freshmen because low ability natives likely are winnowed out prior to achieving 90 credits. What is more surprising is that lower ability transfer students (at least as defined by the fact that they drop out soon after entering Western) are not winnowed out by their transfer institution. I suspect some of this has to do with the significantly higher Pre90GPAs that transfer students earn relative to natives. If transfer schools give higher grades for similar abilities than does Western, then transfers would not be winnowed out early by low performance and instead make it to Western where they encounter academic troubles.

Given the likely increased reliance on transfer students in the future, this report suggests that if the quality of admitted transfer students remains similar to that of the past, one would expect lower GPAs, decreased graduation rates, and longer time to graduate. Of course, this assumes that the quality of admitted transfer students remains the same. One might expect that as Western relies increasingly on transfer students, the pool of high quality transfer students diminishes and the performance discrepancy between transfers and natives grows. One might counter such facts by providing increased incentives, both financial and economic, to high quality potential transfer students in hopes of attracting them to Western. Of course, it is not clear if an extra dollar of incentives spent on attracting a transfer student generates a better or worse outcome than an extra dollar spent on a native student. Ultimately, understanding the best use of incentives is the purview of IR.

Appendix A

Figure 5, Regression 1

```
. reg post90gpa transfer if hoursearned>=90 & post90hrsattempt>=30
```

Source	SS	df	MS		
Model	.110295574	1	.110295574	Number of obs	16714
Residual	4826.8255	16712	.288823929	F(1, 16712)	0.38
				Prob > F	0.5366
Total	4826.9358	16713	.288813247	R-squared	0.0000
				Adj R-squared	-0.0000
				Root MSE	.53742

post90gpa	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
transfer	-.0052571	.0085071	-0.62	0.537	-.021932	.0114178
_cons	3.155009	.0053402	590.81	0.000	3.144542	3.165477

Figure 5, Regression 2

```
. reg post90gpa transfer age age2 hoursearned hoursearned2 male black hispanic asian indian aa
> firstgen if hoursearned>=90 & post90hrsattempt>=30
```

Source	SS	df	MS		
Model	432.150625	12	36.0125521	Number of obs	16630
Residual	4367.63251	16617	.262841218	F(12, 16617)	137.01
				Prob > F	0.0000
Total	4799.78314	16629	.288639313	R-squared	0.0900
				Adj R-squared	0.0894
				Root MSE	.51268

post90gpa	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
transfer	-.0150169	.0169685	-0.88	0.376	-.0482769	.0182432
age	-.0212235	.004545	-4.67	0.000	-.0301321	-.0123148
age2	.0004743	.0000634	7.49	0.000	.0003501	.0005985
hoursearned	.0155316	.0063139	2.46	0.014	.0031557	.0279075
hoursearned2	-.0000642	.0000297	-2.16	0.031	-.0001224	-5.90e-06
male	-.2388619	.0080721	-29.59	0.000	-.254684	-.2230397
black	-.2772226	.029078	-9.53	0.000	-.3342186	-.2202266
hispanic	-.1439166	.0219392	-6.56	0.000	-.1869197	-.1009134
asian	-.2026923	.0149592	-13.55	0.000	-.2320139	-.1733707
indian	-.1656849	.0279292	-5.93	0.000	-.2204291	-.1109406
aa	-.0184796	.0172753	-1.07	0.285	-.052341	.0153818
firstgen	-.0730437	.0084565	-8.64	0.000	-.0896193	-.056468
_cons	2.642192	.3475546	7.60	0.000	1.960948	3.323437

Figure 5, Regression 3

```
. reg post90gpa transfer hoursearned hoursearned2 age age2 male black hispanic asian ///
> indian firstgen ACS-Bio CBE-EET English-ID Journ-Undec aa if hoursearned>=90 & post90hrsatten
> pt>=30
```

Source	SS	df	MS		
Model	663.41659	62	10.7002676	Number of obs	= 16630
Residual	4136.36655	16567	.24967505	F(62, 16567)	= 42.86
				Prob > F	= 0.0000
Total	4799.78314	16629	.288639313	R-squared	= 0.1382
				Adj R-squared	= 0.1350
				Root MSE	= .49967

post90gpa	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
transfer	-.0586428	.0171114	-3.43	0.001	-.092183	-.0251025
hoursearned	.0199111	.0061721	3.23	0.001	.0078132	.032009
hoursearned2	-.0000821	.000029	-2.83	0.005	-.0001391	-.0000252
age	-.0059745	.0046982	-1.27	0.204	-.0151834	.0032344
age2	.0002285	.0000649	3.52	0.000	.0001012	.0003558
male	-.1826871	.0084459	-21.63	0.000	-.199242	-.1661322
black	-.2692704	.0284108	-9.48	0.000	-.3249587	-.2135821
hispanic	-.1438825	.0214294	-6.71	0.000	-.1858864	-.1018786
asian	-.178611	.0146435	-12.20	0.000	-.2073138	-.1499082
indian	-.1675379	.0272916	-6.14	0.000	-.2210323	-.1140434
firstgen	-.0697153	.0082676	-8.43	0.000	-.0859207	-.05351
ACS	.2022372	.1587844	1.27	0.203	-.1089973	.5134717
Anth	.2404953	.0374614	6.42	0.000	.167067	.3139236
Art	.2338056	.0260008	8.99	0.000	.1828412	.28477
Bio	.0705892	.0243726	2.90	0.004	.0228163	.118362
CBE	-.0169593	.0197024	-0.86	0.389	-.055578	.0216594
Chem	.0092494	.0356784	0.26	0.795	-.0606841	.0791828
Comm	.1081852	.0270808	3.99	0.000	.0551039	.1612665
Compsci	-.0822607	.026813	-3.07	0.002	-.134817	-.0297044
CSD	.2378894	.061126	3.89	0.000	.118076	.3577029
Dance	.2237509	.1587273	1.41	0.159	-.0873717	.5348735
Easian	.2080236	.1345073	1.55	0.122	-.0556251	.4716723
Econ	.0122844	.0540837	0.23	0.820	-.0937254	.1182942
Educ	.3303817	.0177526	18.61	0.000	.2955847	.3651787
EET	.3015601	.17743	1.70	0.089	-.0462217	.649342
English	.3351822	.0256274	13.08	0.000	.2849497	.3854147
Engtech	.0806097	.0278979	2.89	0.004	.0259269	.1352926
Envir	.2303827	.0263979	8.73	0.000	.17864	.2821253
Fair	.1878363	.0375023	5.01	0.000	.1143277	.2613448
Finmark	-.0379163	.0260084	-1.46	0.145	-.0888955	.0130629
Genstud	.1692558	.1297207	1.30	0.192	-.0850107	.4235223
Geog	.2432671	.08827	2.76	0.006	.0702484	.4162857
Geol	-.0932495	.0582861	-1.60	0.110	-.2074964	.0209975
Health	.0848789	.0938541	0.90	0.366	-.0990853	.2688431
Hist	.052359	.0325065	1.61	0.107	-.0113572	.1160752
Humserv	.3378926	.0271031	12.47	0.000	.2847676	.3910175
ID	.2057546	.0737207	2.79	0.005	.0612541	.3502551
Journ	.1543243	.0318149	4.85	0.000	.0919637	.2166849
Lang	.1681505	.0383148	4.39	0.000	.0930493	.2432517
Libstud	.1575589	.0687132	2.29	0.022	.0228737	.292244
Ling	.2110489	.0896624	2.35	0.019	.0353009	.3867969
Math	.1267053	.0394445	3.21	0.001	.0493898	.2040208
Music	.2730503	.0315943	8.64	0.000	.211122	.3349786
PE	.0752712	.0352211	2.14	0.033	.006234	.1443083
Phil	.1958765	.0610822	3.21	0.001	.076149	.3156041
Physics	.0552313	.0541506	1.02	0.308	-.0509096	.1613723
Polisci	.1083921	.0341065	3.18	0.001	.0415397	.1752444
prearch	-.0526998	.2502152	-0.21	0.833	-.5431485	.4377489
predent	.0373304	.0599616	0.62	0.534	-.0802007	.1548615
preeng	.0713637	.0680931	1.05	0.295	-.0621061	.2048335
prelaw	.019328	.0442871	0.44	0.663	-.0674794	.1061355
premed	.0424053	.0311099	1.36	0.173	-.0185734	.1033839
prenurse	-.0092777	.1894127	-0.05	0.961	-.3805469	.3619915
prepharm	.4034973	.4998739	0.81	0.420	-.5763092	1.383304
prept	.0617724	.0419933	1.47	0.141	-.020539	.1440839
prevet	-.0660953	.2044301	-0.32	0.746	-.4668002	.3346096
psych	.0842687	.0217986	3.87	0.000	.041541	.1269963
Recreat	-.0211093	.0591491	-0.36	0.721	-.1370478	.0948292
Soc	.1090684	.0389774	2.80	0.005	.0326686	.1854682
Theatre	.2260743	.0369852	6.11	0.000	.1535794	.2985692
Undec	.1108312	.0168058	6.59	0.000	.0778901	.1437723
aa	-.0278218	.0169232	-1.64	0.100	-.0609932	.0053496
_cons	2.03014	.3432122	5.92	0.000	1.357408	2.702873

Figure 5, Regression 4

```
. reg post90gpa transfer hoursearned hoursearned2 age age2 male black hispanic asian ///
> indian firstgen ACS-Bio CBE-EET English-ID Journ-Undec aa firstterm200330-firstterm200920 if
> hoursearned>=90 & post90hrsattempt>=30
```

Source	SS	df	MS		
Model	688.999993	86	8.01162783	Number of obs	= 16630
Residual	4110.78315	16543	.24849079	F(86, 16543)	= 32.24
				Prob > F	= 0.0000
Total	4799.78314	16629	.288639313	R-squared	= 0.1435
				Adj R-squared	= 0.1391
				Root MSE	= .49849

post90gpa	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
transfer	-.0855278	.0188946	-4.53	0.000	-.1225631	-.0484924
hoursearned	.0145464	.0063148	2.30	0.021	.0021687	.026924
hoursearned2	-.000058	.0000296	-1.96	0.050	-.0001161	9.04e-08
age	.0217835	.0061386	3.55	0.000	.0097512	.0338158
age2	-.0001163	.0000813	-1.43	0.152	-.0002756	.000043
male	-.1841991	.0084377	-21.83	0.000	-.2007379	-.1676603
black	-.2728186	.0283654	-9.62	0.000	-.3284178	-.2172193
hispanic	-.1438345	.0214012	-6.72	0.000	-.1857831	-.1018859
asian	-.1769372	.0146173	-12.10	0.000	-.2055887	-.1482857
indian	-.1706144	.0272643	-6.26	0.000	-.2240553	-.1171735
firstgen	-.0700203	.0082599	-8.48	0.000	-.0862106	-.05383
ACS	.1791598	.1586115	1.13	0.259	-.1317358	.4900554
Anth	.2246432	.0376168	5.97	0.000	.1509102	.2983761
Art	.2162977	.026196	8.26	0.000	.1649506	.2676447
Bio	.0526547	.0246368	2.14	0.033	.0043639	.1009455
CBE	-.0263791	.0199259	-1.32	0.186	-.0654361	.0126778
Chem	-.0151439	.0358575	-0.42	0.673	-.0854283	.0551406
Comm	.0996086	.0272155	3.66	0.000	.0462633	.1529538
Compsci	-.0911689	.0269712	-3.38	0.001	-.1440355	-.0383024
CSD	.2075167	.0612336	3.39	0.001	.0874924	.3275411
Dance	.1923396	.1584466	1.21	0.225	-.1182327	.5029119
Easian	.1616749	.1343784	1.20	0.229	-.1017213	.425071
Econ	-.0064715	.0541493	-0.12	0.905	-.1126099	.0996669
Educ	.3099916	.0181432	17.09	0.000	.2744288	.3455543
EET	.2832279	.1772924	1.60	0.110	-.0642843	.6307401
English	.3174721	.025865	12.27	0.000	.2667738	.3681703
Engtech	.064685	.0281748	2.30	0.022	.0094593	.1199107
Envir	.2035163	.0266437	7.64	0.000	.1512918	.2557408
Fair	.1662611	.0376517	4.42	0.000	.0924597	.2400625
Finmark	-.0513192	.0262935	-1.95	0.051	-.1028573	.000219
Genstud	.1510031	.1295207	1.17	0.244	-.1028713	.4048776
Geog	.2231577	.0884148	2.52	0.012	.0498552	.3964603
Geol	-.1131864	.0583872	-1.94	0.053	-.2276316	.0012588
Health	.0704114	.0940048	0.75	0.454	-.1138481	.2546709
Hist	.038157	.0327197	1.17	0.244	-.0259771	.102291
Humserv	.3015929	.0275369	10.95	0.000	.2476177	.3555681
ID	.1803497	.0737885	2.44	0.015	.0357163	.3249831
Journ	.1393667	.0320369	4.35	0.000	.076571	.2021624
Lang	.1523471	.0383717	3.97	0.000	.0771344	.2275598
Libstud	.1482671	.0687105	2.16	0.031	.0135871	.2829472
Ling	.1938286	.0896886	2.16	0.031	.0180293	.3696278
Math	.1067672	.0395299	2.70	0.007	.0292843	.1842501
Music	.2490705	.031805	7.83	0.000	.1867293	.3114117
PE	.0618359	.035352	1.75	0.080	-.0074578	.1311297
Phil	.1837091	.0611361	3.00	0.003	.0638758	.3035424
Physics	.0448077	.0542571	0.83	0.409	-.0615421	.1511576
Polisci	.0940848	.0342843	2.74	0.006	.0268839	.1612857
prearch	-.0398263	.2496499	-0.16	0.873	-.5291669	.4495142
predent	.0251796	.06	0.42	0.675	-.0924268	.142786
preeng	.05767	.068022	0.85	0.397	-.0756605	.1910005
prelaw	.004899	.0443774	0.11	0.912	-.0820854	.0918834
premed	.021957	.0313376	0.70	0.484	-.039468	.083382
prenurse	.0034824	.1890471	0.02	0.985	-.3670701	.374035
prepharm	.4349182	.4987102	0.87	0.383	-.5426074	1.412444
prept	.0417953	.0421516	0.99	0.321	-.0408263	.1244169
prevet	-.0605309	.2040411	-0.30	0.767	-.4604734	.3394115
psych	.0700107	.0221094	3.17	0.002	.0266739	.1133474
Recreat	-.0247325	.0592289	-0.42	0.676	-.1408275	.0913625
Soc	.0946896	.0391472	2.42	0.016	.0179569	.1714222
Theatre	.2065011	.0371232	5.56	0.000	.1337357	.2792665
Undec	.1066943	.0172548	6.18	0.000	.072873	.1405156
aa	-.0350041	.0169567	-2.06	0.039	-.0682411	-.0017671
first~200330	.0737156	.0611407	1.21	0.228	-.0461268	.1935579
first~200340	.0393673	.0136345	2.89	0.004	.0126423	.0660923
first~200410	-.0040923	.0377753	-0.11	0.914	-.0781359	.0699513
first~200420	.007852	.0490787	0.16	0.873	-.0883475	.1040515
first~200430	-.0961942	.0760979	-1.26	0.206	-.2453542	.0529658
first~200440	.0747959	.0139602	5.36	0.000	.0474324	.1021594
first~200510	.0715092	.0373942	1.91	0.056	-.0017874	.1448058
first~200520	.0742959	.0548771	1.35	0.176	-.0332692	.1818609
first~200530	-.135478	.0723591	-1.87	0.061	-.2773096	.0063536
first~200540	.0923043	.0152754	6.04	0.000	.0623629	.1222458
first~200610	.0580651	.0404416	1.44	0.151	-.0212048	.137335
first~200620	.0899474	.0643576	1.40	0.162	-.0362005	.2160953
first~200630	.0259923	.0906909	0.29	0.774	-.1517717	.2037563
first~200640	.1050716	.0173518	6.06	0.000	.0710601	.139083
first~200710	-.0259615	.0427806	-0.61	0.544	-.109816	.0578931
first~200720	.0499775	.06153	0.81	0.417	-.070628	.170583
first~200730	-.0256973	.1256557	-0.20	0.838	-.271996	.2206015
first~200740	.1609305	.0239004	6.73	0.000	.1140832	.2077778
first~200810	.0020611	.0446978	0.05	0.963	-.0855513	.0896735
first~200820	-.0922826	.0585708	-1.58	0.115	-.2070878	.0225225
first~200830	.205619	.1392623	1.48	0.140	-.06735	.478588
first~200840	.1048609	.0284499	3.69	0.000	.0490959	.1606258
first~200910	.0740376	.0510729	1.45	0.147	-.0260707	.1741459
first~200920	.202146	.1898526	1.06	0.287	-.1699856	.5742776
_cons	1.817636	.3460778	5.25	0.000	1.139286	2.495985

Appendix B

Regression results for native students used in Figure 7:

```
. reg post90gpa GPA GPA2 hoursearned age male peakapplnum black hispanic ///
> asian indian ACS-Bio CBE-EET English-ID Journ-Undec interest aa firstgen after90term200240-after90term200920 ///
> if hoursearned>=90 & transfer==0 & GPA>2 & post90hrsattempt>=30, robust

Linear regression                               Number of obs =      8648
                                                F( 88,  8557) =         .
                                                Prob > F      =         .
                                                R-squared     =    0.4945
                                                Root MSE      =    .37268
```

post90gpa	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
GPA	.932389	.1133255	8.23	0.000	.7102437	1.154534
GPA2	-.0294336	.0179682	-1.64	0.101	-.0646556	.0057884
hoursearned	.0029188	.0007617	3.83	0.000	.0014257	.004412
age	-.0015874	.0061751	-0.26	0.797	-.0136922	.0105174
male	-.0912967	.0091402	-9.99	0.000	-.1092136	-.0733797
peakapplnum	.0177783	.0428675	0.41	0.678	-.0662523	.101809
black	-.0646972	.0313875	-2.06	0.039	-.1262243	-.0031701
hispanic	-.004796	.0260642	-0.18	0.854	-.0558881	.0462962
asian	-.0539077	.0154674	-3.49	0.000	-.0842276	-.0235878
indian	-.0731152	.0364045	-2.01	0.045	-.1444769	-.0017535
ACS	.0601849	.0406822	1.48	0.139	-.0195622	.1399319
Anth	.0228992	.055654	0.41	0.681	-.0861961	.1319944
Art	.1000484	.039565	2.53	0.011	.0224914	.1776053
Bio	.097684	.0395553	2.47	0.014	.0201462	.1752219
CBE	.0497578	.0371608	1.34	0.181	-.0230864	.122602
Chem	-.0007336	.0471408	-0.02	0.988	-.093141	.0916737
Comm	.0754153	.0409133	1.84	0.065	-.0047847	.1556153
Compsci	-.0189128	.0429428	-0.44	0.660	-.1030912	.0652655
CSD	.3906955	.076725	5.09	0.000	.2402959	.5410951
Dance	.0027952	.1824129	0.02	0.988	-.354778	.3603685
Easian	-.334291	.0523515	-6.39	0.000	-.4369125	-.2316694
Econ	-.0593987	.0843985	-0.70	0.482	-.2248401	.1060428
Educ	.1564745	.0370539	4.22	0.000	.0838399	.2291091
EET	.3226379	.0727609	4.43	0.000	.180009	.4652667
English	.1119681	.0408235	2.74	0.006	.0319443	.191992
Engtech	.0507701	.0411345	1.23	0.217	-.0298635	.1314037
Envir	.1590677	.0424728	3.75	0.000	.0758108	.2423246
Fair	.1284765	.0466391	2.75	0.006	.0370525	.2199004
Finmark	.0181952	.0398214	0.46	0.648	-.0598643	.0962547
Genstud	.0982966	.0846839	1.16	0.246	-.0677042	.2642974
Geog	.2759633	.0564081	4.89	0.000	.1653898	.3865369
Geol	.0426193	.0647085	0.66	0.510	-.0842249	.1694635
Health	.0205158	.0859095	0.24	0.811	-.1478875	.188919
Hist	.0150652	.0572322	0.26	0.792	-.0971237	.1272541
Humserv	-.0536287	.1450348	-0.37	0.712	-.3379318	.2306745
ID	.0363737	.0842092	0.43	0.666	-.1286968	.2014441
Journ	.0751596	.0434993	1.73	0.084	-.0101096	.1604288
Lang	.0097632	.0519258	0.19	0.851	-.0920238	.1115502
Libstud	-.0161176	.1263118	-0.13	0.898	-.2637193	.231484
Ling	.1885836	.0922574	2.04	0.041	.0077368	.3694304
Math	-.0682431	.0601539	-1.13	0.257	-.1861592	.049673
Music	.0440125	.0425439	1.03	0.301	-.0393838	.1274089
PE	.1280469	.0462896	2.77	0.006	.037308	.2187857
Phil	.0981021	.0915031	1.07	0.284	-.081266	.2774702
Physics	-.0773751	.0711039	-1.09	0.277	-.2167559	.0620057
Polisci	.0177702	.0538523	0.33	0.741	-.0877933	.1233336
prearch	.0644619	.2010255	0.32	0.748	-.3295967	.4585204
predent	-.0046404	.1772611	-0.03	0.979	-.3521149	.3428342
preeng	-.0390763	.1766098	-0.22	0.825	-.385274	.3071215
prelaw	-.0749638	.1735248	-0.43	0.666	-.4151142	.2651866
premed	-.0656103	.1720741	-0.38	0.703	-.402917	.2716964
prenurse	-.1231202	.1903934	-0.65	0.518	-.4963373	.2500969
prepharm	.0181631	.1711181	0.11	0.915	-.3172697	.353596
prept	-.010487	.1735968	-0.06	0.952	-.3507785	.3298046
prevet	.0205283	.2005744	0.10	0.918	-.3726459	.4137025
psych	.0778322	.0388806	2.00	0.045	.0016169	.1540475
Recreat	-.0606462	.1448184	-0.42	0.675	-.3445252	.2232328
Soc	.0866877	.0503648	1.72	0.085	-.0120395	.1854148
Theatre	.0830716	.0477144	1.74	0.082	-.0104601	.1766032
Undec	-.0411722	.1703746	-0.24	0.809	-.3751476	.2928032
interest	-.1048954	.166732	-0.63	0.529	-.4317304	.2219397
aa	.4267081	.1190086	3.59	0.000	.1934225	.6599937
firstgen	-.0279703	.0092016	-3.04	0.002	-.0460076	-.0099329
after~200240	-.0200499	.1970603	-0.10	0.919	-.4063356	.3662359
after~200310	-.1251869	.1793739	-0.70	0.485	-.4768031	.2264293
after~200320	-.0197331	.1642209	-0.12	0.904	-.3416457	.3021795
after~200330	-.0749579	.1672114	-0.45	0.654	-.4027327	.2528168
after~200340	-.0960311	.1630391	-0.59	0.556	-.415627	.2235649
after~200410	-.0318109	.1629987	-0.20	0.845	-.3513277	.2877059
after~200420	-.108319	.164503	-0.66	0.510	-.4307845	.2141466
after~200430	-.0146062	.1632991	-0.09	0.929	-.3347117	.3054994
after~200440	-.0167138	.1615234	-0.10	0.918	-.3333386	.299911
after~200510	-.0571883	.1612876	-0.35	0.723	-.3733509	.2589744
after~200520	-.0499925	.1616948	-0.31	0.757	-.3669533	.2669682
after~200530	-.037174	.1637652	-0.23	0.820	-.3581934	.2838454
after~200540	-.0674038	.1606048	-0.42	0.675	-.3822278	.2474203
after~200610	-.079315	.1605775	-0.49	0.621	-.3940858	.2354557
after~200620	-.022652	.160692	-0.14	0.888	-.337647	.2923431
after~200630	-.0499205	.161834	-0.31	0.758	-.3671541	.2673131
after~200640	-.0510088	.1596287	-0.32	0.749	-.3639196	.2619019
after~200710	-.0098089	.1594692	-0.06	0.951	-.322407	.3027892
after~200720	-.0387427	.1597506	-0.24	0.808	-.3518925	.2744071
after~200730	-.0460343	.1604413	-0.29	0.774	-.360538	.2684694
after~200740	-.0458913	.1589327	-0.29	0.773	-.3574377	.265655
after~200810	-.0623123	.1591165	-0.39	0.695	-.374219	.2495943
after~200820	-.0301923	.1594989	-0.19	0.850	-.3428486	.282464
after~200830	-.0172478	.1611658	-0.11	0.915	-.3331716	.2986761
after~200840	-.0614934	.1585782	-0.39	0.698	-.3723449	.2493581
after~200910	-.0805391	.1589938	-0.51	0.612	-.3922054	.2311272
after~200920	.0296537	.1615777	0.18	0.854	-.2870776	.346385
_cons	.5039052	.3235735	1.56	0.119	-.130377	1.138187

Regression used for transfer students in Figure 7:

```
. reg post90gpa GPA GPA2 GPA3 hoursearned age age2 age3 male peakapplnum black hispanic ///
> asian indian Acct-EET English-ID Journ-Polisci predent-premed prept-Undec interest aa firstgen ///
> after90term200240-after90term200910 everettcc-northwestind yakimavalcc-spokanecc if hoursearned>=90 & GPA>2 & transfer==1 & post90t
> rsattempt>=30, robust

Linear regression                                      Number of obs =      6432
                                                       F(131, 6298) =         .
                                                       Prob > F      =         .
                                                       R-squared     =    0.4164
                                                       Root MSE      =    .42967

------------------------------------------------------------------------------
             |               Robust
    post90gpa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         GPA |  -4.750415   1.587523    -2.99   0.003    -7.8625   -1.638329
        GPA2 |   1.359648   .5102301     2.66   0.008     .3594229    2.359872
        GPA3 |  -.1090998   .0540596    -2.02   0.044    -.215075   -.0031246
  hoursearned |   .0051467   .0006295     8.18   0.000     .0039126    .0063808
         age |   .1165476   .024551      4.75   0.000     .0684193    .1646759
        age2 |  -.0026276   .0006389    -4.11   0.000    -.00388    -.0013751
        age3 |   .0000195   5.33e-06     3.67   0.000     9.10e-06     .00003
        male |  -.073007    .0124867    -5.85   0.000    -.0974852   -.0485287
  peakapplnum |  -.0115785   .0095991    -1.21   0.228    -.0303961    .007239
       black |  -.095702    .0461047    -2.08   0.038    -.186088    -.005326
    hispanic |  -.050432    .0274027    -1.84   0.066    -.1041506    .0032866
       asian |  -.137088    .0251273    -5.46   0.000    -.1863462   -.0878299
      indian |  -.0854211   .0374546    -2.28   0.023    -.1588448   -.0119973
        Acct |  -.4007265    .05233     -7.66   0.000    -.5033111   -.2981419
         ACS |  -.329267    .1571539    -2.10   0.036    -.6373421   -.0211918
        Anth |  -.0501869   .0516157    -0.97   0.331    -.1513713    .0509976
         Art |  -.0872183   .0460184    -1.90   0.058     -.17743    .0029934
         Bio |  -.3767933   .0493883    -7.63   0.000    -.4736112   -.2799755
       Canam |  -.2975649   .3650602    -0.82   0.415    -1.013207    .4180775
         CBE |  -.3626434   .0445146    -8.15   0.000    -.4499071   -.2753797
        Chem |  -.4875825   .0675627    -7.22   0.000    -.6200284   -.3551365
        Comm |  -.1958258   .0510579    -3.84   0.000    -.2959167   -.095735
     Compsci |  -.5050238   .0573339    -8.81   0.000    -.6174177   -.3926299
         CSD |  -.1291936   .0679838    -1.90   0.057    -.2624649    .0040778
       Dance |  -.3591755   .4103596    -0.88   0.381    -1.16362     .445269
      Easian |  -.1779347   .132051     -1.35   0.178    -.4367997    .0809304
        Econ |  -.302466    .0675752    -4.48   0.000    -.4349363   -.1699956
        Educ |  -.0835919   .0416642    -2.01   0.045    -.165268    -.0019159
         EET |   .017275    .0710332     0.24   0.808    -.1219743    .1565242
     English |   .016592    .0465438     0.36   0.721    -.0746497    .1078338
     Engtech |  -.2104297   .0554579    -3.79   0.000    -.3191461   -.1017133
       Envir |  -.1486433   .0449905    -3.30   0.001    -.2368401   -.0604466
        Fair |  -.2253067   .0700208    -3.22   0.001    -.3625713   -.0880421
     Finmark |  -.3946701   .0498348    -7.92   0.000    -.4923633   -.2969768
     Genstud |  -.1979919   .1501314    -1.32   0.187    -.4923005    .0963168
        Geog |  -.1616578   .1148296    -1.41   0.159    -.386763     .063448
        Geol |  -.4176012   .0684476    -6.10   0.000    -.5517818   -.2834205
      Health |  -.1757515   .1285685    -1.37   0.172    -.4277896    .0762865
        Hist |  -.3146573   .0519259    -6.06   0.000    -.4164499   -.2128648
     Humserv |  -.2901787   .0463155    -6.46   0.000    -.3809728   -.1993846
          ID |  -.1607111   .0894561    -1.80   0.072    -.3360756    .0146534
       Journ |  -.1578031   .0517245    -3.05   0.002    -.2592007   -.0564054
        Lang |  -.1540901   .0663427    -2.32   0.020    -.2841443   -.0240358
     Libstud |  -.0292534   .0835589    -0.35   0.726    -.1930574    .1345505
        Ling |  -.1982784   .1114117    -1.78   0.075    -.4166833    .0201265
        Math |  -.3031343   .0680177    -4.46   0.000    -.4364722   -.1697964
       Music |  -.0819887   .0553696    -1.48   0.139     -.190532    .0265546
          PE |  -.2686383   .0559866    -4.80   0.000    -.3783911   -.1588856
        Phil |  -.1476544   .0617265    -2.39   0.017    -.2686594   -.0266494
     Physics |  -.1596468   .0861128    -1.85   0.065    -.3292414    .0099477
     Polisci |  -.2040357   .0550794    -3.70   0.000     -.31201   -.0960614
     predent |  -.8594345   .1302762    -6.60   0.000    -1.11482    -.6040488
      preeng |  -.6623698   .104561     -6.33   0.000    -.867345    -.4573947
      prelaw |  -.7311796   .1429679    -5.11   0.000    -1.011446   -.4509137
      premed |  -.7722017   .078846     -9.85   0.000    -.9258623   -.6185412
      prept |  -.7284035   .0787427     -9.25   0.000    -.8827661   -.5740409
      prevet |  -1.201277   .0546535   -21.98   0.000    -1.308416   -1.094137
       psych |  -.269292    .0435227    -6.19   0.000    -.3546113   -.1839726
     Recreat |  -.2656196   .0782492    -3.39   0.001    -.4190147   -.1122245
         Soc |  -.2481889   .0550231    -4.51   0.000    -.3560529   -.1403249
     Theatre |  -.076095    .06309      -1.21   0.228    -.199773     .0475829
       Undec |  -.6632026   .0570918   -11.62   0.000    -.7751219   -.5512833
    interest |  -.4401718   .0229199   -19.20   0.000    -.4851025   -.395241
          aa |  -.0299823   .0187441    -1.60   0.110    -.0667271    .0067625
    firstgen |  -.0244632   .0111084    -2.20   0.028    -.0462395   -.0026868
 after~200240 |  -.140293    .0917075    -1.53   0.126    -.320071    .0394849
 after~200310 |  -.0774773   .0972085    -0.80   0.425    -.2680391    .1130844
 after~200320 |  -.1145009   .0999347    -1.15   0.252    -.310407     .0814052
 after~200330 |  -.0214123   .1047306    -0.20   0.838     -.22672     .1838954
 after~200340 |  -.1275634   .0913787    -1.40   0.163    -.3066969    .0515701
 after~200410 |  -.1295431   .0970224    -1.34   0.182    -.3197402    .0606539
 after~200420 |  -.1244336   .0972632    -1.28   0.201    -.3151026    .0662354
 after~200430 |  -.2341889   .1129147    -2.07   0.038    -.4555401   -.0128377
 after~200440 |  -.0928764   .0910215    -1.02   0.308    -.2713095    .0855567
 after~200510 |  -.1771156   .0950884    -1.24   0.216    -.3041212    .06869
 after~200520 |  -.113302    .1013186    -1.12   0.263    -.3119209    .085317
 after~200530 |  -.3104674   .1249728    -2.48   0.013    -.5554566   -.0654781
 after~200540 |  -.1455029   .0911512    -1.60   0.110    -.3241904    .0331845
 after~200610 |  -.1292472   .098195     -1.32   0.188    -.3217429    .0632486
 after~200620 |  -.0385644   .0429937    -0.37   0.708    -.2404671    .1633383
 after~200630 |  -.0478672   .1191183    -0.40   0.688    -.2813798    .1856453
 after~200640 |  -.0870154   .0911337    -0.95   0.340    -.2656685    .0916377
 after~200710 |  -.1104592   .0962486    -1.15   0.251    -.2991394    .0782209
 after~200720 |  -.039924    .1044609    -0.38   0.702    -.2447031    .164855
 after~200730 |  -.0989645   .1369592    -0.72   0.470    -.3674512    .1695223
 after~200740 |  -.0693654   .0918637    -0.76   0.450    -.2494495    .1107187
 after~200810 |  -.0892313   .0986164    -0.90   0.366    -.2825531    .1040905
 after~200820 |  -.231042    .1110188    -2.08   0.037    -.4486766   -.0134074
 after~200830 |  -.0101979   .132795     -0.08   0.939    -.2705213    .2501254
 after~200840 |  -.0524103   .0914243    -0.57   0.566    -.2316632    .1267825
 after~200910 |  -.0425755   .0995369    -0.43   0.669    -.2377016    .1525507
    everettcc |   .0328063   .0219307     1.50   0.135    -.0101853    .0757979
      skagitcc |   .0528231   .0218874     2.41   0.016     .0099165    .0957298
   bellevuecc |   .062721    .0262155     2.39   0.017     .0113297    .1141123
    olympiccc |  -.0172076   .023965     -0.72   0.473    -.0641871    .0297719
           uw |   .1724125   .0492674     3.50   0.000     .0758317    .2689933
     edmondcc |   .0387705   .0282452     1.37   0.170    -.0165997    .0941407
 shorelinecc |   .0439507   .0301513     1.46   0.145    -.0151562    .1030576
    greenrcc |  -.025566    .0310767    -0.82   0.411    -.086487     .035355
   seattleccc |   .0232873   .0339227     0.69   0.492    -.0432128    .0897873
     pierccc |  -.1402756   .0396913    -3.53   0.000    -.218084    -.0624671
   nseattlecc |   .0929998   .0388281     2.40   0.017     .0168836    .169116
    spugetscc |   .0120262   .0381594     0.32   0.753    -.0627793    .0868317
   highlinecc |  -.0300061   .0405349    -0.74   0.459    -.1094684    .0494561
          wsu |   .0059137   .0641004     0.09   0.926    -.119745     .1315723
 peninsulacc |  -.0167048   .0359497    -0.46   0.642    -.0871784    .0537687
     clarkcc |   .1365998   .0399468     3.42   0.001     .0582904    .2149092
    tacomacc |   .0186705   .0436053     0.43   0.669    -.0668106    .1041517
  cascadiacc |  -.0781995   .0521405    -1.50   0.134    -.1804126    .0240135
 wenatcheecc |  -.0213642   .0455152    -0.47   0.639    -.1105894    .0678611
         cwu |  -.1105354   .020313     -1.83   0.067    -.2287695    .0076986
         ewu |  -.1050983   .1154997    -0.91   0.363    -.3315171    .1213205
  spokanefcc |  -.0243523   .0638417    -0.38   0.703    -.1495038    .1007992
 centraliacc |  -.0889899   .059804     -1.49   0.137     -.206226    .0282463
  columbiacc |   .1187691   .0516631     2.30   0.022     .0174918    .2200465
  lowercolcc |   .0338212   .0482407     0.70   0.483    -.0607469    .1283893
   sseattlecc |  -.0113072   .0727388    -0.16   0.876    -.1539001    .1312857
 graysharbo~c |  -.0741323   .0672767    -1.10   0.271    -.2060175    .0577528
    seattleu |   .0747888   .0773483     0.97   0.334    -.0768403    .2264179
 northwestind |  -.2465188   .1060768    -2.32   0.020    -.4544654   -.0385721
 yakimavalcc |  -.1119182   .0853534    -1.31   0.190     -.27924     .0554037
   bigbendcc |   .0069195   .0834268     0.08   0.934    -.1566254    .1704644
wallawallacc |  -.1664421   .0701829    -2.37   0.018    -.3040244   -.0288597
     evergst |  -.0889273   .1506941    -0.59   0.555    -.3843391    .2064845
         spu |  -.0626738   .0922575    -0.68   0.497    -.2435298    .1181823
         psu |  -.0296954   .2136788    -0.14   0.889    -.4485787    .3891878
         pcc |   .3399478   .101186     3.36   0.001     .1415888    .5383068
         plu |   .0052878   .0691125     0.08   0.939    -.1301961    .1407718
         msu |   .1202423   .1541209     0.78   0.435    -.1818873    .4223718
          um |   .0810893   .1611234     0.50   0.615    -.2347674    .3969459
          ui |  -.2322342   .2115258    -1.10   0.272    -.6468969    .1824285
 bellingham~h |   .215935    .1723155     1.25   0.210    -.1218622    .5537321
    spokanecc |  -.0367577   .1099495    -0.33   0.738    -.2522961    .1787808
        _cons |   6.628554   1.663975     3.98   0.000     3.366597    9.890511
------------------------------------------------------------------------------
```

Appendix C

Figure C1: GPA Distribution of Students Who Eventually Graduated

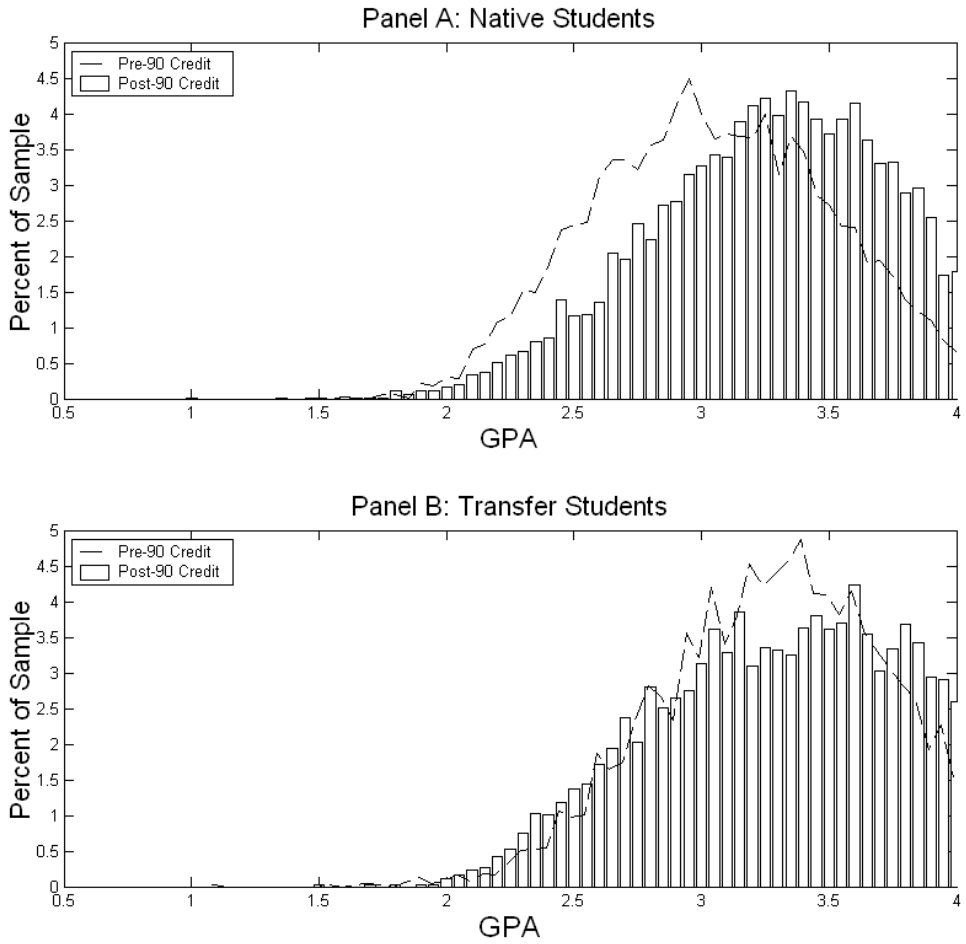
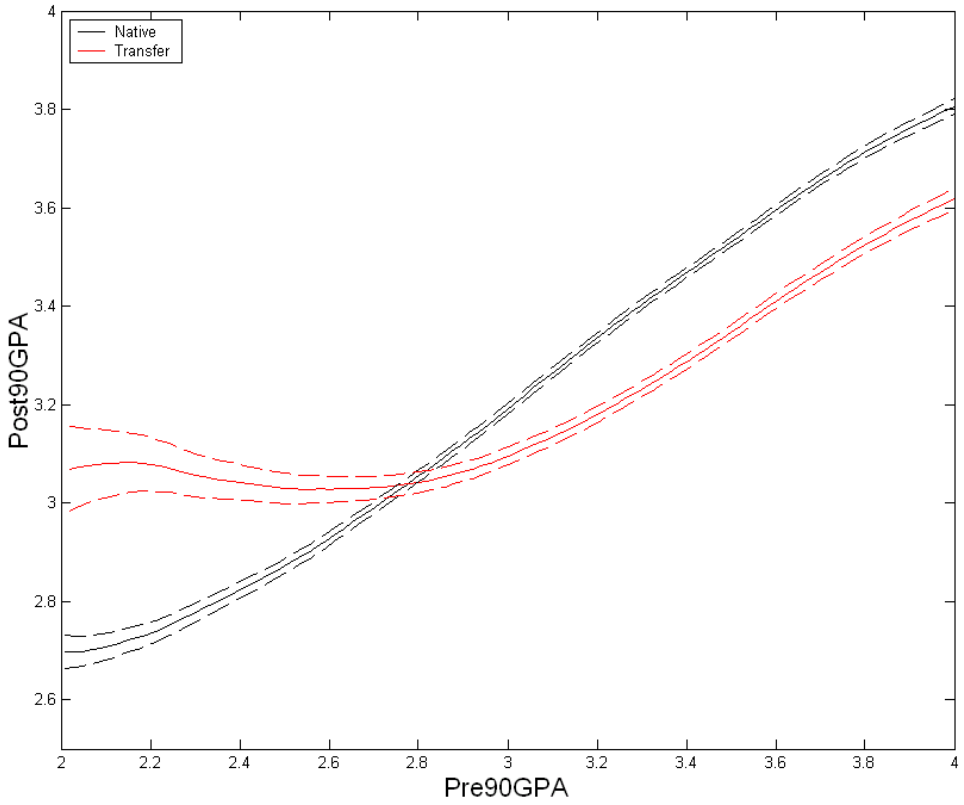
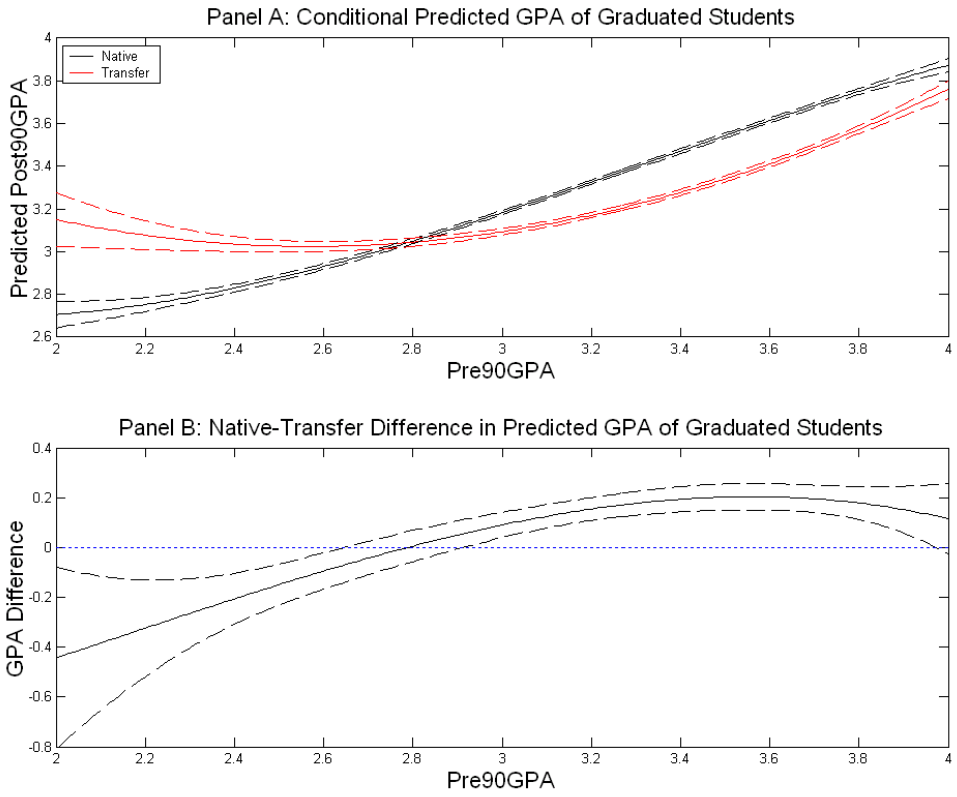


Figure C2: Average Post90GPA of Graduated Students, Native v. Transfer



Notes: 95% confidence intervals for the average Post90GPA in dashed lines. Both plots are constructed using kernel-weighted local polynomial smoothing. Each regression also contains the control variables listed in Appendix B.

Figure C3: Conditional Post90GPA of Graduated Students by Pre90GPA



Notes: Dashed lines indicate 95% confidence intervals. The native-transfer difference is defined as the native line in panel A less the transfer line in the same panel.

Appendix D

Probit results used for native students in Figure 14.

```
. probit graduated GPA GPA2 GPA3 hoursearned hoursearned2 age age2 male ///
> peakapplnum black hispanic asian indian unknown firstgen interest collcount ///
> resident Undec if after90term<=200720 & hoursearned>=90 & GPA>=2 & transfer == 0

Iteration 0:   log likelihood = -1994.2883
Iteration 1:   log likelihood = -1854.7501
Iteration 2:   log likelihood = -1852.0363
Iteration 3:   log likelihood = -1852.0336
Iteration 4:   log likelihood = -1852.0336

Probit regression                                 Number of obs   =       6103
                                                  LR chi2(19)     =     284.51
                                                  Prob > chi2     =     0.0000
Log likelihood = -1852.0336                       Pseudo R2       =     0.0713
```

graduated	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
GPA	10.17989	4.811381	2.12	0.034	.7497582	19.61002
GPA2	-2.702387	1.640456	-1.65	0.099	-5.917621	.5128472
GPA3	.2413238	.1837087	1.31	0.189	-.1187387	.6013864
hoursearned	.0089774	.0552808	0.16	0.871	-.0993711	.1173258
hoursearned2	.0000159	.000272	0.06	0.953	-.0005171	.0005489
age	1.123613	.2883185	3.90	0.000	.5585193	1.688707
age2	-.020616	.0057386	-3.59	0.000	-.0318634	-.0093686
male	-.1814578	.0465301	-3.90	0.000	-.2726552	-.0902604
peakapplnum	-.2927877	.159775	-1.83	0.067	-.605941	.0203656
black	-.0963728	.1547998	-0.62	0.534	-.3997749	.2070292
hispanic	.1108914	.1377847	0.80	0.421	-.1591617	.3809445
asian	.1218373	.0813911	1.50	0.134	-.0376863	.281361
indian	-.0105141	.1846173	-0.06	0.955	-.3723573	.3513292
unknown	-.1944906	.110061	-1.77	0.077	-.4102062	.0212249
firstgen	-.1049681	.049672	-2.11	0.035	-.2023233	-.0076128
interest	.0971029	.0857987	1.13	0.258	-.0710595	.2652653
collcount	-.0374284	.0479342	-0.78	0.435	-.1313778	.056521
resident	.1674631	.0824444	2.03	0.042	.005875	.3290511
Undec	.1645635	.0924559	1.78	0.075	-.0166469	.3457738
_cons	-27.30847	6.420318	-4.25	0.000	-39.89206	-14.72488

Probit results used for transfer students in Figure 14.

```
. probit graduated GPA GPA2 GPA3 hoursearned hoursearned2 age age2 male ///
> peakapplnum black hispanic asian indian unknown aa firstgen interest collcount ///
> resident Undec if after90term<=200720 & hoursearned>=90 & GPA>=2 & transfer == 1

Iteration 0:   log likelihood = -3235.9821
Iteration 1:   log likelihood = -3163.5152
Iteration 2:   log likelihood = -3163.3573
Iteration 3:   log likelihood = -3163.3573

Probit regression                                 Number of obs   =       5886
                                                  LR chi2(20)     =     145.25
                                                  Prob > chi2     =     0.0000
Log likelihood = -3163.3573                       Pseudo R2       =     0.0224
```

graduated	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
GPA	-4.55556	4.932357	-0.92	0.356	-14.2228	5.111682
GPA2	1.565579	1.607375	0.97	0.330	-1.584818	4.715975
GPA3	-.1621057	.172689	-0.94	0.348	-.50057	.1763585
hoursearned	-.0078993	.0270644	-0.29	0.770	-.0609445	.0451459
hoursearned2	.0000546	.0001259	0.43	0.665	-.0001923	.0003014
age	-.0025384	.0186321	-0.14	0.892	-.0390567	.0339799
age2	-7.34e-06	.00024	-0.03	0.976	-.0004778	.0004631
male	.0169072	.0381073	0.44	0.657	-.0577818	.0915961
peakapplnum	.0542628	.0298198	1.82	0.069	-.0041829	.1127085
black	.1479282	.1444263	1.02	0.306	-.1351421	.4309985
hispanic	-.0546797	.0926887	-0.59	0.555	-.2363461	.1269867
asian	-.086048	.0761575	-1.13	0.259	-.2353139	.0632179
indian	-.370167	.0950348	-3.90	0.000	-.5564317	-.1839023
unknown	.0655428	.0713003	0.92	0.358	-.0742032	.2052888
aa	.0390994	.053285	0.73	0.463	-.0653372	.143536
firstgen	-.0550148	.0370837	-1.48	0.138	-.1276975	.0176678
interest	-.2466391	.0545817	-4.52	0.000	-.3536172	-.1396611
collcount	.0557712	.0235605	2.37	0.018	.0095934	.101949
resident	.0433678	.0907782	0.48	0.633	-.1345542	.2212899
Undec	-.4200931	.1094596	-3.84	0.000	-.6346298	-.2055563
_cons	4.912808	5.189518	0.95	0.344	-5.25846	15.08408

Appendix E

Marginal effects after probit
y = Pr(graduated) (predict)
= .91375513

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
transfer*	-.0990574	.01257	-7.88	0.000	-.123686	-.074428	.417417
male*	-.023087	.00558	-4.14	0.000	-.034026	-.012148	.428514
black*	-.0418432	.02256	-1.85	0.064	-.086058	.002371	.018414
hispanic*	-.0154763	.01514	-1.02	0.307	-.045145	.014192	.032728
asian*	-.0165099	.0106	-1.56	0.119	-.03728	.00426	.073577
indian*	-.054175	.02159	-2.51	0.012	-.096496	-.011854	.021068
age	-.0136382	.00428	-3.19	0.001	-.022024	-.005252	27.1139
age2	.0001746	.00006	3.04	0.002	.000062	.000287	762.836
hourse~d	.0167504	.0039	4.29	0.000	.009097	.024404	96.9669
hourse~2	-.0000703	.00002	-3.88	0.000	-.000106	-.000035	9472.65
aa*	.0051155	.00977	0.52	0.601	-.014038	.024269	.348183
resident*	-.0077942	.01042	-0.75	0.455	-.028221	.012633	.938324
firstgen*	-.0064127	.00539	-1.19	0.234	-.016978	.004152	.372628
Acct*	.0809568	.01148	7.05	0.000	.058447	.103467	.017369
ACS*	.0774998	.01814	4.27	0.000	.041954	.113046	.000643
Anth*	.0766103	.01455	5.27	0.000	.048102	.105118	.012062
Art*	.081792	.01257	6.51	0.000	.057149	.106435	.026375
Bio*	.074555	.01987	3.75	0.000	.035612	.113498	.034014
CBE*	.0868111	.01736	5.00	0.000	.052781	.120841	.070119
Chem*	.0660693	.02399	2.75	0.006	.01905	.113088	.010614
Comm*	.0839888	.0106	7.92	0.000	.063208	.10477	.025812
Compsci*	.0640303	.02746	2.33	0.020	.010214	.117847	.029029
CSD*	.0759881	.0146	5.21	0.000	.047377	.104599	.004423
Dance*	-.0298039	.18204	-0.16	0.870	-.386593	.326985	.000241
Easian*	.0325377	.07012	0.46	0.643	-.104903	.169978	.000643
Econ*	.0795437	.01075	7.40	0.000	.058481	.100606	.004986
Educ*	.0840278	.02627	3.20	0.001	.03253	.135525	.11531
English*	.0819289	.01314	6.24	0.000	.056176	.107682	.029833
Engtech*	.0696975	.02217	3.14	0.002	.026239	.113156	.022837
Envir*	.0778792	.01593	4.89	0.000	.046659	.109099	.026777
Fair*	.0636578	.02622	2.43	0.015	.012273	.115042	.012383
Finmark*	.0826904	.01162	7.12	0.000	.059913	.105468	.025491
Genstud*	.0766847	.01816	4.22	0.000	.041091	.112278	.000965
Geog*	.0813014	.00916	8.87	0.000	.06334	.099262	.001769
Geol*	.0763434	.01414	5.40	0.000	.048631	.104056	.005468
Health*	.0805624	.0105	7.68	0.000	.059992	.101133	.001769
Hist*	.0722061	.01922	3.76	0.000	.034528	.109884	.016806
Humserv*	.0825164	.01328	6.22	0.000	.056496	.108536	.033934
ID*	.0292486	.06316	0.46	0.643	-.094534	.153031	.001206
Journ*	.0772369	.01474	5.24	0.000	.048339	.106135	.016565
Lang*	.0781953	.01291	6.06	0.000	.052897	.103494	.010614
Libstud*	.0785282	.01214	6.47	0.000	.054734	.102322	.00394
Ling*	.0757355	.01835	4.13	0.000	.039774	.111697	.000804
Math*	.0539453	.03415	1.58	0.114	-.012983	.120874	.009649
Music*	.0564518	.03215	1.76	0.079	-.006568	.119472	.013268
PE*	.0777609	.01369	5.68	0.000	.050932	.10459	.013107
Phil*	.0717702	.01876	3.83	0.000	.034998	.108543	.003779
Physics*	.0540519	.03471	1.56	0.119	-.013969	.122073	.005468
Polisci*	.0791089	.01253	6.31	0.000	.054556	.103662	.01375
predent*	.0199301	.06266	0.32	0.750	-.102878	.142738	.004181
preeng*	.0218567	.06219	0.35	0.725	-.100027	.143741	.003619
prelaw*	-.0182427	.08217	-0.22	0.824	-.179286	.1428	.00772
premed*	-.004463	.07184	-0.06	0.950	-.145262	.136336	.015761
prept*	.0437016	.04251	1.03	0.304	-.039613	.127016	.008122
psych*	.0825164	.01682	4.91	0.000	.049559	.115474	.051463
Recreat*	.0777603	.01256	6.19	0.000	.053147	.102374	.004583
Soc*	.0826246	.00869	9.51	0.000	.065588	.099661	.011579
Theatre*	.0611936	.02821	2.17	0.030	.005908	.116479	.011499
Undec*	.0324494	.05342	0.61	0.544	-.072262	.13716	.150531
unk*	-.0089433	.07186	-0.12	0.901	-.149777	.131891	.107591
interest*	-.0937406	.01554	-6.03	0.000	-.124203	-.063279	.637826
a~200310*	-.0169009	.01601	-1.06	0.291	-.048272	.01447	.056931
a~200320*	-.0063784	.0197	-0.32	0.746	-.04499	.032233	.028225
a~200330*	-.0024758	.02782	-0.09	0.929	-.057007	.052056	.012544
a~200340*	-.0236577	.01363	-1.74	0.083	-.05037	.003054	.102445
a~200410*	-.0614445	.02054	-2.99	0.003	-.101701	-.021188	.056369
a~200420*	-.1173343	.0309	-3.80	0.000	-.177897	-.056771	.023561
a~200430*	-.0771505	.03798	-2.03	0.042	-.151589	-.002712	.012625
a~200440*	-.0078037	.01285	-0.61	0.544	-.032988	.01738	.111853
a~200510*	-.0708393	.02162	-3.28	0.001	-.113221	-.028458	.061113
a~200520*	-.0773885	.02822	-2.74	0.006	-.132702	-.022075	.02734
a~200530*	-.0639225	.03807	-1.68	0.093	-.13854	.010695	.011821
a~200540*	-.0559818	.01705	-3.28	0.001	-.089408	-.022556	.106385
a~200610*	-.1150443	.02591	-4.44	0.000	-.165832	-.064257	.052911
a~200620*	-.1037401	.03276	-3.17	0.002	-.167946	-.039534	.02541
a~200630*	-.0542685	.04378	-1.24	0.215	-.140071	.031534	.009489
a~200640*	-.1344073	.02207	-6.09	0.000	-.177668	-.091147	.099711
a~200710*	-.2131505	.0304	-7.01	0.000	-.272726	-.153575	.059183
a~200720*	-.2828746	.03853	-7.34	0.000	-.358389	-.20736	.031361

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Appendix F

```
. reg post90gpa GPA GPA2 hoursearned age age2 male peakapplnum black hispanic asian indian unknown aa ///
> firstgen peakcampus privfour privtwo pubfour Acct EET English-ID Journ-Polisci predent-premed prept-Undec ///
> interest if transfer==1 & TRANS_HRS_EARNED>=90 & lastcoltype~=0 & post90hrsattempt>=30, robust

Linear regression                               Number of obs =    6452
                                                F( 53,  6397) =       .
                                                Prob > F      =       .
                                                R-squared     =  0.3785
                                                Root MSE      =  .4409
```

post90gpa	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
GPA	-1.249711	.2303335	-5.43	0.000	-1.701242	-.7981801
GPA2	.2820447	.0362207	7.79	0.000	.21104	.3530493
hoursearned	.0045942	.0006108	7.52	0.000	.0033969	.0057915
age	.0278066	.0051942	5.35	0.000	.0176242	.0379891
age2	-.0002846	.0000685	-4.15	0.000	-.0004188	-.0001503
male	-.1124688	.0122221	-9.20	0.000	-.1364283	-.0885093
peakapplnum	-.0083945	.0093338	-0.90	0.368	-.0266919	.0099029
black	-.0867846	.0452713	-1.92	0.055	-.1755315	.0019623
hispanic	-.0467779	.0277227	-1.69	0.092	-.1011238	.0075679
asian	-.1525235	.0261048	-5.84	0.000	-.2036976	-.1013494
indian	-.0929211	.0375449	-2.47	0.013	-.1665217	-.0193206
unknown	-.0007515	.0209318	-0.04	0.971	-.0417847	.0402818
aa	-.0300764	.0215723	-1.39	0.163	-.0723653	.0122126
firstgen	-.0343533	.0112364	-3.06	0.002	-.0563804	-.0123263
peakcampus~n	-.5117308	.0645753	-7.92	0.000	-.6383199	-.3851416
privfour	.0316997	.0408846	0.78	0.438	-.0484479	.1118473
privtwo	-.2093248	.0998296	-2.10	0.036	-.4050242	-.0136254
pubfour	-.0084045	.031729	-0.26	0.791	-.0706038	.0537949
Acct	-.1614881	.0356184	-4.53	0.000	-.2313121	-.091664
EET	.3311622	.0632303	5.24	0.000	.2072096	.4551148
English	.258639	.0269194	9.61	0.000	.205868	.31141
Engtech	.0544797	.0399306	1.36	0.173	-.0237976	.1327571
Envir	.0628069	.0248671	2.53	0.012	.014059	.1115547
Fair	.0013627	.0602086	0.02	0.982	-.1166662	.1193916
Finmark	-.1558318	.0311825	-5.00	0.000	-.2169599	-.0947036
Genstud	.0232806	.135655	0.17	0.864	-.2426486	.2892098
Geog	.1220008	.1095691	1.11	0.266	-.0927913	.336793
Geol	-.1976072	.0597779	-3.31	0.001	-.3147919	-.0804224
Health	.0580355	.1231439	0.47	0.637	-.1833678	.2994387
Hist	-.073277	.0366104	-2.00	0.045	-.1450457	-.0015084
Humserv	-.1688293	.0230178	-7.33	0.000	-.2139519	-.1237067
ID	.1092773	.0799417	1.37	0.172	-.0474353	.2659898
Journ	.0621262	.0379302	1.64	0.101	-.0122298	.1364821
Lang	.0600904	.0551787	1.09	0.276	-.0480783	.1682591
Libstud	.196078	.0760399	2.58	0.010	.0470144	.3451417
Ling	.0216867	.1049727	0.21	0.836	-.1840948	.2274683
Math	-.0554545	.0570373	-0.97	0.331	-.1672667	.0563576
Music	.1690305	.0426362	3.96	0.000	.0854493	.2526117
PE	-.0326053	.0433188	-0.75	0.452	-.1175248	.0523141
Phil	.1065021	.0504774	2.11	0.035	.0075496	.2054547
Physics	.082319	.0766642	1.07	0.283	-.0679685	.2326066
Polisci	.0280909	.0419922	0.67	0.504	-.0542279	.1104096
predent	-.2566916	.1404873	-1.83	0.068	-.5320938	.0187106
preeng	-.0050557	.1218758	-0.04	0.967	-.2439731	.2338618
prelaw	-.1355704	.1544424	-0.88	0.380	-.4383292	.1671883
premed	-.154127	.0897895	-1.72	0.086	-.3301444	.0218905
prept	-.115661	.0933865	-1.24	0.216	-.2987298	.0674078
prevet	-.6161305	.0719119	-8.57	0.000	-.7571018	-.4751591
psych	-.0389377	.0226213	-1.72	0.085	-.083283	.0054076
Recreat	-.0156482	.0641468	-0.24	0.807	-.1413974	.110101
Soc	-.0202561	.041007	-0.49	0.621	-.1006436	.0601314
Theatre	.1405177	.0532819	2.64	0.008	.0360673	.244968
Undec	-.066333	.073807	-0.90	0.369	-.2110194	.0783534
interest	-.0644645	.0659481	-0.98	0.328	-.1937449	.0648159
_cons	3.831791	.3924883	9.76	0.000	3.062382	4.601199