ENROLLMENT RESPONSIVENESS TO CHANGES IN RECENT EMPLOYMENT CONDITIONS AT FOR-PROFIT AND COMMUNITY COLLEGES

by

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A thesis submitted in partial fulfillment
of the requirements for the degree

of

Master of Science

in

Applied Economics

MONTANA STATE UNIVERSITY
Bozeman, Montana

January, 2013

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This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citation, bibliographic style, and consistency and is ready for submission to The Graduate School.

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January, 2013

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ABSTRACT

For-profit colleges are continually criticized as preying on individuals from lower socioeconomic backgrounds. This condemnation typically calls out for-profit colleges for putting profits ahead of students, leaving them with poor quality education in exchange for large amounts of debt. However, given that students can select between multiple suppliers of higher education, it is unclear why costly for-profit colleges remain a viable option in the higher education market, especially with substantial government subsidies to their direct competitors. One potential reason may be the institution themselves; for-profit colleges are more able to respond to structural changes in labor markets in ways that non-profit institutions are unable.

Using a panel dataset with student information from three rounds of the restricted-access National Postsecondary Student Aid Study (2000, 2004, 2008) and employment data from the Bureau of Labor Statistics' Occupational Employment Statistics, I empirically test the responsiveness of enrollment at for-profit and community colleges to changes in sectorial employment conditions. The results indicate that a 1% increase in a sector's employment growth results in a 2.5% increase in the percentage of students enrolled at for-profit colleges in majors that lead to occupations within that sector. However, no effect is observed on the enrollment in these majors at community colleges. The results also indicate that students are responsive to both local sectorial employment conditions and national conditions. Lastly, both for-profit colleges and community college enrollments appear to be unresponsive to sector wage growth, while only males show a response to sector wage levels. One explanation of these results is that for-profit colleges face different constraints than non-profit institutions and are better able to quickly adjust their faculty inputs to changing enrollment demands.

CHAPTER 1

OVERVIEW

For-profit colleges (FPCs) are continually criticized as preying on individuals from lower socioeconomic backgrounds. This condemnation typically claims FPCs put profits ahead of students needs by offering poor quality education in exchange for high levels of debt.[1] Indeed, a comparison of average tuition costs at community colleges (CCs) and FPCs indicates an $11,900 per year differential (Knapp, Kelly-Reid, Ginder 2011). A substantial proportion of this differential is due to CCs receiving large amounts of government assistance that subsidizes and reduces the cost of tuition students pay directly. Without these subsidies, FPCs rely on students to finance their education, often in part with federal student aid.

Given that students can select between multiple suppliers of higher education, it is unclear why costly FPCs remain a viable option in the higher education market, especially with substantial government subsidies to their primary competitors. In addition to remaining viable, FPCs have expanded enrollment by 11.5% per year and Associate's degrees granted over the last two decades at a rate of 8.4% per year. This expansion is far more rapid than at CCs, with FPC enrollment growing six times faster and Associate's degrees granted increasing three times faster than CCs. (Digest of Education Statistics, 2012, Table 291 and Table 199.5). One potential reason may be the institution

[1] For example, in 2012, the New York Times ("False Promises" 2012), Washington Post (Matthews 2012), and TIME Magazine (Webley 2012) all ran pieces discussing the failings of FPCs. The USA Today featured a column by Nobel Laureate Joseph Stiglitz where he claimed that FPCs had "full scope to exploit those at the bottom" (2012).

themselves; that is, FPCs are able to respond to structural changes to labor markets in ways that non-profit institutions are unable. The purpose of this thesis is to study the responsiveness of FPCs and CCs to changes in the labor market by investigating the correlation between measures of recent labor market conditions and student enrollment rates at FPCs and CCs, respectively.

The literature on FPCs and CCs documents significant differences in organization and objectives indicating that FPCs may be more responsive to changes in the demand for various programs than CCs. For example, the literature suggests that FPCs have top-down management structures with flexible labor supplies (Bennett, Lucchesi, Vedder 2010). In addition, FPCs typically lease commercial space in conveniently located urban areas permitting expansion or contraction as program demands change (Chung 2008, Bennett et al. 2010). One the other hand, CCs typically have management structures of traditional non-profit institutions of higher education with faculty governance committees and full-time tenured faculty (Hentschke 2010). CCs typically establish large campuses with multiple facilities in a single location (Hentschke 2010). This may limit CCs when attempting to expand high demand programs if capacity constraints are binding.

The literature has also investigated whether FPCs and CCs are substitutes. Turner (2003) shows that as tuition at public non-profit institutions of higher education increases, Pell Grant eligible students are more likely to increase enrollment at FPCs. Cellini (2009) shows that as funding to CCs increases through passage of county-level bonds, students are more likely to switch from FPCs to CCs. These results provide some evidence that there is substitution between CCs and FPCs. However, the direct influence

of sector employment conditions on the rate of enrollment in majors that lead to occupations in those sectors has yet to be investigated. It may be the case that FPCs are more able to adjust to changes in labor markets and if the two school types are substitutes then students may be attracted to programs at these schools. This thesis investigates whether this is true.

Using a panel dataset with student information from three rounds of the restricted-access versions of the National Postsecondary Student Aid Study (2000, 2004, 2008) and employment data from the Bureau of Labor Statistics' Occupational Employment Statistics, this thesis empirically tests the responsiveness of enrollment in majors within sectors at FPCs and CCs to changes in sector employment conditions. College majors and occupational industries are mapped into sectors. For each sector, enrollment rates are constructed separately for FPCs and CCs by aggregating all students within a major in that sector for each state as a percentage of all students within that state. The three measures of recent labor market conditions tested are employment growth, wage level, and wage growth and are constructed by aggregating the labor market variables for occupations in the sector that are likely to be attained with an Associate's degree at the state and national levels. The enrollment rates are then linked to the employment conditions by sector and year. This thesis analyzes the effect of these three measures of recent employment conditions on the sector enrollment rates at FPCs and CCs.

The results indicate that a 1% increase in state-level sector-specific employment growth state results in a 2.5% increase in the percentage of students enrolled at FPCs in majors within those sectors. However, no effect is observed on the enrollment rate in

these majors at CCs. Subgrouping students by gender and by age indicates that both males and females and students of all age groups are similarly affected. In addition, the results suggest that recent national-level employment conditions are correlated with enrollment at FPCs. However, given that state fixed effects are not included in the specification, these results are tentative. Studying wages also reveals several important relationships. First, the general results suggest no significant relationship between either wage level or wage growth and enrollment rates at FPCs or CCs. Second, there is some empirical evidence that male students respond to higher sector-specific wage levels by increasing their enrollment in majors within those sectors at FPCs and CCs. These results suggest that FPCs' business model may be more responsive to changes in program enrollment than CCs.

This thesis is organized as follows. Chapter 2 provides background information on two-year Associate's degrees and reviews the economic literature on CCs and FPCs. Chapter 3 describes the data and introduces the empirical specification and techniques used for estimating the effects of changing employment conditions on enrollment rates. Chapter 4 presents the empirical results and Chapter 5 summarizes and provides concluding remarks.

CHAPTER 2

BACKGROUND AND REVIEW OF LITERATURE

2.1 Overview on the Associate's Degree Higher Education Market

Associate's degrees are undergraduate academic degrees awarded in the first two years of college or university upon completion of a course of study. In the United States, these degrees are granted by community colleges, junior colleges, technical colleges, and some bachelor's degree-granting colleges and universities. In addition, these colleges can be not-for-profit institutions or for-profit institutions. In 2011, Associate's degrees comprise of 27% of all higher education degrees with 74% awarded by public institutions, which include community, junior, and technical colleges (hereafter community colleges or CCs). The remaining 26% is divided between for-profit colleges (FPCs) with 21% of degrees awarded and private not-for-profit colleges (PNPCs) with 5% of degrees awarded (Digest of Education Statistics, 2012, Table 199.5 and Table 291, reproduced in Table 1 below).

The Associate's degree market has had substantial growth over the last two decades as measured by the number of degrees granted and total enrollment. As displayed in Table 1, Associate's degrees granted have grown by 3.6% annually since 1995, compared to 2.4% growth in Bachelor's degrees granted. The growth in Associate's degrees granted varies by the type of degree-granting institution. Since 1995, CCs have increased the number of degrees conferred by 2.9% annually, while FPCs and PNPCs

have increased by 9.5% and .5%, respectively (Digest of Education Statistics, 2012, Table 291). Comparing total enrollment suggests similar growth rates across institution types. In 1995, student enrollment at CCs and FPCs were 5,277,829 and 139,546 respectively, and increased to 7,218,038 and 1,956,731 by 2010 (Digest of Education Statistics, 2012, Table 199.5).[2] In contrast, enrollment at two-year degree granting PNCPs fell from 75,154 in 1986 to 32,660 in 2010. Given that PNCPs are such small shares of the two-year Associate's degree market and display little (or negative) growth in enrollment and degrees granted, they are excluded from this analysis.[3] In addition, 4-year public institutions are also excluded due to the dissimilarity between these students and FPC and CC students.

CCs and FPCs differ by their program concentrations. Many smaller FPCs specialize in only one or two areas (Apling 1993). On the other hand, CCs typically offer a wider spectrum of programs, but have heavy concentration in the general or liberal arts programs. During the 2011-2012 academic school year, FPCs awarded 31% of all degrees in health fields, 25% in business fields, and 9% in computer and information sciences, while 42% of all CC degrees were awarded in liberal arts, humanities, or general education (Digest of Education Statistics, 2012, table 292).

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[2] In 2000, 13% of all Associate's degrees and 2% of all Bachelor's degrees were awarded by FPCs, while in 2011, 21% of all Associate's degrees, and 9% of all the Bachelor's degrees were awarded by FPCs (Deming, Goldin, Katz 2012).

[3] It is unclear why enrollment at PNCPs has decreased precipitously while the number of degrees conferred remains roughly constant.

Table 1: Total enrollment and degrees conferred in 2-year degree-granting institutions, 1995 through 2011.

	Enrollment at 2-year degree-granting institutions				Associate's degrees conferred by institution			
	All	Public	For-profit	Private Non-profit	All	Public	For-profit	Private Non-profi
1995-96	5,492,529	5,277,829	139,546	75,154	555,216	454,291	50,247	50,678
1996-97	5,563,327	5,314,463	173,489	75,375	571,226	465,494	56,564	49,168
1997-98	5,605,569	5,360,686	173,089	71,794	558,555	455,084	55,846	47,625
1998-99	5,489,314	5,245,963	177,481	65,870	564,984	452,616	64,611	47,757
1999-200	5,653,531	5,398,061	192,169	63,301	564,933	448,446	70,150	46,337
2000-01	5,948,431	5,697,388	192,199	58,844	578,865	456,487	76,667	45,711
2001-02	6,250,579	5,996,701	206,329	47,549	595,133	471,660	77,712	45,761
2002-03	6,529,379	6,270,380	211,912	47,087	634,016	498,279	89,554	46,183
2003-04	6,494,234	6,209,257	241,109	43,868	665,301	524,875	94,667	45,759
2004-05	6,545,863	6,243,576	260,037	42,250	696,660	547,519	103,797	45,344
2005-06	6,488,055	6,184,229	260,304	43,522	713,066	557,134	109,490	46,442
2006-07	6,518,540	6,225,120	254,264	39,156	728,114	566,535	117,750	43,829
2007-08	6,617,930	6,324,119	260,325	33,486	750,164	578,520	126,856	44,788
2008-09	6,971,378	6,640,344	295,683	35,351	787,325	596,098	144,298	46,929
2009-10	7,521,406	7,101,445	385,194	34,767	849,452	640,113	162,666	46,673
2010-11	7,680,875	7,218,038	430,177	32,660	942,327	696,788	193,570	51,969

Note: Includes only institutions that offer a 2-year Associate's degree and participate in Title IV federal financial aid programs.

Source: Digest of Education Statistics, 2011. Table 199.5 for enrollment data and Table 291 for degree data.

In addition to differences in program concentration, the cost of attending these institutions vary considerably as well. The costs of attending FPCs are substantially more expensive than attending CCs. Knapp et al. (2011) find average annual tuition costs at CCs of $2,700 compared to $14,600 at FPCs. The substantial difference in costs partly reflects that CCs receive 70% of their revenue directly from government sources permitting the subsidization of student tuition ("Community College Fact Sheet" 2012). FPCs do not receive government funds directly; rather, students receive federal financial aid that they apply to their costs of education. This translates into 88% of FPCs' revenues consisting of students' tuition (Hentschke 2010). Thus, given the costs of attending FPCs, FPCs rely on federal student financial aid to remain viable.

Given the disparities in cost between attending CCs and FPCs, researchers have investigated whether students substitute between FPCs and CCs. Studying increases in real tuition costs at public non-profit institutions of higher education, Turner (2003) finds that students eligible for Pell Grant substitute away by increasing enrollment at FPCs. Cellini (2009) studies the impact of funding to CCs on FPCs by investigating changes in enrollment rates the year after the passage of county-level bonds for funding CCs using a unique dataset comprised of California FPCs and CCs. The results indicate that an increase of $100 million in local funding for a CC causes, on average, 700 students to switch from FPCs to CCs in the year after passage of the bond. This equates to a 2% increase in student enrollment. In addition, she finds that this passage results in two FPCs exiting the market. These results indicate that increasing CC funding may signal to students that CC quality is rising (or that costs are contained), making CCs more

attractive and pushing students away from FPCs. However, it is unclear exactly what causes students to switch, i.e., do program enrollment caps increase in high demand fields or are other binding constraints loosened. This literature suggests that there is some substitution between CCs and FPCs, with the caveat that the substitution is likely to be strongest for lower income students that are eligible for federal student financial aid.

2.2 For-Profit Colleges

FPCs are institutions of higher education offering an array of postsecondary programs and degrees to students similar to not-for-profit public colleges. Programs and degrees range from certificates to graduate degrees. In this section, a brief overview on the historical background on FPCs is provided, followed by a more in-depth discussion on several noteworthy inherent characteristics of FPCs pertinent to how they are able to respond to changes in the labor market. In particular, this section highlights three of these distinct characteristics analyzed by researchers: the management structure, FPCs' objective, and the FPC business model. In addition, anecdotal evidence will also be provided.

FPCs have existed in the United States for nearly the same length of time as all other institutions of higher education. While early non-profit colleges were created and supported by religious groups, there was an immediate need to supplement the classical, religious-based education offered at these colleges. Early for-profit schools taught subjects that were relevant to the employment of residents for this era, specializing in fields such as agriculture and surveying. By the middle of the nineteenth century, the

number of proprietary business schools expanded rapidly, setting the foundation for modern FPCs (see Bennett et al. (2010) for further historical details). FPCs became known for providing skills-oriented training that was not offered by traditional non-profit colleges. In a report to the House of Representatives in 1873, the *Report of the Commissioner of Education* stated that "[t]he rapid growth of [for-profit] schools and the large number of pupils seeking the special training afforded by them sufficiently attest that they meet a want which is supplied by no other schools in an equal degree" (1874). After World War II, institutions of higher education experienced substantial growth, including FPCs (Bennett et al. 2010). FPCs, such as DeVry University, were chosen by the government to be providers of education for their military officers ("DeVry University Historical Timeline" 2006). During the next forty-five years, the number of FPCs increased rapidly until new regulations in 1992 caused a substantial decrease.[4] Currently, FPCs focus on programs that emphasize career training and not humanities or liberal arts education (Digest of Education Statistics, 2012, table 292).

Currently there are approximately 3.3 million students enrolled across all FPCs with the largest fifteen FPC firms enrolling approximately 60% of all FPC students (Bennett et al. 2010). Table 2 lists the fifteen largest FPC firms and a selection of their colleges. These firms are quite large, even when compared to not-for-profit public Bachelor's degree granting institutions. Furthermore, thirteen of the fifteen largest firms

[4] Regulations in 1992 covered areas where FPCs were being accused of wrong doing with emphasis on the establishment of minimum program lengths, stricter recruiting and admission standards, limits on the amount of revenue from federal student aid a school could receive, and accreditation requirements. Due to these regulations, approximately 50% of FPCs exited the market (see Hentschke (2010) for further details).

are publically traded (Bennett et al. 2010).[5] However, there are also hundreds of small FPCs that offer select programs. In a study of California FPCs, on average, each FPC offered four degrees or certificate programs and enrolled approximately 71 students (Cellini 05).

FPCs operate to serve their shareholders and investors, and therefore operate similarly to other publically-traded firms with boards of directors and operation management teams. FPCs pursue profits and distribute dividends to shareholders. FPCs primary means of increasing profits are through raising students' tuition and fees (per student revenue), increasing the number of students enrolled (total revenue), and lowering costs (Hentschke 2010). Since a large percentage of FPC students receive federal student financial aid, aid policies have direct impact on profitability.

[5] The University of Phoenix is the largest for-profit college and currently enrolls 319,400 undergraduate students and a total of 380,800 students across many campuses and through online programs ("Apollo Group, Inc." 2011). By contrast, Arizona State University, the largest public university by enrollment, has 58,404 undergraduates and a total of 72,254 students ("About ASU" 2012).

Table 2: Largest For-Profit Higher Education Firms

Firm	Colleges	Enrollment
Apollo Group	University of Phoenix	395,361
Education Management Corporation	The Art Institutes, Argosy University	104,547
Career Education Corporation	Colorado Technical University, Le Cordon Bleu North America	97,645
Corinthian College	Corinthinan College	82,029
DeVry	DeVry University	78,544
Kaplan Education	Kaplan University	67,897
ITT Educational Services	ITT Technical Institute, Daniel Webster College	60,890
Strayer Education	Strayer University	45,491
Laureate	Kendall College, Walden University	37,201
Bridgepoint Education	Ashford University, University of the Rockies	25,746
Capella Education	Capella University	25,245
Lincoln Education Services	Lincoln College of Technology, Lincholn Technical Institute	23,403
Grand Canyon Education	Grand Canyon University	22,025
American Public Education	American Military University, American Public University	21,729
Universal Technical Institute, Inc.	Universal Technical Institute, Marine Mechanics Institute	15,735

Adapted from Bennet et al. 2010

The profit maximizing nature of FPCs permits them to pursue a dynamic business model. In order to attract as many students as possible, they must provide value-added programs to students or they will lose them to their competitors. The structure of FPCs' business model facilitates this. Hentschke (2010) discusses four aspects of the FPC business model that leads itself to maximizing profits. First, owners and shareholders can invest directly in their institutions. Second, FPCs' decision making is a central control model with operations being directed from the top-down, i.e., from the board of directors to the instructors. This is accomplished by using mostly part-time non-tenured adjunct instructors.[6] Kinser (2007) finds that only 3% of faculty members at publically-traded FPCs have tenure. Thus, FPCs' boards of directors have few constraints to reduce programs, course offerings, or remove poor performing instructors. Third, FPCs can use mergers, acquisitions, and the sale of portions of the business to maximize profits. Lastly, FPCs can attract capital from private investors seeking a return on their investment.

A part of FPCs' business model is to maintain relationships with local businesses. FPCs have constructed *Employer Advisory Boards* or *Industry Advisory Councils* which aid in gathering information on what type of skills firms demand. They also receive feedback on graduates' performance, hire part-time faculty from contacts within the industry, and adjust programs as necessary to better meet employers' expectations. In addition, FPCs also market their relationships with employers to potential students (see Hentschke 2010). The relationships between FPCs and local industry may suggest tighter relationships between students and local employers.

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[6] Only one-third of employees at FPCs are full-time and only 25% of employees at publicly-traded FPCs are full-time ("American Academic").

While not directly related to the FPCs' business model, there are other important nuances with regards to FPCs that distinguish them from CCs. First, FPCs choose locations that are highly convenient for their students. Chung (2008) finds that in larger cities, FPCs typically have multiple facilities for students which decreases travel costs. Furthermore, FPCs generally lease space rather than own and maintain a campus as it allows for expansion and reduction of space as program demands change (Bennett et al. 2010). Second, FPCs devote many resources towards student support with particular emphasis on counseling and career placement (Bailey 2006). FPCs often assign students a single advisor and require students to meet with their advisor each term. This is different than the model at many CCs where students must initiate a meeting with a counselor if they need or want assistance. This disparity in student services is documented by Deil-Amen and Rosenbaum (2003) who find that FPCs have one counselor for every 260 students, while CCs have one counselor for every 800 students. Third, FPCs have pioneered the widespread use of the Internet for its programs. FPCs have expanded more rapidly online with 42% market share of the online higher education market (Bennett et al. 2010). The online format permits FPCs to expand enrollment easily. FPCs focus their resources on developing high quality content and then distribute it with low per student costs (Bennett et al. 2010).

In summary, FPCs maximize profits by providing fields of study that students are most willing to pay. Cowen and Papenfuss (2010) describe this approach as pursuing excellence in areas most "valued by students in dollar terms." This provides the

motivation for FPCs to offer programs that other higher education institutions cannot easily provide. For ease of the reader, the key FPC traits are summarized in Table 3.

2.3. Community Colleges

CCs have been the predominant supplier of traditional two-year Associate's degrees. Each of the fifty states has at least one publicly supported community college, the largest of all suppliers of two-year Associate's degrees (IPEDS). In this section, the mission and funding of CCs are briefly discussed, followed by an overview on the characteristics of CCs pertinent to their ability to respond to changes in the labor market, such as their mission statements, management structures, and fixed costs.

CCs are primarily funded through government support with 54% of revenue in 2008 being provided by state and local sources ("Community College Fact Sheet" 2012). Given this heavy reliance on local and state funds, CCs are sensitive to the business cycle when local and state revenues decrease. This procyclical business cycle effect is exacerbated on CCs given that the demand for higher education is counter-cyclical (Betts and McFarland 1995). That is, revenue tends to fall during economic downturns and enrollment tends to increase. The lack of funds may cause CCs to reduce instructor numbers or cap program enrollment as tuition costs are insufficient to cover the marginal costs of offering additional programs and courses precisely when the demand for these programs is greatest.

Due to direct government support, the missions of CCs are substantially different than FPCs. CCs have wide-reaching missions that seek to benefit its local population. For

example, a survey of CCs' mission statements indicated that typical CCs' objectives are to aid in *developmental education*, *lifelong learning*, *university transfer*, *cultural enrichment*, *civic, personal, and cultural growth*, *community service*, *community prosperity*, and *community vitality*.[7] These missions suggest that CCs have expansive goals that seek to potentially benefit a diverse student population, and not just those students who are focused on specific career training. Due to their reliance on state and local taxpayers, it is possible that these missions are the result of voters' preferences that influence their budgets.

CCs maintain a traditional management structure with faculty governance. Bailey (2006) describes CC faculties as having "a collegiate view of their institutions and the tradition of shared governance." Decentralized committees of faculty members make important organizational decisions such as curriculum development, peer evaluation, hiring, marketing, and compensation at many CCs (Hentschke 2010). Similar to traditional non-profit universities, many CC faculty lines are full-time tenured positions. According to Kinser (2007), 17.5% of CC faculty is tenured and 42% of new full-time hires are on a tenure track. In addition, 43% of CC faculty members are full-time employees ("American Academic" 2009). A bottom-up management with faculty-lead

[7] These mission statement excerpts are taken from various community colleges, including City College of San Francisco (CA), Cleveland State Community College (TN), Cloud County Community College, (KS), Collin College (TX), Cuyahoga Community College (OH), Flathead Valley Community College (MT), Manchester Community College (CT), Nassau Community College (NY), Piedmont Virginia Community College (VA), State College of Florida Manatee-Sarasota (FL).

committees and granting tenure to faculty impose constraints on CCs when attempting to adjust faculty composition rapidly.[8]

CCs have high fixed costs due to the establishment of large campuses. CC campuses contain multiple facilities that typically provide most classes offered by the CCs (Hentschke 2010). In addition, due to the requirement of large tracks of land to create these campuses, it is typically infeasible to locate new colleges in urban areas easily accessible to their students. Furthermore, the establishment of campuses also causes facility expansion to be slower than it could be if CCs rented commercial space offsite.

The literature has also studied student services at CCs. First, CCs typically require students to maintain their own academic plan as opposed to requiring students to meet with an academic advisor. Students choose their classes and must ensure that they are meeting degree requirements (Deil-Amen and Rosenbaum 2003). This can lead to students making errors during the registration process such as taking classes that are not required for their degree. Deil-Amen and Rosenbaum (2003) find that 45% of CC students had taken courses that they subsequently identified as non-applicable to their degree or program, compared to 16% of students at FPCs. Second, CCs often do not integrate career services into curriculum or program development. CCs have career service offices that are independent from its faculty and work with the human resource departments of employers. Moreover, CCs typically do not have full-time staff members that are involved with job placement (Deil-Amen and Rosenbaum 2003).

[8] For example, Goldrick-Rab, Harris, Mazzeo, and Kienzl (2009) argue that there is a shortage of faculty in key growth areas such as health and technology.

In summary, CCs provide local education services for a diverse set of learners. Many of their students receive a liberal arts education that can be transferred to other institutions that offer programs leading to a four-year Bachelor's degree with minimal loss of credits. In addition, CCs have faculty governance and tenured faculty that may hamper administrators' ability to adjust programs and course offerings. CCs also establish large campuses with multiple facilities that support all of their programs. The CC traits are also summarized in Table 3.

Table 3: Comparison of For-profit Colleges and Community Colleges

	For-profit Colleges	Community Colleges	Source
Annual tuition	$14,600	$2,700	Knapp et al. (2011)
Portion of all Associate's Degrees awarded (2011)	21%	74%	Digest of Education Statistics Table 291 (2011)
Tenured faculty	3.0%	17.5%	"American Academic" (2009)
Full-time faculty	25.0%	43.0%	"American Academic" (2009)
Revenue sources	0% directly from government sources; 88% from tuition and student fees	70% directly from government sources with 54% from local and state government	Hentschke (2010), AACC12
Growth in degrees awarded since 1995	9.5%	2.9%	Digest of Education Statistics Table 291 (2011)
Growth in enrollment since 1995	8.2%	2.1%	Digest of Education Statistics Table 199.5 (2011)
Most popular programs of study (with percentage of all programs)	Heath (31%) Business (25%) Computer and information sciences (9%)	Liberal Arts (42%) Health (18%) Busines (11%)	Digest of Education Statistics Table 292 (2012)
Career placement	Employee Advisory Boards; faculty from industry;	Career services not integrated with faculty; may or may not have full-time position for job placement	Hentschke (2010), Deil-Amen and Rosenbaum (2003)
Campus	Multiple locations, leased commerical space	Large campuses housing multiple facilitiies	Hentschke (2010)

CHAPTER 3

DATA AND EMPIRICAL SPECIFICATION

This thesis investigates how sector specific changes to recent employment conditions influence FPC and CC enrollments within majors leading to employment in those sectors. The characteristics discussed in the preceding section suggest that FPCs may be more responsive to labor markets than CCs. This chapter provides a description of the data and empirical specification used to conduct this analysis. First, a description of the data sources is provided. Second, the mapping of Associate's degrees and occupations into thirteen distinct sectors is provided. Third, the aggregation of the student-level data into a panel is discussed, including the calculation of the enrollment rates for each sector (the dependent variable). Fourth, the construction of sector-specific employment condition variables is provided. Lastly, the empirical specification is described along with a discussion of independent and control variables.

3.1 Data Sources

The empirical analysis presented in this thesis uses student-level data along with sector employment condition data. In this subsection these data sources are described. The primary data source used is the restricted-access versions of the National Postsecondary Student Aid Study (NPSAS) conducted by the National Center for Education Statistics. The NPSAS is collected every four years and provides a random sample of students enrolled in Title IV eligible postsecondary institutions throughout the

United States.[9] Title IV eligible institutions are those that meet eligibility requirements such that their students are permitted to use federal student financial aid to cover the costs of their attendance.[10] The data include demographic, background, and financial information for students and their families. In addition, it is the largest cross-sectional data source of this type available. Furthermore, the NPSAS samples all students enrolled in postsecondary schools, and not just students entering the higher education market directly from high school or first-time enrollees at a postsecondary school. This is an important consideration for this study due the large number of non-traditional students attending CCs and FPCs that may not be included in other data sources.

This study uses data collected from three rounds of the NPSAS: 2000, 2004, and 2008 (NPSAS:2000, NPSAS:04, NPSAS:08, respectively). Each round of the NPSAS is a representative sample of students at all Title IV eligible institutions, including public universities, community colleges, private non-profit schools, and private for-profit schools. This study limits the student sample to students pursuing an Associate's degree at FPCs and CCs. While some public 4-year degree universities and non-profit private schools offer two-year degrees, they are not examined in this study. As discussed in the previous section detailing the Associate's degree market, the availability of these programs at four-year public institutions and non-profit private higher education

[9] Prior to 2000, the NPSAS data did not keep track of Title IV institution status.

[10] Data on Title IV ineligible for-profit institutions are mostly unavailable. Title IV ineligible institutions are not fully represented in any of the national datasets and as a result little is known about them. Virtually all of these institutions are certificate granting schools that do not offer Associate's degrees or higher (Deming et al. 2012). As such, even though FPCs grant a large percentage of certificates, this thesis focuses on Associate's degrees and abstracts from enrollment in programs leading to a certificate.

institutions are limited and may not be a feasible choice for many students. In addition, preliminary descriptive statistics indicated that students attending four-year public institutions are considerably dissimilar to students attending CCs and FPCs. As displayed in Table 4, the sample includes 53,790 students enrolled during the sample period, with 46,400 enrolled at CCs and 7,390 enrolled at FPCs.[11] Furthermore, Table 4 provides a breakdown of the number of students sampled in each of the three years used in this analysis.

Table 4: Student Observations[a]

	NPSAS:2000	NPSAS:04	NPSAS:08	All years
Community College Students	6,910	15,580	23,920	46,400
For-profit College Students	1,160	2,430	3,800	7,390
Total Students	8,070	18,010	27,720	53,790

[a] Observations are rounded to the nearest 10s place as per restriced-use data license.

The labor market condition measures are provided by the Occupational Employment Statistics (OES) compiled by the Bureau of Labor Statistics (BLS). The OES estimates the number of people employed in designated occupations and the mean state-level annual hour wage for each state. This analysis uses OES data from 1997 through 2008.[12]

[11] Student observations are rounded to the nearest 10s place as per restricted-use data license.

[12] Prior to 1999, the BLS classified employment based on individual jobs rather than occupations. Data from 1997 and 1998 have been converted to the current classifications for comparison, but pre-1997 employment data does not map one-to-one with current

Lastly, additional data sources are used to account for other influences on students' enrollment decisions. These include the local area unemployment rates provided by the BLS Local Area Unemployment Statistics (LAUS), real per capita income provided by the Bureau of Economic Analysis (BEA), and community college accessibility data from the Integrated Postsecondary Education Data System (IPEDS). A full list of variables with descriptions and their sources are provided in Table 5.

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data (see http://www.bls.gov/oes/1999/g_itsoc.pdf for further details). As such, this analysis is limited to post-1997 OES data and the NPSAS:2000 is the earliest round permitted. In addition, in earlier versions of the NPSAS, it is not clear how to distinguish between Title IV eligible and ineligible institutions. The NPSAS:2000 "is the first to restrict institutional sampling to Title IV participating institutions" (http://nces.ed.gov/pubs2002/2002152.pdf). This is important as FPC students' enrollment decision is constrained by their ability to obtain federal student financial aid.

Table 5: Description of Variables

Variable	Description	Source
Dependent Variable		
Percent enrolled	Ratio of students enrolled in a sector and school type to all students enrolled in a state for each year.	NPSAS
Employment Outlook Variables		
Employment Growth	Average rate of growth of employment during the previous three years in occupations requiring an Associate's Degree.	BLS OES
Wage level	Average wage during the previous three years in occupations requiring an Associate's Degree. Adjusted to 2008 dollars.	BLS OES
Wage growth	Average rate of growth in real wages during the previous three years in occupations requiring an Associate's Degree.	BLS OES
Control Variables		
State unemployment rate	The 3-year average unemployment rate.	BLS LAUS
Community college access	The number of community colleges in each state per million residents.	IPEDS and Census Bureau
State per capita income	The 3-year average per capita income. Adjusted to 2008 dollars.	BEA
Expects Bachelor's degree	Equals 1 if student responded that their highest level of education expected is a Bachelor's degree or above.	NPSAS
Public high school	Equals 1 if student attended a public high school	NPSAS
Dependent	Equals 1 if student is a dependent	NPSAS
Gender	Equals 1 if student is male	NPSAS
Black	Equals 1 if student is black or African American	NPSAS
Hispanic	Equals 1 if student is of Hispanic or Latino origin	NPSAS
Full-time student	Equals 1 if student is enrolled mostly full-time during the academic year of the NPSAS.	NPSAS
Parent college graduate	Equals 1 if student has at least one parent who earned a Bachelor's degree or higher	NPSAS
Parent high school dropout	Equals 1 if student has at least one parent who did not graduate from high school	NPSAS
Job prior	Equals 1 if student had a job prior to enrolling	NPSAS
Single parent	Equals 1 if student has dependents and is not married	NPSAS
Age: 21 and under	Equals 1 if the student is 21 years old or younger	NPSAS
Age: 22 to 40	Equals 1 if student is between the ages of 22 and 40	NPSAS

3.2 Sector Definitions

The analysis requires that college majors coded in the NPSAS data and occupations coded in the OES data to be separately mapped into each other. These mappings are critical to assure that a type I error is not committed where no correlation is observed due to a poor mapping between college majors and occupations. The mapping of occupation codes onto the 13 distinct sectors is first discussed, followed by the mapping of the majors.

OES occupations are classified based on a 6-digit Standard Occupational Classification (SOC) code. The first two digits of each SOC code signify an industry. There are a total of 22 SOC industries. First, many of these industries are unrelated and are mapped one-to-one into a sector. For example, SOC code 23: legal occupations is mapped into a law sector and SOC code 25: education, training, and library occupations is mapped into an education sector. However, a few SOC industries are closely related and it is quite possible that a student enrolled in a particular major may obtain employment into one of several occupations located in different industries. In the case that the OES industries are similar, they are combined to make one sector. For example, SOC code 11: management occupations, SOC code 13: business and financial operations

occupations, SOC code 41: sales and related occupations, and SOC code 43: office and administrative support occupations are combined into a business sector.[13]

Only occupations that require an Associate's degree are included in each sector. This is done to ensure that occupations that are not attainable with an Associate's degree or require less education are not influencing the estimation. To accomplish this, the BLS' 2012-13 Occupational Outlook Handbook Table 1.11 is used to exclude these occupations by assigning an educational attainment threshold. Occupations are excluded if over half those employed in the occupation have a Bachelor's degree or higher. Similarly, occupations where more than half of those employed have a high school diploma or less education are excluded.[14] Applying these rules excludes occupations with high educational attainment requirements, e.g., doctors, lawyers, and teachers, and also excludes occupations with low educational attainment requirements, e.g., shampooers and garbage collectors. The occupations remaining are those that a graduate with an Associate's degree is likely qualified to pursue, such as nurses, recreational therapists, paralegals, and teachers' assistants. Table 6 below provides the full mapping of occupations into the 13 sectors in detail.

A caveat that should be mentioned is that the liberal arts sector is distinct from the other twelve sectors. Because a liberal arts curriculum does not pair directly with any

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[13] Since occupations in social sciences and physical sciences (SOC code 19: life, physical, and social science occupations) require different types of skills, these occupations are classified into two separate sectors: occupations in the physical and life sciences are mapped into the physical science sector, while occupations in the social sciences are mapped into the social science sector using the three-digit SOC codes.

[14] The BLS provides a breakdown of educational attainment by SOC occupation codes.

industry, the occupations from multiple industries where a liberal arts graduate may find employment are included. The liberal arts sector is constructed by mapping occupations from industries aligned to other sectors. This is distinct from the other twelve sectors where each industry is only mapped to one sector. The liberal arts sector maps occupations from the social science, community, law, education, and services sectors.

Table 6: Mapping of College Majors and OES Industries to Sectors

Sector	College Majors	OES Industries
Arts	Communications Crafts, Folk Art, Artisanry Design Film Arts Journalism Music Speech/Drama Visual, Performing, Fine Arts	27: Arts, design, entertainment, sports, and media occupations
Business	Accounting Business Finance Management Marketing Secretarial	11: Management occupations 13: Business and financial operations occupations 41: Sales and related occupations 43: Office and administrative support occupations
Community	City Planning Criminology History International Relations and Affairs Political Science and Government Public Administration Security and Protective Services Social Work Vocational: Child Care/Guidance	21: Community and social services occupations 33: Protective service occupations
Computer and Information Science	Computer and Information Sciences Computer Programming Data Processing Technology Mathematics and Statistics	15: Computer and mathematical occupations
Education	Early Childhood Education Elementary Education Secondary Education Special Education Physical Education Other Education Library Science	25: Education, training, and library occupations
Note: Occupations with more than 50% of workers having a Bachelor's degree or higher are excluded. Occupations with than 50% of workers having a high school diploma or less are excluded.		

Table 6: Mapping of College Majors and OES Industries to Sectors (Continued)

Sector	College Majors	OES Industries
Engineering	Architecture and related services Electrical Engineering Chemical Engineering Civil Engineering Mechanical Engineering Engineering Technology	17: Architecture and engineering occupations
Health	Allied Health Dental/Medical Technician Health Professions and Related Sciences Nursing Veterinary Medicine	29: Healthcare practitioners and technical occupations 31: Healthcare support occupations
Law	Legal Professions and Studies Para-legal (Pre-law)	23: Legal occupations
Production	Agriculture and Related Sciences Construction Trades Electronics Forestry Industrial Arts Mechanic and Repair Technologies Precision Production Textiles Transportation and Materials Moving	45: Farming, fishing, forestry occupations, 47: Construction and extraction occupations 49: Installation, maintenance, and repair occupations 51: Production occupations 53: Transportation and material moving occupations
Services	Basic/Personal Skills Consumer Services Mortuary Services Personal and Culinary Services	35: Food preparation and serving related occupations 39: Personal care and service occupations
Physical Science	Biological and Biomedical Sciences Environmental Studies Natural Resources and Conservation Natural Sciences Physical Sciences Science Technologies	19: Life, physical, and social science occupations* Includes professions
Social Science	Anthropology/Archaeology Economics Psychology Social Sciences Sociology	19: Life, physical, and social science occupations**
Liberal Arts	Area, ethnic, and gender studies English Language and Literature Family, Consumer, and Human Sciences Foreign Languages and Literatures Geography Leisure Studies Liberal Arts, Sciences, and Humanities Parks, Recreation, and Fitness Studies Philosophy and Religious Studies	19: Life, physical, and social science occupations** 21: Community and social services occupations 23: Legal occupations 25: Education, training, and library occupations 33: Protective service occupations 35: Food preparation and serving related occupations 39: Personal care and service occupations

Note: Occupations with more than 50% of workers having a Bachelor's degree or higher are excluded. Occupations with than 50% of workers having a high school diploma or less are excluded.
* Includes occupations with SOC code 19-1 Life Scientists, 19-2 Physical Scientists, and 19-4 Life, Physical and Social Science Technicians except 19-4061 Social Science Research Assistants.
** Includes occupations with SOC code 19-3 Social Scientists and Related Workers and 19-4061 Social Science Research Assistants.

Each college major is mapped into 13 sectors. The methodology for mapping the majors into sectors involves pairing majors to occupations.[15] Though no mapping of Associate's degree majors to occupations is available, a crosswalk provided by the National Crosswalk Service Center maps 'fields of study' using Classification Instructional Programs (CIP) codes to SOC occupations is available. The CIP codes do not directly align one-to-one with SOCs occupations, rather CIP codes match one to many SOC codes. Given that the sectors are aggregates of industries at the two-digit level, mapping students' majors to one of 13 sectors is straightforward. For example, students with computer and information science, data processing technology, mathematics, and statistics majors are mapped into the computer and information science sector, which includes occupations from SOC code 15: computer and mathematical occupations. Similarly, as library occupations are included in the education sector, the library science major is also aligned to this sector.

3.3 Aggregation of Student-level Data and the Construction of Enrollment Rates

To capture enrollment growth, it is important to maintain between-sector and between-school type variation. This implies that a simple limited dependent variable

[15] The number of majors in each round of the NPSAS is different; the NPSAS:2000 has one hundred major categories, the NPSAS:04 has 47 categories, and the NPSAS:08 has 46 categories. However, the earliest round of the NPSAS having more majors does not reflect distinctly different majors, rather refinements. For example, NPSAS: 2000 lists Business: Finance, Business: Management/Business Administration, Business: Marketing/Distribution, etc. as separate entries where NPSAS:04 and NPSAS:08 list Business, management, and marketing as one major. Similarly, NPSAS:2000 includes five majors for different types of education majors whereas NPSAS:04 and NPSAS:08 include just one education major.

specification such as a logit or probit with a binary dependent variable of whether the student enrolled in a CC or FPC are insufficient as they would only capture the variation in enrollment between school types and not between-sector. Thus, to study enrollment growth in various majors, the student-level data must be aggregated up to the sector-school type level, capturing both sources of variation. To observe the variation by sector-school type, enrollment rates are constructed that consist of the ratio of total enrollment in a particular sector and school type in each state and year to total enrollment in each state and year. These rates are represented as

$$Y_{ijst} = \frac{\text{Enrollment}_{ijst}}{\text{Enrollment}_{st}} \times 100$$

where i = {CC, FPC} represents the school type (community college or for-profit college), j = {1, 2,…, 13} corresponds to the thirteen sectors, s is the state of residence for each student, and t = {2000, 2004, 2008} corresponding to the NPSAS round. The enrollment rate indicates the percentage of students enrolled in a certain sector for either CCs or FPCs, in a specific state, during a specific time period. For example, the enrollment rate of the FPC business sector in Georgia during the 2003-04 school year is equal to the number of students enrolled in the business sector at FPCs in Georgia during the 2003-04 school year divided by the total number of students enrolled at FPCs and CCs in Georgia during 2003-04 school year. By construction, for each state and year, the sum across all sectors for the two school types equals 100. That is,

$$\sum_{j=1}^{13} Y_{CCjst} + \sum_{j=1}^{13} Y_{FPCjst} = 100 .$$

This construct permits both variation in school type and sector within the same state and year. That is, both FPC and CC enrollments in the same sector can rise (or fall) in the same time period. Thus, if better sector-specific recent employment conditions leads to enrollment growth in majors within these sectors, then CCs and FPCs enrollment rates can both rise. This is important as the analysis requires between school type and sector variation to be unconstrained. Table 7 provides average enrollment rates in sector at FPCs and CCs. In general, CCs have higher enrollment rates than FPCs. The largest FPC enrollment rates are clustered in just a few sectors while multiple sectors at community colleges have substantial enrollments.

It should also be noted that students are grouped based on the students' state of residence rather than the location of the institution. This is due to the difficulty in determining the location the student attends school. First, FPCs frequently have multiple campuses across states that may be classified as the main campus in the NPSAS data. Second, the expansion of fully online programs allows students to attend a school that is not in their home state. CC students typically attend in their home state. This is partly due to convenience, but also because in-state tuition is lower than non-resident rates. It is also anticipated that local economic conditions where the student resides influence students' enrollment decisions rather than the local conditions of the headquarters of the institute they attend.

Table 7: Student Enrollment by School Type and Year [a]

Sector	For-Profit College			Community College		
	NPSAS:2000	NPSAS:04	NPSAS:08	NPSAS:2000	NPSAS:04	NPSAS:08
Arts	1.81	2.07	0.29	5.88	2.85	3.34
Business	0.79	2.47	4.57	15.87	16.52	14.40
Community	0.23	0.32	0.72	6.30	5.62	4.55
Computer and Information Science	0.92	2.17	0.78	9.48	5.49	3.84
Education	0.02	0.09	0.17	6.27	9.84	5.19
Engineering	0.35	1.16	0.46	3.46	5.05	4.60
Health	3.20	2.59	3.03	14.74	19.62	17.89
Law	0.09	0.70	0.29	1.66	1.11	0.98
Production	0.86	0.64	0.04	6.26	3.75	3.78
Services	0.25	0.51	0.56	0.53	0.94	0.83
Physical Science	0.04	0.04	0.01	4.23	1.82	1.78
Social Science	0.00	0.02	0.06	1.86	2.74	1.46
Liberal Arts	0.32	0.06	0.10	15.27	11.78	26.27
Total	8.88	12.85	11.08	91.82	87.15	88.92

[a] The sum across school types and sectors for each year equals 100.

Aggregating the student-level NPSAS data creates a panel dataset consisting of students grouped by school type, major, state of residence, and the round of the NPSAS. The resulting aggregation constructs a panel with 2,329 observations (1,601 CCs observations and 728 from FPCs observations). Table 8 provides a breakdown of observations by round of the NPSAS. This panel is unbalanced as each round of the NPSAS does not always have students enrolled in each combination of i, j, and s.[16] Since FPCs have lower enrollment percentages and fewer program offerings than CCs, there are fewer observations at FPCs. In total, 51% of the panel is complete.

Table 8: Sector-School Type Observations by Year

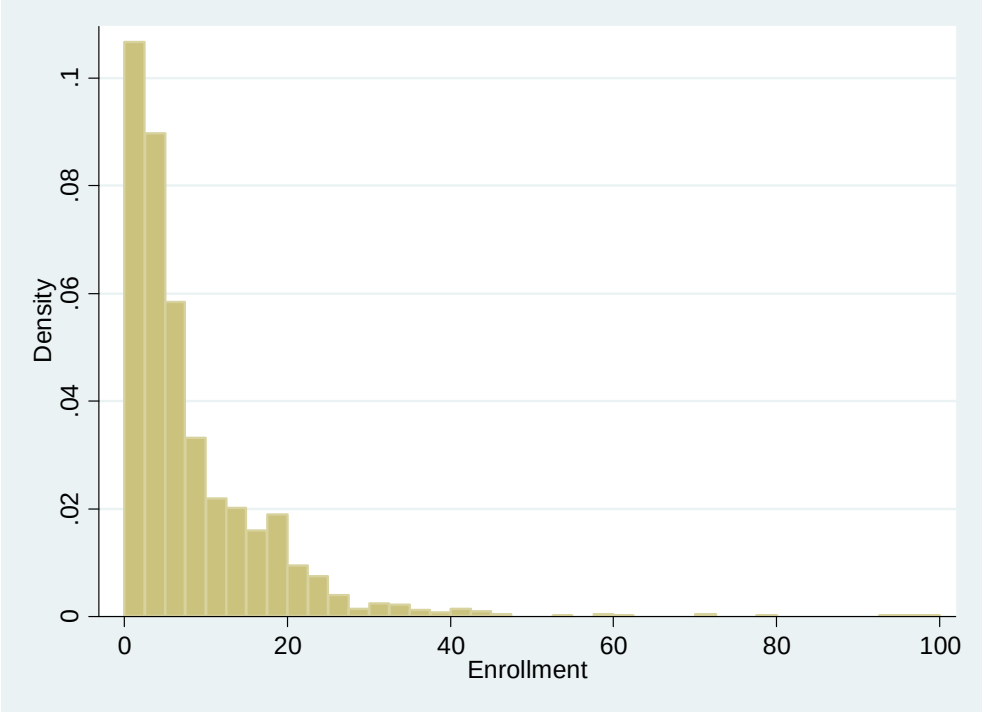
School Type	NPSAS:2000	NPSAS:04	NPSAS:08	All years
Community Colleges	486	535	580	1,601
For-profit Colleges	174	261	293	728
Total Observations	660	796	873	2,329

The enrollment rates are not normally distributed with most observations being clustered around the left tail of the distribution. Figure 1a and Figure 1b show histograms of the enrollment rates for CCs and FPCs, respectively. The majority of observations for both school types are less than 5% of the total enrollment, though all are greater than zero by construction. Nearly 80% of the enrollment rates at FPCs are less than 2.5% of the total enrollment and nearly half the enrollment rates at CCs are less than 5% of total

[16] While it is possible to construct a balanced panel for the enrollment rates simply by inputting 0 values for all cells that do not have a CC or FPC student enrolled in a sector in a specific state during a round of the NPSAS, this strategy is infeasible since the corresponding student characteristics that are used during the empirical analysis do not exist.

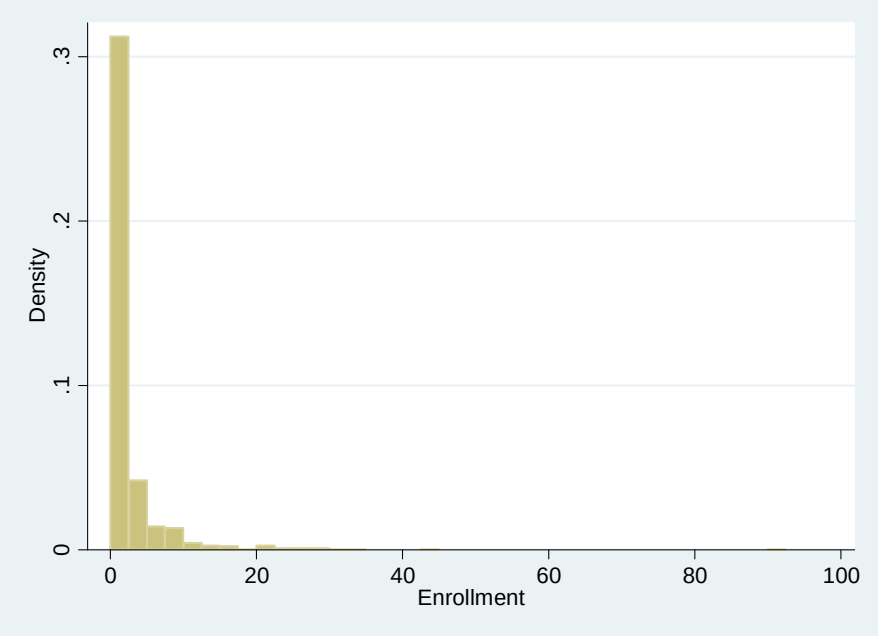
enrollment. Due to the clustering of enrollment rates at low levels and the long tails observed extending to higher values, the distributions are unsuitable for Ordinary Least Squares (OLS) regression.

Figure 1a: Histogram of the Distribution of Enrollment at CCs



Note: Enrollment rate is per sector

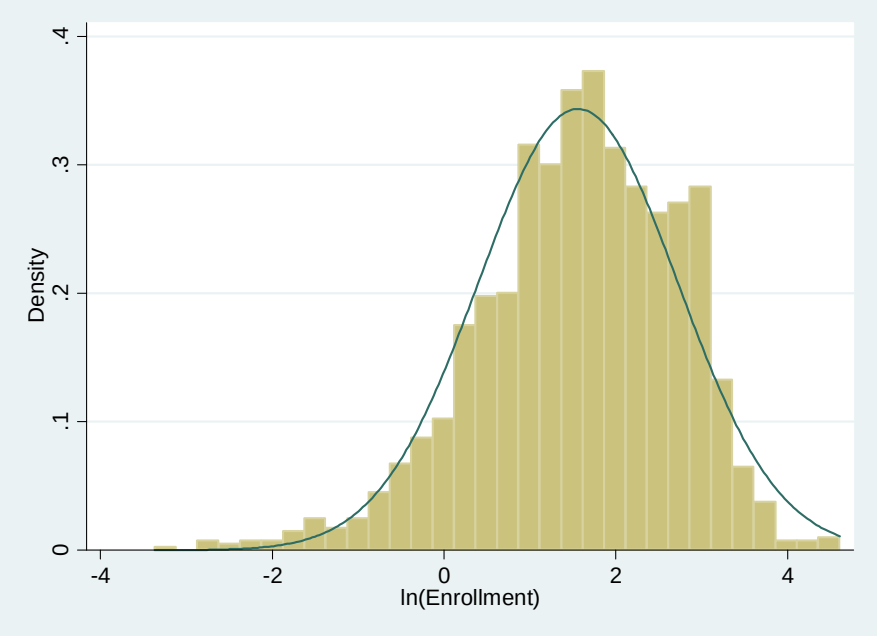
Figure 1b: Histogram of the Distribution of Enrollment at FPCs



Note: Enrollment rate is per sector

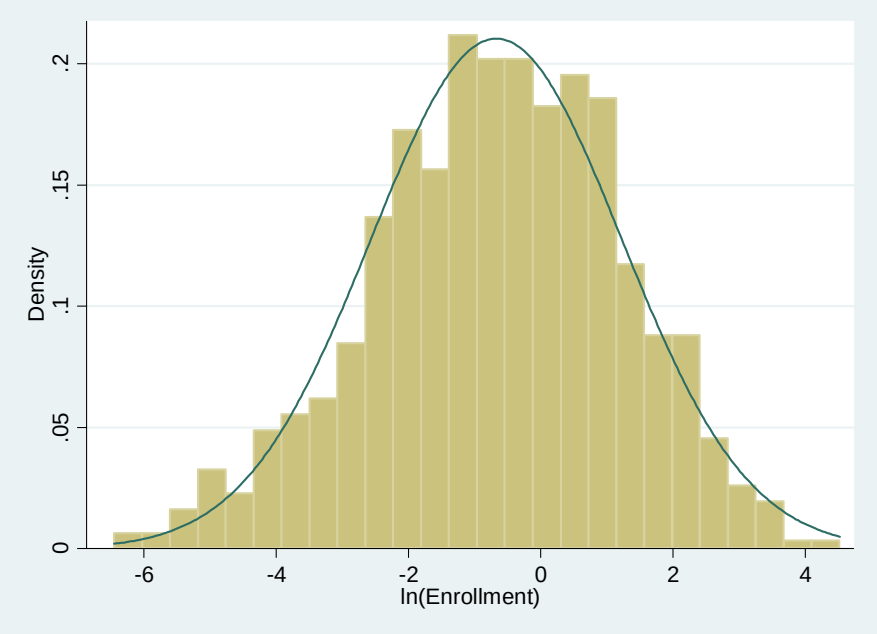
To address these non-normal distributions, the enrollment rates are logged. Figure 2a and 2b show histograms with the resulting distribution of the transformed enrollment rates. These histograms are shown with a normal distribution laid over top. By taking the log of the enrollment rates, the long tails that existed previously are dampened, and the distribution approximates a normal distribution. The kurtosis of the CC enrollment rates and FPC enrollment rates prior to the transformation are 22.9 and 103.1, respectively. After logging these enrollment rates, the kurtosis for CCs and FPCs are 3.6 and 2.8, respectively. These values are closer to 3, which represents normal distribution dispersion (Greene 2008). This transformation yields enrollment rates that are better suited for OLS regression.

Figure 2a: Histogram of the Distribution of Logged Enrollment at CCs



Note: Enrollment rate is per sector

Figure 2b: Histogram of the Distribution of Logged Enrollment Ratios at FPCs



Note: Enrollment rate is per sector

3.4 Employment Condition Variables

The analysis assumes three sector-specific measures of structural change to the labor market: employment growth, real wage level, and real wage growth.[17] This section describes these variables in detail.

The OES data contain annual information on the number of individuals employed and the mean wage for each occupation at the state-level. For each year of OES data from 1997- 2008, occupations are aggregated into the sectors using the mapping described previously to construct the total number of individuals employed and the average mean wage (weighted by employment) for each sector. The annual employment growth rate is then calculated as the growth rate in employment to the previous year. Similarly, the annual real wage growth is calculated as the growth rate of real mean wages from the previous year.[18]

Employment condition measures are then constructed for each of the three employment statistics. This is done by for each round of the NPSAS by averaging current and two previous years' employment statistics. For example, the employment growth in

[17] Wages are adjusted for inflation to 2008 dollars using the GDP deflator.

[18] Because the BLS use a different occupation classification system in 1997 and 1998 than 1999 to 2008, the 1997-98 data need to be converted to the SOC system to ensure the same occupations are being mapped into the same sectors. The National Crosswalk Service Center provides a crosswalk that ensures consistent matches for most sectors. However, the Arts and Services sectors experience large movements in total employment between 1998 and 1999 under the different classification systems. For these sectors, the values for 1999 are omitted and the values for 1998 and 2000 are averaged to calculate the new job growth rate for 1999. Additionally, there is a large shift in the number of jobs for social science and physical science occupations in 2004 in many states. To reduce bias, the 2004 data have been replaced by the averages of 2003 and 2005 data.

the business sector in Georgia during the 1999-2000 academic year is defined as the average employment growth rate during 1997-98, 1998-99, and 1999-2000. These forecasts are also constructed at the national level. Thus, each sector-state combination has a specific employment growth, wage level, and wage growth for each round of the NPSAS and each sector has a national-level employment growth, wage level, and wage growth for each round of NPSAS. By averaging across multiple years, the employment variables reflect how sector-specific employment conditions change during the period when students would have chosen to enroll in their school.[19]

The recent employment conditions are then merged to the panel dataset by sector, state, and year for the state-level employment condition variables and by sector and year for the national-level employment condition variables. Thus, each panel observation has state-level and national-level recent employment condition variables. Given this construction, observations from both CCs and FPCs in the same sector, state, and year are assigned the same labor market condition variable values.

Table 9 below provides summary statistics for the sector-specific employment condition variables. Employment growth varies substantially across sectors, from a low of -8.02% (Education) to a high of 7.76% (Social science). These values also vary across the three rounds of the NPSAS. Mean hourly wages also vary, from a low of $7.24 per

[19] A check for data anomalies is conducted to ensure unrealistically large changes in the three measures of employment conditions are not included. To identify data anomalies, a Z-test is conducted to identify values that are outside of 2.5 standard deviations away from the mean. Individual values that are outside this interval are replaced by the mean of the employment condition measure from the remaining years for that state and sector. In all, 424 growth rates out of 7,293, or approximately 6%, are outside this interval and have been replaced. In no case are multiple growth rates for the same state and sector replaced.

hour (Services) to a high of $19 per hour (Computer and Information Science). Each sector has positive wage growth between 2.05% (Health) and 2.65% (Business). For all three indicators, variation exists between sectors and over time, permitting an analysis on the responsiveness of enrollment at CCs and FPCs.

Table 9: Summary Statistics for Employment Outlook by Sector

	Employment Growth		Wage Level [a]		Wage Growth	
Sector	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Arts	5.25	7.7	14.08	2.3	2.23	0.48
Business	1.57	1.6	11.18	1.6	2.65	0.52
Community	2.78	4.5	11.30	1.7	2.52	0.53
Computer and Information Science	6.35	5.8	19.00	2.5	2.21	0.48
Education	-8.02	12.8	9.41	1.3	2.22	0.48
Engineering	1.26	7.6	15.05	1.7	2.26	0.47
Health	2.75	1.9	11.99	1.6	2.05	0.69
Law	5.58	10.0	13.10	1.9	2.27	0.48
Production	0.77	1.9	10.92	1.4	2.32	0.45
Services	3.83	3.4	7.24	0.9	2.39	0.50
Physical Science	6.01	25.0	14.03	1.4	2.22	0.48
Social Science	7.76	13.4	18.06	2.9	2.25	0.45
Liberal Arts	1.32	2.8	9.53	1.5	2.42	0.74

[a] Wage level is in 2008 dollars per hour.

3.5 Empirical Specification

Prior to stating the empirical specification, motivating figures on the relationship between enrollment and employment conditions are provided. Figures 3, 4, and 5, shown below, display sector employment growth for occupations attainable with an Associate's degree along with the growth in Associate's degrees granted at FPCs and CCs in select sectors from 1998 to 2008.[20] As yearly data is unavailable on the enrollment growth in these sectors, the growth of degrees granted is used as a proxy. These figures show that for these sectors, FPC enrollment rates appear to respond positively to employment growth, while CC enrollment appears to be unresponsive. Figure 3 displays the business sector. The figure indicates that employment growth increases significantly during 2000 and 2004 accompanied by enrollment at FPCs increasing markedly during approximately the same time period, while CC enrollment remains mostly flat.

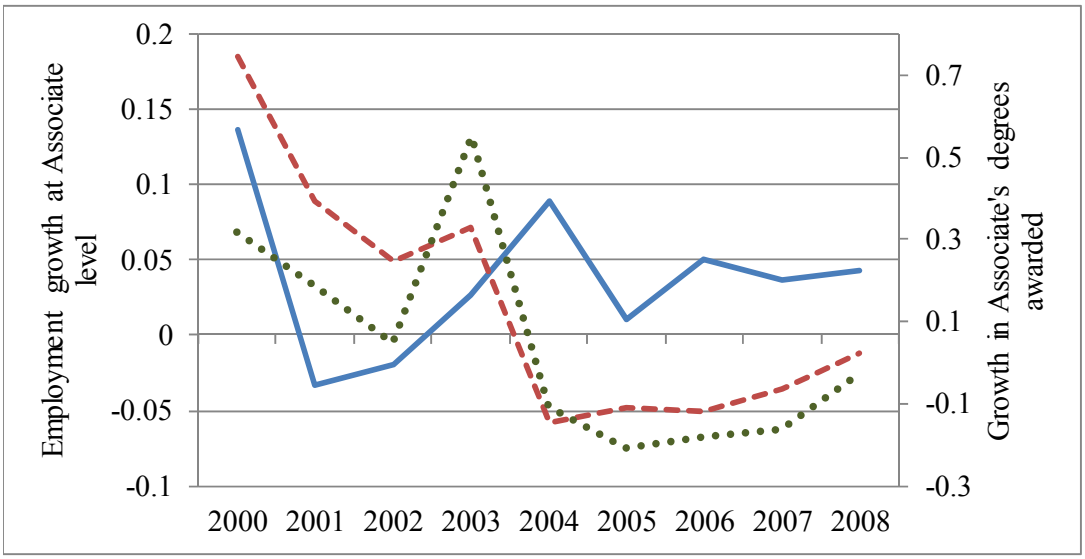
[20] National-level statistics on degrees granted are from the 2000-2009 editions of the Digest of Education Statistics, including Table 261 (2000), Table 261 (2001), Table 257 (2002), Table 257(2003), Table 255 (2004), Table 254 (2005), Table 260 (2006), Table 267 (2007), Table 277 (2008), Table 277 (2009).

Figure 3: Employment and Associate's Degree Growth in Business Sector

Source: Digest of Education Statistics, 2000-2009 for growth in degrees awarded and BLS OES, 1999-2008 for employment growth

Similarly, Figure 4 displays the computer and information sector. As displayed in the figure, employment and degrees at FPCs grew rapidly around 2000, followed by substantial declines in both employment and degrees at FPCs. The CC enrollment rate also grew during the boom years, but not as rapidly as FPCs.

Figure 4: Employment and Associate's Degree Growth in Computer and Information Science Sector



Source: Digest of Education Statistics, 2000-2009 for growth in degrees awarded and BLS OES, 1999-2008 for employment growth

Finally, Figure 5 shows the health sector. Employment growth was large around 2004 and the number of FPC degrees awarded grew rapidly around that time. CC enrollment shows only a slight response during this high growth period.

Figure 5: Employment and Associate's Degree Growth in Health Sector

Source: Digest of Education Statistics, 2000-2009 for growth in degrees awarded and BLS OES, 1999-2008 for employment growth

These figures suggest a relationship between sector employment growth and FPC enrollment rates. This thesis attempts to more accurately understand this relationship. Further, these figures do not capture the local enrollment response due to changes in local employment, only national trends.

The main empirical analysis in this thesis investigates how recent state-level sector-specific employment conditions influence enrollment in majors within those sectors at FPCs and CCs. The state-level panel permits estimation of how structural changes in labor markets impact the percentage of students enrolled in those sectors' majors at FPCs and CCs. Given that there are two distinct variations (between school

types and sectors) for each state and year, adequate controls must be included so as only the correlation between employment conditions and enrollment is identified. The baseline empirical specification is

$$\ln Y_{ijst} = \beta_0 + \beta_1 \mathrm{I}_i + \beta_2 \mathrm{O}_{jst} + \beta_3 \left(\mathrm{I}_i * \mathrm{O}_{jst} \right) + X_{ijst} \beta_4 + \delta_{is} + \delta_j + \mathrm{Trend}_{ist} + \varepsilon_{ijst} \qquad (1)$$

where Y_{ijst} is the enrollment rate at school type *i,* in sector *j,* in state *s*, during academic year *t* as defined above, I_i is an indicator variable for school type *i*, O_{jst} is the employment condition variable in sector *j*, in state *s*, during time *t*, X_{ijst} is a vector of control variables that includes local economic indicators and student characteristics, δ_{is} are school type-by-state fixed effects, δ_j are sector fixed effects, Trend_{ist} are school type-sector time trends, and ε_{ijst} is a robust standard error clustered at the state for each year. Given the construction of enrollment rates, the cluster robust standard errors address correlation between enrollment rates within each state. Clustering reduces the likelihood of Type I error, where the null hypothesis that a variable's effect on enrollment equals zero is rejected when it is actually true for the population (Kézdi 2004).

Since the school type variable is a binary indicator variable coded as 1 for FPCs and 0 for CCs, the I_i term is an intercept shifter for FPCs and the interaction term, $\mathrm{I}_i * \mathrm{O}_{jst}$, is the additional effect of employment condition in sector *j* on FPC enrollment. In addition, it is important to detail why the inclusion of these specific fixed effects and time trends aid in identifying the effect of employment conditions on enrollment. The first set of fixed effects, $\boldsymbol{\delta}_{is}$, pick up the average enrollment in each state for FPCs and CCs, respectively. Thus, the effect of a state having larger enrollments at either FPCs or CCs is controlled, or between school-type variation is controlled. Second, sector fixed effects, $\boldsymbol{\delta}_j$,

are included to pick up the average enrollment for each sector. These fixed effects absorb enrollment across different sectors. Thus, if certain sectors have larger enrollments than others, the effect is absorbed. Lastly, an enrollment trend, $Trend_{ist}$, is included for each state and school type. These set of controls absorb the linear growth in enrollment over time at FPCs and CCs, respectively, for each state.

The coefficients of interest in this specification are β_2 and β_3. β_2 represents the percentage change in enrollment in majors at CCs within sectors in response to a change in employment conditions in that sector, while β_3 represents the additional response on enrollment in the same majors at FPCs. Thus, $\beta_2 + \beta_3$ captures the effect of changes in employment conditions on enrollment at FPCs. Given that the left-hand side of equation (1) is logged, the marginal effects are identified as $100\times\beta$ (see Wooldridge 2009). For example, a 1% increase in state-level sector-specific employment growth is correlated with a $100\times\beta_2$% increase in the enrollment rates at CCs within majors in those sectors and a $100\times(\beta_2 + \beta_3)$% increase in the enrollment rate at FPCs within those same majors. Thus, if $(\beta_2 + \beta_3) > 0$, then enrollment at FPCs within a sector grows as a result of better employment conditions in that sector.

In both coefficients of interest, changes in the correlation between sector-specific employment conditions and enrollment rates in majors within those sectors at CCs and FPCs are being identified. Given the construction of the employment condition variables, these coefficients identify changes in enrollment behavior due to exogenous changes in the labor market. The analysis assumes that individuals observe recent labor market conditions and use this information as projections for future labor market conditions

while considering various education opportunities. By design, employment conditions and enrollment at both CCs and FPCs can both potentially be positively correlated, negatively correlated, or uncorrelated.

A vector of control variables is also included in the specification. These variables control for influences that may induce individuals to enroll in higher education. First, the higher education literature has documented the effect of the business cycle on higher education enrollment rates (Betts and McFarland 1995, Chung 2012). As such, local economic indicators, the unemployment rate and per capita income, are included.[21,22] Second, to account for accessibility to CCs, the number of CCs per million residents in each state is included.[23] Third, an additional set of student-level control variables accounts for differences in students. The students' characteristics are constructed identically to the panel formation as discussed in the previous section. The student characteristics included are influenced by Chung (2012) who studies the self-selection of individuals into FPCs. Chung finds that gender and parental education significantly influence school choice. In addition to these characteristics, other student characteristics are included. These variables include demographic characteristics: gender, dependent status, and age; background characteristics: whether the student is a single parent, whether the student had a job prior to enrolling, whether they attended a public high

[21] The unemployment rate is defined as the average annual unemployment rate of the previous three years for each state.

[22] Per capita income is defined as the average annual per capita income of the previous three years for each state adjusted to 2008 dollars.

[23] The number of community colleges per state is provided by the IPEDS Data Center, while the population estimates are provided by the U.S. Census Bureau.

school, whether the student attends school full time, and whether the student expects to earn a Bachelor's degree in the future.

Table 10 provides summary statistics for the included control variables at FPCs and CCs. The values presented in the table are the panel averages. The students at the two colleges have several differences. FPCs have a higher percentage of minority students than CCs. CC students have better educated parents and are more likely to be dependents. FPC students are more likely to be single parents and less likely to have had a job immediately prior to enrolling. They are also more like to attend school full-time. A nearly identical percentage of students at both schools expect to earn a Bachelor's degree. CC students skew younger and older than FPC students, the majority of whom are between the ages of 22 and 39.

Table 10: Summary Statistics for Control Variables by School Type [a]

	For-Profit Colleges		Community Colleges	
Variable	Mean	Std. Dev.	Mean	Std. Dev.
State unemployment rate	4.94	1.1	4.74	1.1
Community college access	4.23	2.4	4.99	3.0
State per capita income	37,843	5,973	36,749	5,916
Male	41.9%		44.7%	
Black	22.2%		14.4%	
Hispanic	12.1%		8.6%	
Parent graduated from college	38.7%		42.6%	
Parent dropped out of high school	24.4%		20.5%	
Attended public high school	86.5%		88.2%	
Dependent	33.9%		43.7%	
Single parent	24.8%		16.2%	
Had job prior to enrolling	50.4%		58.7%	
Full-time student	70.8%		43.1%	
Expects Bachelor's Degree	71.5%		72.0%	
Age: 21 and Under	33.0%		41.9%	
Age: 22 to 39	57.5%		45.2%	
Age: Over 40	9.5%		12.9%	

[a] Standard deviations omitted for binary indicator variables

CHAPTER 4

EMPIRICAL RESULTS

A series of empirical analyses are conducted to investigate the correlation between measures of recent employment conditions and enrollment rates at FPCs and CCs. First, state-level employment growth on enrollment at FPCs and CCs is analyzed, including a series of reduced models to test whether omitted variable bias is present. The analysis is then extended to investigate whether enrollment is responsive to national-level sector employment growth. Additional analysis is then conduct to test the responsiveness of enrollment for various sub-groups of the population, in particular, by age group and gender. Lastly, secondary analysis examines the correlation between sector-specific wage levels and wage growth and enrollment rates. Similar to the main analysis using the employment growth, the correlation is investigated for the identical subgroups of students.

4.1 Main Results

Using the constructed panel dataset, equation (1) is estimated using the state-level employment growth as the measure of structural change in the local labor market and the brief results are presented in Table 11 in column 'Baseline Model'. The model includes school type-by-state fixed effects, sector fixed effects, and school type, sector time trends. The coefficients of interest in this model are for the employment growth term and

the interaction of employment growth and the indicator for FPC. The coefficient estimates are not displayed for the control variables for conciseness.

The results indicate that state-level sector-specific employment growth is not significantly correlated with enrollment in majors within those sectors at CCs. On the other hand, the results indicate that a 1% increase in state-level employment growth in a sector results in a 2.5% increase in the enrollment within majors of that sector at FPCs in that state. The enrollment responsiveness at FPCs can be estimated as the sum of the coefficients on employment growth and employment growth interacted with an indicator for FPCs, and a F-test can evaluate if combined they are significantly different from zero. The p-value from the F-test is provided in Table 11 and indicates that the sum of the coefficients is significant at a 5% confidence level. Thus, the empirical evidence suggests enrollment at FPCs is responsive to structural changes in the local labor market, while there is no evidence that CC enrollment is responsive.

As discussed in the empirical specification, it is important to control for the between school type and between sector variation when analyzing sector-specific employment conditions and enrollment responsiveness at FPCs and CCs. To analyze whether omitting these controls influences the main results, a series of four additional reduced models are included. Each model builds up to the baseline specification by adding additional sets of control. By testing all of these specifications, the influence of each restriction on the parameters of interest can be examined. Table 11 above includes the results of all five regressions, including the baseline specification.

Table 11: Estimation Results: Employment Growth

Variable	Reduced Model 1	Reduced Model 2	Reduced Model 3	Reduced Model 4	Baseline Model
Employment growth	-0.012 ***	-0.014 ***	-0.002	-0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Employment growth * FPC	0.017	0.018 *	0.027 **	0.031 ***	0.028 **
	(0.010)	(0.011)	(0.011)	(0.011)	(0.012)
P-value from F-test that Employment Growth + Employment Growth*FPC = 0	0.662	0.687	0.023 **	0.012 **	0.029 **
Year fixed effects	Yes	Yes	Yes	No	No
School type-by-year fixed effects	No	No	No	Yes	No
School type-by-state fixed effects	Yes	Yes	Yes	Yes	Yes
Sector fixed effects	No	No	Yes	Yes	Yes
School type, sector time trends	No	No	No	No	Yes
Controls	No	Yes	Yes	Yes	Yes
R-Squared	0.464	0.468	0.660	0.662	0.724

Asterisks *, **, *** indicate significance at the 10%, 5%, and 1% statistical levels, respectively.

Standard Errors are clustered by state and listed beneath the coefficient estimates in parenthesis.

Control variables include state unemployment rate, community college access, state per capita income, expects Bachelor's degree, public high school, dependent, gender, black, Hispanic, full-time student, parent college graduate, parent high school dropout, job prior, single parent, age 21 and under, age 22 to 40.

The first reduced model, Reduced Model 1, only includes school type-by-state fixed effects and year fixed effects. It does not include any additional control variables or trend variables. Reduced Model 2, is similar to the first, but additionally includes the control variables. The coefficient estimates for employment growth and the interaction of employment growth and FPCs are nearly identical in the first and second model. The coefficient estimate of employment growth, which estimates the impact on enrollment responsiveness at CCs, is significant and negative. The estimate on the interaction of employment growth and FPCs is positive though only significant for Reduced Model 2. For both models, F-tests fail to reject that the sum of the coefficients does not equal zero. Without the additional controls of the baseline model, the model suggests there is a relationship between employment growth and enrollment rates at CCs, but not FPCs. However, the similarity in the coefficient estimates between the two models with the inclusion of the control variables suggests that omitted variable bias due student and local area characteristics is unlikely.

Reduced Model 3 and Reduced Model 4 add additional fixed effects to Reduced Model 2. Reduced Model 3 includes sector fixed effects to control for the variation between the 13 sectors. The results of this analysis indicate that enrollment is unresponsive at CCs to employment growth, while FPC enrollment is responsive. Thus, omitted variable bias is likely when sector fixed effects are not included. These sector fixed effects are necessary as there is large variation among sectors that is unaccounted for. Reduced Model 4 additionally includes school type-by-year fixed effects rather than year fixed effects to account for the variation between the school types over the time of

the study. The magnitude of the effect of employment growth on enrollment at FPCs in Reduced Model 4 is only slightly larger than in Reduced Model 3 as a result of including school type-by-year fixed effects. This provides evidence that the addition of year-by-school type fixed effects do not significantly influence the main results.

4.2 State versus National Employment Growth

The baseline model is used to investigate the correlation between state-level recent employment conditions and enrollment rates. In this section, the empirical analysis investigates whether enrollment is responsive to recent national employment conditions as well. As described previously, the national-level employment condition data computes one employment growth measure for each sector across all states for each time period. Table 12 below contains the results of estimating equation (1) using the national employment growth and additionally includes the baseline estimation results using the state-level data (these results are identical to the Baseline Model described in the previous section). Testing national-level data in addition to the state-level data provides additional evidence about what types of employment conditions students respond to. In particular, since some FPCs exist nationally while CCs typically only have a local presence there may be differences in the enrollment response at the two schools. Due to the collinearity between the school type-by-state fixed effects and the national employment growth these fixed effects have been dropped from the baseline model in the test of national employment conditions. Similarly, the control variables for state

unemployment rate, community college access, and state per capita income are also dropped because of collinearity with the national employment conditions.

The results indicate a significant correlation between national sector-specific employment growth and enrollment within majors of those sectors at FPCs, but not at CCs. The coefficient on employment growth is not significantly different from zero, but a F-test rejects the null hypothesis that the sum of the employment growth term and the interaction term are equal to zero using the national-level employment conditions. This result indicates that a 1% increase in national-level employment in a sector results in a 3.5% increase in the enrollment within majors of that sector at FPCs. These results provide evidence that CC enrollment is not responsive to sector changes in national employment growth. However, the exclusion of the school type-by-state fixed effects may cause upward bias on the estimate of the impact of employment growth on enrollment since some unobserved heterogeneity is not controlled. Despite this, these results suggest that enrollment at FPCs respond both to the local labor market conditions and aggregate labor market fluctuations. The national presence of some large FPCs may allow for a response to both types of labor market shifts

Table 12: Estimation Results: Employment Growth with National and State-level Data

Variable	State	National
Employment growth	-0.003	0.000
	(0.002)	(0.002)
Employment growth * FPC	0.028 **	0.035 ***
	(0.012)	(0.009)
P-value from F-test that Employment Growth + Employment Growth*FPC = 0	0.029 **	0.000 ***
School type-by-year fixed effects	Yes	Yes
School type-by-state fixed effects	Yes	No
Sector fixed effects	Yes	Yes
School type, sector time trends	Yes	Yes
Controls	Yes	Yes
R-Squared	0.724	0.726
Observations	2167	2167

Asterisks *, **, *** indicate significance at the 10%, 5%, and 1% statistical levels, respectively. Standard Errors are clustered by state and listed beneath the coefficient estimates in parenthesis. State-level control variables include state unemployment rate, community college access, state per capita income, expects Bachelor's degree, public high school, dependent, gender, black, Hispanic, full-time student, parent college graduate, parent high school dropout, job prior, single parent, age 21 and under, age 22 to 40.

National-level control variables include expects Bachelor's degree, public high school, dependent, gender, black, Hispanic, full-time student, parent college graduate, parent high school dropout, job prior, single parent, age 21 and under, age 22 to 40.

4.3 Employment Growth by Age of Students

To further explore how state-level employment growth affects enrollment rates at FPCs and CCs, the baseline model is estimated for subgroups of students. Given that students of different ages have different levels of career experience, it is possible that

they respond differently to changes in employment growth.[24] Three subgroups are formed: students 21 and under, students 22 to 39, and students 40 and over. The first group is the youngest students who represent those with limited experience, many of whom are going to college directly from high school. The second group of students is those who are expected to have begun careers and are continuing to develop skills. The third group contains the oldest students and represents those that are expected to have many years of work experience.

For each subgroup, students are pooled together using the data construction described in the previous section to form a distinct panel dataset. Thus, three separate panels are formed. For each subgroup, the sum of all enrollments in each state and year equals 100. This allows for the same empirical specification to be used to conduct the empirical analysis permitting the same interpretation of the marginal effects.

Table 13 below displays the results of these regressions. For each age group, the coefficient on the employment growth term is not significantly different from zero. The coefficient on the interaction term is positive and significant for each age group and a F-test rejects that the sum of the two terms equals zero at a 1% confidence level. These results provide no empirical evidence that employment growth influences the enrollment of students in any age group at CCs. However, the results do suggest that students from all age groups may be positively influenced by employment growth by enrolling at FPCs in majors within those sectors that are expected to grow. Since these results suggest that

[24] Using years of career experience would be preferred to using student age. This was unavailable in the data.

for each age group FPC enrollment is responsive to sector employment growth, it may be that career experience is not important to understanding why this response is occurring.

Table 13: Estimation Results: Employment Growth by Age Group

Variable	21 and under	22 to 39	40 and above
Employment growth	-0.002	0.001	-0.001
	(0.003)	(0.002)	(0.003)
Employment growth * FPC	0.042 ***	0.036 ***	0.058 ***
	(0.015)	(0.013)	(0.021)
P-value from F-test that Employment Growth + Employment Growth*FPC = 0	0.009 ***	0.010 ***	0.009 ***
School type-by-year fixed effects	Yes	Yes	Yes
School type-by-state fixed effects	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes
School type, sector time trends	Yes	Yes	Yes
Controls	Yes	Yes	Yes
R-Squared	0.713	0.702	0.714
Observations	1762	1806	1032

Asterisks *, **, *** indicate significance at the 10%, 5%, and 1% statistical levels, respectively.
Standard Errors are clustered by state and listed beneath the coefficient estimates in parenthesis.
Control variables include state unemployment rate, community college access, state per capita income, expects Bachelor's degree, public high school, dependent, gender, black, Hispanic, full-time student, parent college graduate, parent high school dropout, job prior, single parent.

4.4 Employment Growth by Gender of Students

The analysis additionally studies the effect of state-level sector employment growth on males and females. The literature suggests that the male and female labor markets are distinct and simple gender controls may fail to account for these differences.[25] Thus, this analysis studies whether the male and female enrollment respond differently to changes in employment growth. Similarly to the analysis using age

[25] See Blakemore and Low (1984), Turner and Bowen (1999), and Montmarquette, Cannings, Mahseredjian (2002).

subgroups of students, this analysis requires two additional panel datasets (one for male students and another for female students). These datasets are created in an identical manner to those above such that the sum of male enrollments and female enrollments in each sector equals 100 for each state and year, respectively.

Table 14 contains the results of the estimations for males and females using the baseline model. For both males and females, the employment growth coefficient is not significantly different than zero. The coefficient on the interaction term is positive and significant for males and females. A F-test indicates that the sum of employment growth and the interaction term is significantly different from zero at a 10% confidence level for females and at a 5% confidence level for males. This test suggests that there is a positive correlation between sector enrollment rates at FPCs for both males and females and employment growth in those sectors. No correlation is identified for enrollment rates at CCs for either gender. As with the analysis of age sub-groups, the enrollment effect appears consistent across students regardless of age group or gender.

Table 14: Estimation Results: Employment Growth by Gender

Variable	Male	Female
Employment growth	-0.001	-0.002
	(0.003)	(0.002)
Employment growth * FPC	0.031 **	0.027 **
	(0.015)	(0.013)
P-value from F-test that Employment Growth + Employment Growth*FPC = 0	0.047 **	0.063 *
School type-by-year fixed effects	Yes	Yes
School type-by-state fixed effects	Yes	Yes
Sector fixed effects	Yes	Yes
School type, sector time trends	Yes	Yes
Controls	Yes	Yes
R-Squared	0.691	0.740
Observations	1711	1826

Asterisks *, **, *** indicate significance at the 10%, 5%, and 1% statistical levels, respectively. Standard Errors are clustered by state and listed beneath the coefficient estimates in parenthesis. Control variables include state unemployment rate, community college access, state per capita income, expects Bachelor's degree, public high school, dependent, black, Hispanic, full-time student, parent college graduate, parent high school dropout, job prior, single parent, age 21 and under, age 22 to 40.

4.5 Additional Analysis Using Wage Level and Growth

In addition to the primary analysis on employment growth, two additional measures of recent employment conditions are explored. In this section, the effect of sector-specific state wage levels and wage growth are examined. The analysis uses the panel dataset constructed using all students to estimate the baseline specification, Equation (1). The first analysis uses the state-level sector-specific wage level for the employment condition measure. The second analysis uses the state-level sector-specific wage growth for the employment condition measure. In addition, sub-groups of students

based on age and gender are also analyzed. Analyzing these other employment conditions may reveal evidence about which employment conditions affect enrollment.

Table 15 displays the results of the estimations using the wage level and wage growth as measures of employment conditions. The coefficients of interest in the model are the wage condition term and the interaction between the wage condition and school type. For brevity, only these coefficient estimates are included in Table 15. The results indicate that both the coefficients on the wage level and wage growth are not significantly different from zero. While the coefficient on the interaction of wage growth and FPC is significant, F-tests on the sum of the coefficients are not significantly different than zero for either wage condition. This provides evidence that neither the wage level nor wage growth within a sector is significantly correlated with enrollment at FPCs and CCs.

Table 15: Estimation Results: Wage Level and Wage Growth

Wage Variable	Level	Growth
Wage Condition	-0.008	0.016
	(0.029)	(0.027)
Wage Condition * FPC	0.048 **	-0.102
	(0.023)	(0.092)
P-value from F-test that Wage Condition + Wage Condition*FPC = 0	0.307	0.336
School type-by-year fixed effects	Yes	Yes
School type-by-state fixed effects	Yes	Yes
Sector fixed effects	Yes	Yes
School type, sector time trends	Yes	Yes
Controls	Yes	Yes
R-Squared	0.723	0.722

Asterisks *, **, *** indicate significance at the 10%, 5%, and 1% statistical levels, respectively. Standard Errors are clustered by state and listed beneath the coefficient estimates in parenthesis. Control variables include state unemployment rate, community college access, state per capita income, expects Bachelor's degree, public high school, dependent, gender, black, Hispanic, full-time student, parent college graduate, parent high school dropout, job prior, single parent, age 21 and under, age 22 to 40.

To further examine these wage conditions, the analysis studies the effect of wages across the three age subgroups. Table 16 displays these results. The coefficient estimates on wage level and F-tests on the sum of wage level and the interaction term are not significantly different than zero for the students 21 and under and the students 22 to 39. For students 40 and over the coefficient estimate for wage level is negative at a 10 % significance level, suggesting that there is a weak negative correlation between enrollment at CCs and sectors with higher wage levels. A F-test on the sum of this term and the interaction term for students 40 and over fails to reject that there is no correlation between mean wage levels and FPC enrollment rates. This result suggests that older

students are decreasing enrollment at CCs in sectors with high wages, however, there is no effect on enrollment rates at FPCs for these older students. The results using wage growth indicate no significant effect for students of any age group at either school type. This provides further evidence that wage growth may not influence enrollment at FPCs or CCs.

The wage level and wage growth indicators are also tested for male and female student subgroups. Table 17 displays the results for both wage level and wage growth by gender. The empirical results suggest that there is an enrollment effect for males in sectors with higher wage levels. This positive correlation occurs with both CC enrollment rates and FPC enrollment rates. The marginal effect can be interpreted as $1 increase in the wage level in a sector results in 4.0% increase in the enrollment rate within majors of that sector at CCs and a 6.9% increase in the enrollment rate within majors of that sector at FPCs. For women, there is no evidence of an enrollment response due to sector wage levels at either school type. The literature suggests that women tend to choose to study fields where their skills are less likely to become obsolete if they take a hiatus from working (Blakemore and Low 1984). It is possible that sectors with higher wage levels are more related to technology growth and therefore less attractive to females. Further, there is no evidence of an enrollment response for males or females due to sector wage growth.

Table 16: Estimation Results: Wage Level and Wage Growth by Age Group

	21 and under		22 to 39		40 and over	
Wage Variable	Level	Growth	Level	Growth	Level	Growth
Wage Condition	-0.013	-0.041	0.000	-0.002	-0.026 *	0.039
	(0.027)	(0.075)	(0.029)	(0.074)	(0.033)	(0.095)
Wage Condition * FPC	0.035	-0.246	0.052 *	-0.030	0.025	-0.284
	(0.026)	(0.224)	(0.024)	(0.241)	(0.038)	(0.397)
P-value from F-test that Wage Condition + Wage Condition*FPC = 0	0.503	0.232	0.258	0.895	0.795	0.545
School type-by-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
School type-by-state fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
School type, sector time trends	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.711	0.710	0.702	0.698	0.710	0.709
Observations	1754	1761	1800	1806	1030	1032

Asterisks *, **, *** indicate significance at the 10%, 5%, and 1% statistical levels, respectively.

Standard Errors are clustered by state and listed beneath the coefficient estimates in parenthesis.

Control variables include state unemployment rate, community college access, state per capita income, expects Bachelor's degree, public high school, dependent, gender, black, Hispanic, full-time student, parent college graduate, parent high school dropout, job prior, single parent.

Combining the results from these secondary analyses indicates that wage growth does not influence enrollment at either CCs or FPCs. There is evidence that male enrollment is correlated with wage levels, but at both CCs and FPCs. These results suggest that some students may not be concerned with pursuing education for wages and those that are may not distinguish between CCs and FPCs.

Table 17: Estimation Results: Wage Level and Wage Growth by Gender

	Male		Female	
Wage Variable	Level	Growth	Level	Growth
Wage Condition	0.040*	-0.062	-0.016	-0.046
	(0.023)	(0.076)	(0.026)	(0.079)
Wage Condition * FPC	0.029	-0.177	0.025	-0.054
	(0.026)	(0.305)	(0.020)	(0.155)
P-value from F-test that Wage Condition + Wage Condition*FPC = 0	0.046**	0.450	0.792	0.521
School type-by-year fixed effects	Yes	Yes	Yes	Yes
School type-by-state fixed effects	Yes	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes	Yes
School type, sector time trends	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R-Squared	0.690	0.690	0.739	0.739
Observations	1711	1711	1825	1825

Asterisks *, **, *** indicate significance at the 10%, 5%, and 1% statistical levels, respectively.
Standard Errors are clustered by state and listed beneath the coefficient estimates in parenthesis.
Control variables include state unemployment rate, community college access, state per capita income, expects Bachelor's degree, public high school, dependent, black, Hispanic, full-time student, parent college graduate, parent high school dropout, job prior, single parent, age 21 and under, age 22 to 40.

CHAPTER 5

CONCLUSION

Popular press suggests that for-profit colleges exploited students by saddling them with large debt loads. Despite substantially higher tuition costs, rates of enrollment and degrees conferred at for-profit colleges continue to outpace community colleges, the largest provider of two-year Associate's degrees. One potential explanation is that program enrollment at for-profit colleges and community colleges change when structural change in the local labor market occurs. Anecdotally, a literature review indicates that community colleges serve its local residences with a broad-array of programs, while the for-profit colleges only maintain programs that provide timely career training. Thus, Bailey et al. (2001) summarizes these functional differences when stating that "for-profits 'train' while community colleges 'educate'." In addition, comparing the management structures of community colleges and for-profit colleges indicate substantial differences between the two. Primarily, community colleges use faculty governance and long-term labor contracts, while for-profit colleges have management structures similar to other publically-traded companies with upper management making decisions regarding various programs. For-profit colleges also have flexible instructor contracts with almost all of them being non-tenured short-term contractors. Even though these differences suggest that for-profit college enrollment could potentially be more responsive to changes in employment conditions, no empirical research has attempted to estimate this relationship.

The purpose of this thesis is to empirically estimate the relationship between various measures of sector-specific employment conditions, namely changes in employment growth, wage level, and wage growth, and enrollment at two-year Associate's degrees programs within these sectors at for-profit colleges and community colleges. The empirical specification permits these correlations to be estimated jointly and the empirical results provide a magnitude of difference in enrollment between for-profit college and community colleges from changes in one of the measures of employment conditions. The results indicate a positive relationship between sector-specific employment growth and enrollment in majors within those sectors at for-profit colleges, while no statistically significant relationship is identified for enrollment at community colleges. The estimates suggest that a 1% change in state-level sector-specific employment growth causes a 2.5% increase in the enrollment rate at for-profit colleges in majors in those sectors. Given that the average sector employment growth rate is 2.9%, the results suggest that employment growth accounts for 7.4% of overall enrollment growth at for-profit colleges. However, in faster growing sectors such as computer and information technology where average employment growth has increased by 6.4%, the results suggest that employment growth accounts for 16% of enrollment in majors within those sectors at for-profit colleges. The empirical analysis also studies these relationships for various subgroups of the population, in particular, by age and gender. The results are robust for each of these subgroups. That is, sector-specific employment growth is positively correlated with enrollment in majors within these sectors at for-profit colleges for both male and female students and young, middle-aged, and older students. Similar to

the main results, no significant relationship is identified during the subgroup analysis between employment growth and enrollment at community colleges. These results suggest that for-profit college's structure is sufficiently flexible to respond to changes in local labor market conditions so as to increase enrolment in programs leading to employment in those sectors.

This analysis is also extended by examining two additional measures of employment conditions, the wage level and wage growth. First, the empirical results suggest that both the recent wage growth or wage level measures have no effect on enrollments at either community colleges or for-profit colleges. Second, gender subgroup analysis of these employment measures suggest that males are responsive to changes in wage levels, while no statistically significant relationships are identified for females. Third, age subgroup empirical analysis of these employment condition measures suggests a negative relationship between sector-specific wage level and enrollment at community colleges for the oldest students at 10% significance level. These results suggest only a weak relationship between sector-specific wage levels and enrollment in majors within these sectors.

Reliable data on for-profit colleges is relatively scarce. Currently, representative national data are only available for Title IV eligible institutions. As a consequence, the economic literature regarding for-profit colleges is fairly sparse. Much of the literature focuses on who is attending for-profit colleges, how students finance their education, and how for-profit colleges respond to changes in financial aid policy. This paper addresses enrollment responses to labor market conditions. Future work could potentially identify

what institutional characteristics permit program enrollment at for-profit colleges to be responsive.

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