Three Essays on the Economics of For-Profit Colleges

By

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Three Essays on the Economics of For-Profit Colleges

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Abstract

This dissertation consists of three studies regarding the growing role of for-profit colleges and universities in the United States. Analyzing the behaviors of these institutions through a microeconomic lens, I investigate the ways in which the internal and external environmental factors in which for-profit colleges and universities operate influence their behaviors as well as impact on traditional colleges and universities. The three separate research questions asked by this dissertation are all analyzed using sophisticated quantitative econometric models.

The substantive conclusions of this dissertation is that many of the assumed behaviors of for-profit colleges and universities – such as the predatory targeting of minority communities – are not empirically realized. Additionally, this dissertation illustrates that the competitive forces introduced by for-profit colleges and universities may lead to positive increased in the efficiency of public institutions. For all three chapters, practical policy recommendations are forwarded in order to promote evidence-based policymaking as it relates to for-profit colleges and universities. Major empirical contributions of this dissertation include one of the first applications of a novel bias correction – the split-panel jackknife - to a substantive policy area as well as a comparison and discussion of the quasi-experimental methodologies used by researchers in applied policy analysis.

Acknowledgements

"It's a beautiful dream, stopping the wheel. You're not the first person who's ever dreamt it."
"I'm not going to stop the wheel, I'm going to break the wheel."

In the most literal sense this dissertation would not be possible without the support of my parents David and Elizabeth Shannon. Although he is no longer with us, dad had been a constant support through every adventure I went on. I am only sorry that I did not finish fast enough for him to see the fruit of his labor. Likewise, mom has been the epitome of courage and strength my entire life; having survived both breast cancer and the loss of a husband within a few years, she often reminded me that in comparison the completion of a PhD is a rather small feat. Not everyone can be as lucky as I have been to have such loving and supporting parents who also reminded me to fight for what I want and that being respected is always better than being liked.

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Finally, to Taylor Swift for releasing *Reputation* and reminding me there's nothing wrong with pursuing success for the sake of being successful. Let the games begin.

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Chapter 1

Introduction

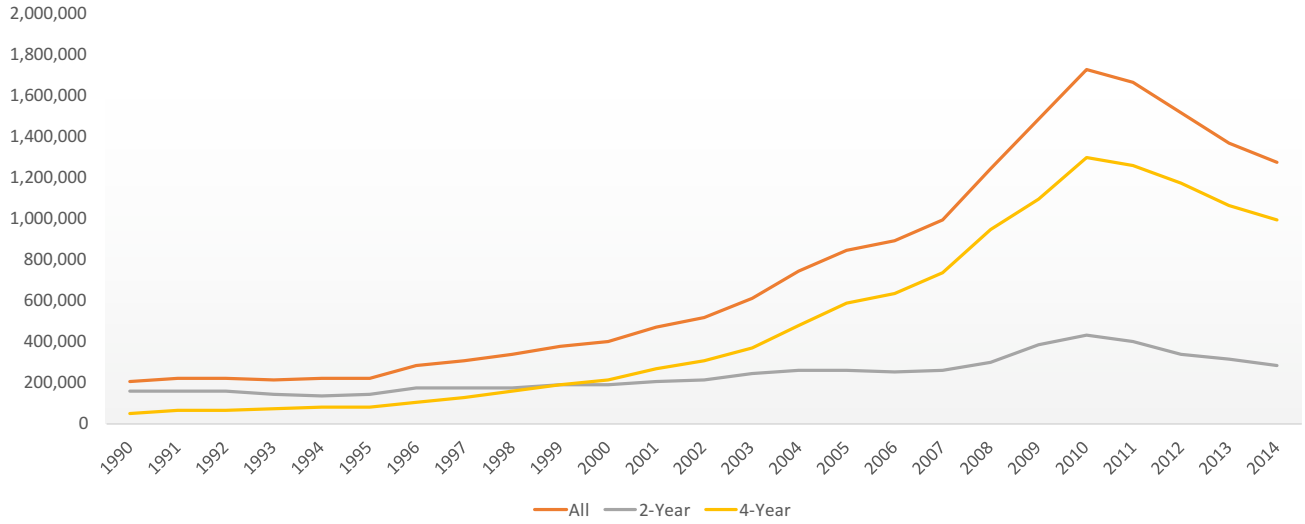
> *"Policy analysts are not advancing a discipline, nor are they advancing a narrative of human experience. Policy analysis methods are a means to the end of improving the bases on which policies are made at all levels of government by raising uncomfortable questions and putting in fresh ideas*" - Lynn, 1999, p. 217.

1.0.1 For-Profit Colleges and Universities as a Policy Problem

In December 2016 alone, two for-profit colleges closed campuses across three states after fraudulently using federal funds forcing approximately 10,000 students to transfer to a partner for-profit college (Zamudio-Sauréz, 2016). Additionally, new analysis by the Department of Education showed that when considering all federal revenue sources – and not just those received through the Department of Education – the number of for-profit colleges and universities receiving *at least* 90% of their revenue from federal sources increased 17 to 200 with additional revenue coming from the Department of Defense as well as the Department of Veterans Affairs (Berman, 2016). Despite claims from popular news sources that for-profit colleges and universities engage in predatory business practices – such as providing students with inaccurate and misleading job placement statistics – as well as calls from lawmakers for increased regulation of the sector, little systematic knowledge exists regarding for-profit colleges and universities writ-large (Hensley-Clancy, 2016; Holland & DeLuca, 2016).

Although one may be tempted to assume that the cases described above are isolated incidents affecting a relatively small sector of the higher education landscape, the numbers tell a different

Figure 1.1: For-Profit College and University Enrollment



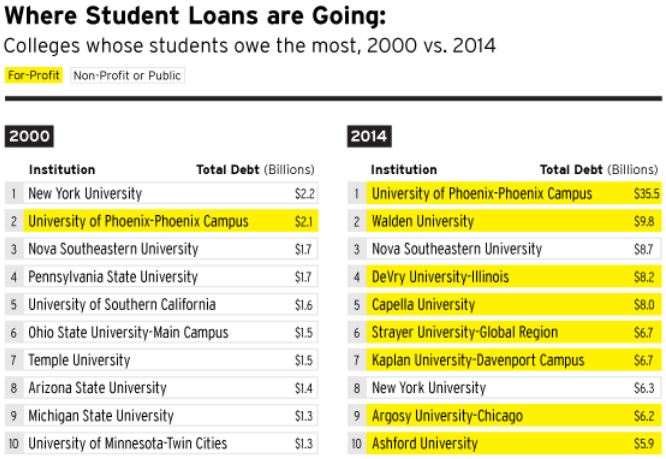
Source: National Center for Educational Statistics/Author's Calculation

story. As illustrated by Figure 1.1, for-profit colleges and universities experienced exponential growth in student enrollments with the years 2011 and 2012 seeing peak enrollment.

Figure 1.1 also illustrates that beginning around 1998/1999, the enrollment growth experienced by for-profit colleges and universities has been primarily in four-year institutions – a data trend that dispels the notion of for-profit colleges and universities as primarily two-year institutions (Cellini, 2005). Compounding the growth in for-profit enrollments is the amount of money students are borrowing to attend for-profit colleges and universities: although students believe the costs of for-profit colleges and universities closely resembles that of public-two year colleges, the real tuition costs are often closer to those at private, non-profit colleges (Kofoed, 2013). The rise in borrowing costs coinciding with enrollment growth is found in Figure 1.2

As depicted in Figure 1.2, the institutions receiving the largest amount of student loans – including federal as well as private loans – dramatically shifted between 2000 and 2014. Whereas in 2010 only one out of the top ten institutions (in terms of student borrowing) was a for-profit college or university, by 2014 eight out of the top ten institutions were for-profit colleges or universities. Despite this growing role of for-profit colleges in the higher education landscape as well as the broader economy, relatively little remains empirically known regarding the behaviors,

Figure 1.2: Changes in Loans Received



Where Student Loans are Going:

Colleges whose students owe the most, 2000 vs. 2014

For-Profit | Non-Profit or Public

2000

	Institution	Total Debt (Billions)
1	New York University	$2.2
2	University of Phoenix-Phoenix Campus	$2.1
3	Nova Southeastern University	$1.7
4	Pennsylvania State University	$1.7
5	University of Southern California	$1.6
6	Ohio State University-Main Campus	$1.5
7	Temple University	$1.5
8	Arizona State University	$1.4
9	Michigan State University	$1.3
10	University of Minnesota-Twin Cities	$1.3

2014

	Institution	Total Debt (Billions)
1	University of Phoenix-Phoenix Campus	$35.5
2	Walden University	$9.8
3	Nova Southeastern University	$8.7
4	DeVry University-Illinois	$8.2
5	Capella University	$8.0
6	Strayer University-Global Region	$6.7
7	Kaplan University-Davenport Campus	$6.7
8	New York University	$6.3
9	Argosy University-Chicago	$6.2
10	Ashford University	$5.9

Source: Looney & Yannelis (2015)

practices, as well as the impacts of for-profit colleges and universities. It is such a lack of empirical evidence that motivates the central question of this dissertation: *what are the internal and external factors – both in terms of markets and policy – influencing the behaviors of for-profit colleges and universities?* This dissertation also attempts to expand on the existing literature by focusing on the practical applications of the questions answered. Rather than interpreting the results as contributing to a theoretical body of knowledge, it only considers the related literatures that help operationalize and contextualize the results at hand while also developing a practical policy analysis. This dissertation contends that without an objective understanding of the empirical realities of a policy domain – in this case for-profit higher education – any future policies will be flawed.

The introduction proceed as a follows: I reintroduce the goal of the dissertation as well as its place within the extant literature, lay out the conceptual framework and major assumptions used throughout the dissertation, followed by short previews of the three studies laying out the main research questions, methodological approaches, and results.

1.0.2 Goals and Place

The goal of this dissertation is to objectively and quantitatively speak to the growing concerns and discussion surrounding for-profit colleges and universities which to this point have been

addressed normatively, qualitatively, or largely ignored by the extant public administration research (Anderson & Taggart, 2016). In order to accomplish this goal, this dissertation draws heavily on microeconomic policy analysis and positive economics. By utilizing the tools provided by these disciplines, this dissertation also attempts to remedy the lack of traditional policy analytic techniques used by public administration scholars who are increasingly relying on post-positivist, critical, and/or political science approaches to policy analysis. As opposed to critical and post-positivist approaches to policy analysis – which often produce results of little utility in actually evaluating the impact of specific policies or forecasting potential outcomes – and the political science approach to policy analysis – which is far more concerned with understanding how the policy process works – the techniques employed here seek to produce results with direct implications for producing better polices as well as a deeper understanding of a specific policy domain (Gormley, 2007; Nowlin, 2011).

One of the only public administration pieces explicitly addressing the for-profit higher education sector, Anderson & Taggart (2016) use the for-profit sector as a means to analyze the role of organizations in creating public value failures or the framework meant to supplement the market failure framework used in traditional policy analysis (Bozeman, 2002). Although the authors provide descriptive information regarding institutional expenditures and student financial aid patterns across institutional sectors (e.g. public, non-profit, for-profit) a majority of the authors' time is spent on describing the drivers of public value failure and *not* the operations of for-profit colleges and universities. Given the purpose of this dissertation to move discussions of the for-profit beyond the nebulous, this line of research offers relatively little utility in the framing of each study.[1]

Looking toward the policy analysis as well as traditional higher education policy literature, those studies empirically examining for-profit colleges and universities, focus primarily on student labor market outcomes; a body of literature that has not yet reached a consensus on the degree to which for-profit colleges lead to better labor market outcomes than their public or non-profit

[1]This is not to say that this literature is of little utility writ-large but rather for the purposes of the present study in being a piece of applied policy analytic research.

counterparts (Cellini & Chaudhary, 2014; Cellini & Turner, 2016). As noted by Jaquette & Parra (2016): "Policymakers have been concerned about the behavior of for-profit institutions for decades...[yet] longitudinal analysis of the behavior of for-profit institutions remain rare" (647). This is not to say, however, that insights are not gleaned from the bodies of literature examining labor market outcomes and college choice decisions: both bodies of literature provide insights into how for-profit colleges and universities introduce the threat of competition and the possibility of a market into the higher education landscape.

The extent to which competition in higher education operates in practice remains a disputed empirical and theoretical question. While some researchers suggest that the conditions necessary to generate a competitive market of higher education are a heuristic analogous to the Weberian concept of bureaucracy, others maintain that for better or worse competition – or the threat of competition – determines an institution's capacity to generate the revenue needed to survive (Zemsky et al., 2001).[2] The literatures on labor market outcomes as well as college choice, however, provide evidence for the latter. For example, in examining the determinants of college choice Chung (2012) finds that even when a student's enrollment decision is driven by a complex set of factors, the selection of a for-profit is due in-part to the concentration of for-profits within the student's local market. While this finding will be built upon in study two – which illustrates the importance of concentration in the market decisions of FPCUs – it is also in line with Long (2004)'s seminal work on college choice which finds that competition faced by public systems and the competitiveness of the public systems themselves influence student choice. Specifically, Long finds that an increase in the market share of public institutions – in terms of expenditures – leads to an increased probability of a student enrolling at an in-state public institution.[3]

As can be gleaned from the discussion above, this dissertation is assuming that competition with higher education takes a specific form. And it is this conceptualization of competition that lays the foundational assumptions for the empirical aspects of the following studies.

[2]Study one provides a review of the relevant studies for operationalizing and conceptualizing markets in higher education

[3]The utility function presented in Long (2004) is a widely accepted operationalization of student behavior and is discussed in more details in both study one and three.

1.0.3 Conceptual Framework

Although the following framework will be modified and discussed in details in each of the following chapters, the basic assumption underlying all three chapters is that each student (*i)* is choosing an institution (*j)* that maximizes their expected utility from attending that institution:

$$U_{ij} = f(P_{ij,}A_{j,}D_{ij,}X_{i,}Z_{j}) \tag{1.1}$$

Where each institution is characterized by their out-of-pocket price paid by student P_{ij}, an institution's academic quality and program offerings (A_j), distance to the school (D_{ij}), and a vector of student (X_i) and institution characteristics (Z_j).[4] From a microeconomic perspective, in order for a for-profit college or university to compete with other institutions, they must simply represent the possibility of increasing one of the terms in the utility function above more than other institutions in a student's choice set (Paulsen & Toutkoushian, 2008). The utility function outlined above also outlines the contributions, as well as limitations, of drawing on related bodies of literature in examining markets in higher education.

Describing the empirical challenge faced by researchers studying competition in education, Linick (2014) states the following:

> There are many well-executed, rigorous studies of the effects of market-based reforms; however, whether these studies capture the effects of competition and not simply the effects of choice, autonomy, or policy-specific context is not clear. (3)

Within Linick's statement is the assumption that any measure of competition is not capturing competition but rather proximity. Such an assumption, however, is coming from a theoretical viewpoint that requires actual competition to take place in order to influence the behavior of other institutions within a market. This theoretical viewpoint is refuted on several fronts. Empirically, Cellini (2009) provides causal evidence of competition – through the use of a regression discontinuity design – that when community colleges receive additional public support

[4] Adapted from: Cellini et al. (2016); Long (2004)

in the form of funding and media coverage, students who previously enrolled in a for-profit college or university transfer to community colleges. Theoretically – as well as empirically – Bridgman et al. (2008) provide a review of findings that the mere *threat* of competition leads to changes in behavior from the public sector. In their own empirical analysis analyzing changes in the Brazilian oil industry following the removal of government enforced trade barriers, the authors conclude: "Studies [just] using market share data will miss threats of competition, which can have real effects" (p. 26).

At the most basic level – even if skeptics do not buy into the arguments above – it can be assumed that competition exists within higher education by adopting the view of the current policy dictating the use of federal financial aid. Specifically, the 1972 Reauthorization of the Higher Education Act of 1965 shifted financial aid to the hands of the students – allowing students to "shop" for an institution of their choice given the utility function specified above. The government's assumption regarding the use of financial aid combined with the growing role of for-profit colleges and universities make this dissertation timely and important: given that the political and policy environment *assume* a competitive marketplace in higher education, what is the evolving role of for-profit colleges and universities in this assumption?

1.0.4 Overview of Dissertation

One of the primary purposes of this dissertation is the utilization of sophisticated yet appropriated econometric techniques in the analysis of public policy issues which are often over politicized. In the current context this is the evolving role of for-profit colleges and universities in a higher education environment which is assumed to achieve allocative efficiency through the competitive pressures *including but not limited to* alternative services in the form of for-profit colleges and universities. Each of the three studies presented here attempt to remedy this oversight by providing a scientific analysis of the assumed behaviors of the for-profit sector.

Study one *The Effect of For-Profit Colleges and Universities on the Public Sector: a Stochastic Frontier Analysis*, represents an empirical examination of the response of public community

colleges to the entry of for-profit colleges and universities into local education markets. Utilizing panel data from the State of Ohio, study one models this relationship using Stochastic Frontier Analysis and a Generalized Estimating technique. Whereas Stochastic Frontier Analysis allows for an explicit examination of changes in the efficiency of community colleges when faced with competition from a for-profit college or university, the Generalized Estimating Equation technique addresses whether differences in efficiency lead to differences in organizational productivity while also appropriately accounting for the organizational inertia commonly found in public organizations. Leveraging the exogenous geographic conditions of the Marcellus Shale to improve identification of causal effects, study one ultimately shows that while competition from for-profit colleges and universities increases the efficiency of community colleges, this efficiency may lead to decreases or have no effect on the productivity of community colleges.

The second study, *Modeling For-Profit College Entry and Exit: an Application of the Split-Panel Jackknife*, examines the supply decisions of for-profit colleges and universities. One of the first studies to empirically examine the location decisions of institutions as opposed to the enrollment decisions of students, study one applies a novel discrete choice estimator to a panel dataset of counties across the United States. By applying the split-panel jackknife, study one not only explicitly addresses the assumption of predatory for-profit college behaviors but also provides policy analysts with a potential tool in their methodological toolbox. Finding that for-profit college and university supply decisions are a function of local market structures and economic conditions – as opposed to the demographic characteristics of the market – study two holds direct implications for any future policies regarding the regulation of for-profit colleges and universities into a local market.

Study three, *Information Disclosure Policies as Policy Instruments*: *a Comparison of Methods*, addresses the growing topic of for-profit college and university accountability by comparing the differential responses of for-profit and non-profit colleges to an information disclosure policy implemented by the United States Department of Education. Additionally, study three also addresses any potential endogeneity by employing three separate treatment effect estimators to

address the nonrandom differences between institutional types, allowing for robust empirical estimates while also appropriately addressing issues of endogeneity that are often ignored or addressed incorrectly in the extant public administration research. Study three provides evidence regarding both the impact of regulations on postsecondary institutions but also the incentives built into differing policy instrument designs.

The dissertation concludes with a summary of the findings of all three studies, followed by limitations of the results and directions for future research before closing on the contributions of the dissertation as a whole.

Chapter 2

The Effect of For-Profit Colleges and Universities on the Public Sector: a Stochastic Frontier Analysis

2.1 Introduction

With an estimated 7,550 for-profit colleges and universities (FPCUs) enrolling 2.5 million students and costing taxpayers $100 billion annually, little research has systematically examined the for-profit sector outside of labor market returns (Cellini, 2012; Cellini & Goldin, 2014). Furthermore, despite the substantial overlap between FPCUs and public two-year colleges in terms of program offerings and degree production, little is known about the relationship between the two sectors (Bailey et al., 2001; Cellini, 2005). Given that FPCUs advertise themselves as alternatives to struggling public institutions – and the prevailing notion of competition leading to a more efficient production of public goods and services – the purpose of this study is to build a deeper understanding of the relationship between community colleges and their for-profit counterparts while also speaking to the larger discussion surrounding competition in the public sector. Specifically, this study answers the following research question: *when faced with competitive pressures – in the form of a for-profit college or university – do public institutions – in the form of community colleges – respond in terms of efficiency and productivity?* To answer this question, I briefly discuss the theoretical expectations of markets in education, operationalize measures of competition and quantitatively analyze the response of community colleges to increased competition in the form of FPCU market entry.

2.2 Markets in Higher Education

Gaining prominence in 1972 with the amendment of the Higher Education Act of 1965 – which shifted financial aid to students rather than institutions – the market model of higher education casts students in the role of consumers (Dill, 1997). First, the provision of financial aid directly to students – as opposed to institutions – incentivizes institutions to adapt to the needs of students and therefore provide a more efficient education (Rothschild & White, 1993). Second, the dispersion of financial aid directly to students equalizes the opportunity for all students to attend the institutions of their choosing – an opportunity which will eventually equalize economic opportunities in the form of labor market outcomes (Leslie & Johnson, 1974). The extent to which the market model of higher education operates in practice, however, remains a disputed empirical question (Zemsky et al., 2001).

Acting as both consumers of and inputs into institutions if higher education, the degree to which students possess enough information to calculate the costs and benefits of attending one institution over another may be limited (Gurantz, 2015). Because of this less-than-perfect information, students may have differential responses to tuition prices and financial aid information: whereas minority students may choose not to enroll in an institution due to a higher sticker price, white students may view tuition increases as evidence of a higher quality product (Heller, 1997; Hoxby, 1997; Perna, 2006). In the context of the two-year sector, students may self-select into FPCUs despite a higher sticker price due to the perceived lower opportunity costs of attending an FPCU: FPCUs provide applicants and potential students with assistance on financial aid applications while also streamlining the processes often associated with red-tape in public institutions (Iloh & Tierney, 2014; Stephan et al., 2009). In addition to spending more on academic, institutional, and student support than their public counterparts, FPCUs also aggressively advertise themselves as providing a flexible alternative to the rigid bureaucracy of public institutions (Cellini, 2005; Cellini & Chaudhary, 2014). While the advertising ability of for-profits may cause community colleges to be overlooked by students in the search process (see: Iloh & Tierney, 2014), such advertising practices also suggest that FPCUs are competing with community colleges on a geographic- and/or

product space dimension. Whereas prestigious colleges and universities compete in a nationwide market, less prestigious colleges and universities often compete on a regional basis (De Fraja & Iossa, 2002; Hoxby, 1997; Rothschild & White, 1993). The question of the ways in which FPCUs and community colleges compete, however, remains answered (Cellini, 2009; Sav, 2012).

Returning to the basic assumption of this dissertation – as discussed in the introduction – this study assumes the following: each student *(i)* will choose the the institution *(j)* in market *(m)* that maximizes their expected utility from attending each institution (U_{ij}):

$$U_{ij} = f(P_{ij,}A_{j,}D_{ij,}X_{i,}Z_{j})$$

where an individual student's expected utility is a function of the expected out of price paid by a student (P_{ij}), an institution's academic quality and program offerings A_j, distance to the school (D_{ij}), and a vector of student (X_i) and institution characteristics (Z_j) (Cellini et al., 2016; Long, 2004). Therefore, institutions – in order to survive – must signal to students an expected increase in utility along at least one of these dimensions (Agasisti, 2009). Although competition for specific – and often prestigious – schools can be reputational, competition among schools is often a function of the local market structure allowing for the possibility of utility-maximizing firms, such as FPCUs, attempting to maximize a student's utility by focusing on the distance term *(D)* in the utility function above (Gu, 2013). The extant research on education markets, however, has produced mixed evidence regarding the degree to which competition exists.

Adopting a game theoretical lens, Gu (2013) contends that the extant literature examining tuition costs of colleges and universities often overlooks the influence of geographical neighbors. Attempting to capture competitive effects through the inclusion of a spatially lagged dependent variable, Gufocuses more on the spatial autocorrelation between neighbor's tuition levels as opposed to how the possibility of competition may impact the other aspects of an institution's operation. Likewise, Gonzalez Canche (2014) also focuses on the impact competitive forces may have on the changes in an institution's tuition. Similar to Gu, Gonzalez Canche also operationalizes competition as a series of lagged variables – such as tuition and non-resident student enrollments –

within a range varying from 1 kilometer to 400 miles. While finding that evidence of competition in the form of institution *i's* neighbors' non-resident enrollment decreasing non-resident tuition levels at institution *i*, Gonzalez Canche also is indifferent to the sectoral differences of institutions: an oversight – which as chapter two of this dissertation suggests – may be the driver of differences in tuition. Utilizing a similar spatial approach, Misra et al. (2012) take Gonzalez Canche's design one step further by explicitly examining the impact of private schools on the efficiency of public schools across various levels of schooling. Although the authors do find that increased competition from private schools increases the technical efficiency of both public primary and secondary schools, they also note "a proper definition of a market is needed" (p. 1189). A note which emphasizes the possibility that the lack of consensus regarding the operationalization of competition and markets used by researchers. Despite a conceptually consistent definition, operationalizations of competition include but are not limited to: the number of institutions within a county (Cellini, 2009); distance to the nearest competitor (Greene & Kang, 2004), the number of competitors within a specific mile-radius (McMillen et al., 2007); or the inclusion of several operationalizations within the same empirical model (Linick, 2014).

This study contributes to the literature by (1) exploring the under examined two-year post-secondary sector, (2) quantitatively evaluating whether increased competition leads to increased performance and efficiency in public institutions, and (3) employing novel estimation techniques to answer the question at hand.

2.3 Data and Methods

Drawing on microeconomic concepts of the firm, this study uses stochastic frontier analysis (SFA) to measure the relationship between increased competition and technical efficiency – or the ratio of a community college's mean production to the corresponding mean production if a community college utilized its expenditures most efficiently (Battese & Coelli, 1992). Associated with concepts of the education production function, SFA also allows for an examination of whether inefficiency may moderate the impact of educational expenditures on improving organizational

performance (Grosskopf et al., 2014). Stated differently: whereas ordinary least squares (OLS) regression estimates the relationship between predicators and the dependent variable for the typical or average observations, SFA estimates the relationship between predicators and the dependent variable for the most efficient observation. For illustrative purposes Eq. (2.1) represents the basic cross-section production function:

$$y_i = \alpha + \beta x_i + \nu_i - \mu_i \tag{2.1}$$

where y_i represents a variable of interest for institution i, β are parameters to be estimated, x_i are the explanatory variables, v_i is the idiosyncratic error term, and μ_i is a non-negative inefficiency term for institution i. In the instance that there is no inefficiency in the error term the OLS estimator will be unbiased, otherwise the SFA estimator is appropriate (Kirjavainen, 2012).

To examine the relationship between competition and performance, this study utilizes to two measures: 1) the total enrollment of an institution in a given academic year and 2) the number of degrees awarded in a given academic year and 2) the number of degrees warded in a given academic year. Acknowledging the limitations of defining performance in terms of an input as well as an output – as opposed to a true outcome – these measures are adopted for two reasons. First, despite criticisms of output measures of performance, those holding institutions accountable – such as governments and potential students – are looking for a simple quantitative measure of performance (Archibald & Feldman, 2008). Second, microeconomic theory suggests that not only will competition increase performance in public sector organizations but such increases will be done efficiently (Carpenter II & Noller, 2010; Gronberg et al., 2016). Whereas degree production measures the extent to which institutions are performing, postsecondary institutions must also compete for enrollments: it is only after crossing an enrollment threshold that institutions concern themselves with performance (Winston, 1999). Therefore, the use of degree production as an outcome measure – in conjunction with SFA – allows for an examination of the degree to which competition leads to efficiency in the public sector. Variance within this efficiency and the impact of efficiency on productivity then requires explanation.

2.3.1 Data Sources

Public two-year postsecondary institutions in the State of Ohio are the primary unit of analysis for this study. Because of the programmatic characteristics and course offerings shared by community colleges and FPCUs, this analysis excludes all four-year public and private non-profit institutions. The Ohio Department of Education provides institution specific degree production information and the Delta Cost Project provides data regarding institution-specific finances and institution controls that were unavailable through the Ohio Department of Education. The final panel consists of 20 community colleges from 2000 to 2013 resulting in a possible 260 observations. The findings reported include descriptive statistics, stochastic frontier estimates, and the results of a generalized estimating equation (GEE) technique analyzing the relationship between efficiency and degree production.

2.3.2 Selection of Variables and Measurement

As mentioned, the variables of interest are the *total enrollment* as well as the *degree count* for two-year public institutions in the State of Ohio. Both degree counts and total enrollment are expected to be a function of several organization factors as suggested by microeconomic theory: a commonality made possible by the "customer-input technology" through which higher education is produced. Stated differently: those students who enroll in a specific institution also supply the institution with one of its primary inputs, an input which attracts additional students of a similar background (Rothschild & White, 1993). Drawing on this conceptual framework, the selected predictor variables can be categorized as *discretionary inputs* and *non-discretionary inputs.* Discretionary inputs – or those under the control of an institution – are traditionally expenditure measures. Under microeconomic theory, an increase in expenditures should lead to increased productivity and performance in educational organizations (Monk, 1989; Webber & Ehrenberg, 2010). As such, the following expenditure measures are included as predictors: *academic support, institutional support, instructional support, operations/maintenance,* and *student services*. Despite the focus of much education policy research on the impact of discretionary inputs on performance

and productivity, the degree to which expenditures alone enhance productivity is limited due to the moderating role of non-discretionary inputs or environmental factors (Monk, 1992). Put simply: a purely economic model does not control for institutional characteristics that may influence both degree production as well as enrollment patterns such as percent of students who ethnic/racial minorities.

In terms of enrollment patterns of community colleges, while higher education institutions often possess some autonomy in the characteristics of the students they admit, community colleges – including those in Ohio – have open enrollment policies. As such, a community college's primary input – students – is a function of an institution's geographic location as opposed to admission decisions or processes (Crouse, 2015). Additionally, while there is relatively little known regarding the instructional workforce of community colleges, the hiring practices of less-selective institutions – such as community colleges – are often a function of the local labor market as well (Eagan, 2007). Likewise, recent research also notes that exposure to part-time faculty – often overrepresented at community colleges – results in decreased likelihood of student completion (Jaeger & Eagan, 2011). In order to account for the impact of faculty on both an institution's efficiency and productivity, I control for the total number of part-time faculty at an institution. Aside from the aforementioned non-discretionary inputs, such as students and faculty, I also account for competitive forces. Table 2.1 displays summary statistics.

2.3.3 Operationalizing Competition

Since the present analysis focuses on community colleges – which are often county-based I follow convention and define a market as a county (Cellini, 2009, 2010). Additionally, it is assumed that students do not attend community colleges outside of their home county due to the rising monetary costs associated with doing so without a corresponding increase in institutional prestige or convenience. Due to the inconsistencies in the operationalization of competition in the extant literature and the pursuit of robust estimates of competition, I operationalizing competition in three

Table 2.1: Summary Statistics

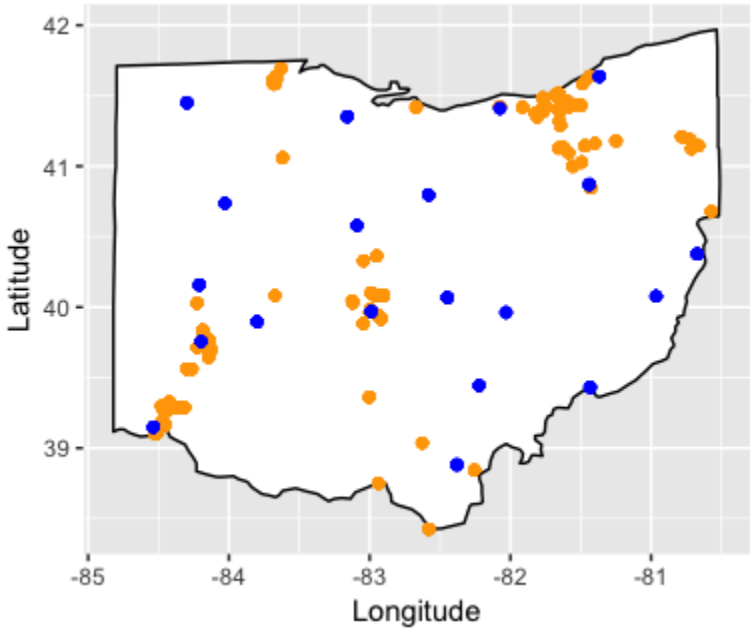
	M	*SD*	*Min*	*Max*
Ln (Enroll)	8.35	0.78	7.13	10.34
Ln (AcadSupp)	6.01	0.57	4.59	7.46
Ln (InstSupp)	7.01	0.36	6.09	8.30
Ln (Instruction)	7.90	0.27	7.24	8.65
Ln (Operations)	6.22	0.36	4.91	7.42
Ln (StudServ)	6.42	0.38	5.63	8.19
HHI	0.92	0.13	0.53	1.00
FPs	1.18	2.46	0.00	11.00
FP Dummy	0.35	0.48	0.00	1.00
Ln (PTEnroll)	7.69	0.93	5.97	9.81
Ln (BlackEnroll)	5.49	1.51	2.56	8.91
Ln (HispEnroll)	3.91	1.37	0.00	6.98
Ln (PTFac)	5.26	0.92	0.00	7.25
Observations	202			

ways. First, I employ a widely-used measure of market concentration: a Herfindahl-Hirschman Index (HHI) that measures the extent to which a single community college has a strong hold over the market share of enrollments within a county. Calculated by the equation presented in Eq. (2.2), the HHI is a bounded measure that takes on a value of 0 if perfect competition exists within a market and a value of 1 if there is a perfect monopoly within a county.

$$HHI = \sum_{i=1}^{N} s_i^2 \tag{2.2}$$

Second, I include a variable indicating the number of FPCUs operating within a college's county in a given year. Third, I include a binary variable that takes on the value of 1 to indicate whether there are *any* for-profit institutions operating within a community college's county in a given year and 0 otherwise. Following the estimation of the models, the coefficients on these variables will allow for an assessment of the degree to which presence or intensity of competition has a stronger impact on performance and efficiency. In order to provide a better understanding of the locations of community colleges as well as FPCUs, Figure 1 presents the geographic distribution of the sample used in the analysis.

Figure 2.1: Visual Representation of Sample



As illustrated by Figure 1, FPCUs (orange points) are more common than community colleges (blue points), but do at first glance appear to cluster around the community colleges. Figure 1 also raises the possibility of cross-state-border competition: as several community colleges are located near state borders. While acknowledging the potential of cross-state competition to inflate the estimates of competition, addressing such competition is beyond the scope of the present study.

2.3.3.1 Addressing Endogeneity

As will be illustrated by the remaining studies of this dissertation, it is most likely the case that locations of FPCUs is not exogenous. In order to address any potential bias introduced into the models by the endogenous location decisions of FPCUs, I adopt a two-stage residual inclusion strategy (2SRI). As opposed to the popular two-stage least squares estimator (2SLS) utilized in a linear context where the predicted values for an endogenous variable replace the endogenous variable in the second stage of the model, 2SRI includes the first-stage residuals within the second stage of the model. In the present context the 2SRI estimator is preferable given the properties of

the endogenous variables.

As with the 2SLS estimator, the 2SRI estimator requires the presence of a variable that is likely to influence the endogenous variable while being exogenous to the error term (Basu et al., 2017; Cellini, 2008; Terza et al., 2008). In the present context the instrument that was selected was whether or not a county was situated on the Marcellus shale; while there are contradicting directional relationships between whether a FPCU has greater or less incentive to enter into these counties, the purpose of this instrument is to simply purge endogeneity from the empirical estimates *not* the direction of the instrument itself. All three measures of competition were instrumented using the binary 'shale' variable and the subsequent residual term was included in all models. Table 2.2 presents the first-stage estimates.

Table 2.2: First Stage Results

	HHI		Intensity		Presence	
Shale	3.069***	(14.989)	-12.556***	(-23.869)	-4.143***	(-11.107)
Observations	202		202		202	

t-statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

2.3.4 Data Analysis and Results

This study involves two estimating techniques: stochastic frontier analyses (SFA) as well as generalized estimating equations (GEE). The first – SFA – is used to estimate the technical efficiency of community colleges and can be represented by the following equation:

$$ln(enrollment)_{it} = \beta_0 + \beta_1 ln(AcadSupp)_{it} + \beta_2 ln(InstSupp)_{it} + \beta_3 ln(Instruct)_{it} + \beta_4 ln(Operations)_{it} + \beta_5 ln(StudServ)_{it} + \nu_{it} - \mu_{it} \quad (2.3)$$

where i and t index individual community colleges and academic years respectively, βs are estimable parameters; $\nu_{it}$is a two-sided term representing random error; μ_{it} is a non-negative

random variable representing inefficiency assumed to be a function of a set of explanatory non-discretionary inputs, therefore the inefficiency term can be expressed in reduced form as follows:

$$\mu_{it} = \delta_0 + \delta_1 ln(ptenroll)_{it} + \delta_3 ln(blackenroll) + \delta_2 ln(hispenroll)_{it} + \delta_3 ln(ptfac)_{it} + \delta_4 (competition)_{it} \tag{2.4}$$

It is assumed that μ has a distribution that can be characterized as half-normal and is independent of v. Additionally, it is assumed that the production function of community colleges takes a Cobb-Douglas functional form, although additional flexible forms were tested – such as the translog functional form – these models resulted in severe multicollinearity. Both the frontier coefficients (β) and inefficiency parameters (δ) are estimated simultaneously via maximum-likelihood in order to avoid the inconsistency problems of a two-stage approach (Diaz & Sanchez, 2008; Wang, 2002). The results of the specified stochastic frontier models are presented in Table 2.3.

Starting with the model where competition is operationalized as the Herfindahl-Hirschman Index, all of the input variables are shown to have a statistically significant effect. Whereas increased levels of instructional and operational spending increase the frontier for student enrollments, increased levels of all other expenditure enrollments are not statistically significant in changing the frontiers for student enrollments. There was, however, a statistically significant relationship between a county's market structure – as captured by the HHI – and the efficiency of a community college as it relates to enrollments. Specifically, the HHI model illustrates that as a community college's market share of enrollments increases, their efficiency in producing enrollments decreases.[1]

Continuing on to the model where competition is operationalized as the number of FPCUs within a county, there are fewer statistically significant input variables but both the AIC and BIC suggest a relatively better fitting model than the previous model where competition was

[1] In measuring technical efficiency, positive coefficients represent increased inefficiency or decreased efficiency.

Table 2.3: Stochastic Frontier Estimates

	HHI		Intensity		Presence	
Ln (AcadSupp)	-0.178*	(0.107)	-0.233	(0.240)	-0.189**	(0.095)
Ln (InstSupp)	-1.101***	(0.120)	-1.058***	(0.182)	-1.123***	(0.138)
Ln (Instruction)	1.169**	(0.554)	1.478	(1.085)	0.997	(0.625)
Ln (Operations)	0.293***	(0.098)	0.251	(0.212)	0.299***	(0.091)
Ln (StudServ)	-0.370**	(0.174)	-0.444*	(0.251)	-0.329	(0.213)
Constant	9.011***	(3.458)	7.439	(5.399)	10.233**	(4.281)
lnsig2v						
Constant	-1.987***	(0.302)	-2.346	(1.446)	-1.869***	(0.259)
lnsig2u						
Competition	15.708**	(7.994)	-1.494***	(0.460)	-3.628	(2.769)
First Stage Residual	-5.688	(9.766)	0.260	(0.856)	2.166	(3.038)
Ln (PTEnroll)	-1.094	(0.769)	-1.181*	(0.629)	-0.992	(1.081)
Ln (BlackEnroll)	-0.238	(0.145)	-0.187	(0.133)	-0.273*	(0.148)
Ln (HispEnroll)	0.141	(0.231)	0.215*	(0.117)	0.154	(0.259)
Ln (PTFac)	-0.339*	(0.188)	-0.240	(0.302)	-0.270*	(0.151)
Constant	-5.741	(11.880)	9.876**	(4.384)	9.074	(6.863)
N	202.000		202.000		202.000	
AIC	302.928		296.477		303.947	
BIC	349.243		342.792		350.263	

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

operationalized as the HHI. As with the HHI model, there is a statistically significant relationship between competition and the efficiency of community college's in terms of producing student enrollments: an increase in the number of for-profits within a county *increases* the efficiency of community college enrollments. Finally, the model operationalizing competition as a dummy variable indicating the presence of any FPCU in a county displays no statistically meaningful relationship between competition and efficiency. Of the three models, however, the presence model has the worst relative model fit as indicated by the AIC and BIC values. Whereas the SFA model addressed the first research question of whether competition from FPCUs increased the efficiency of community colleges, the second research question of whether any efficiency gains due to competition lead to increased productivity in community colleges remains unanswered.

In order to explore the relationship between efficiency and degree production, I utilize an AR(1) population-averaged generalized estimating equation technique, which controls for first-order correlation in the error term of cross-sectional time-series data (Zorn, 2010). A marginal model, GEEs offer an attractive alternative to conditional approaches – such as fixed effects – for the topic at hand. First, while GEEs require the specification of the correlation structure of the data, GEEs are also robust to structural misspecification (Ballinger, 2004; Zorn, 2006). Therefore, while the persistence of inefficiency and lag in productivity gains gives reason to suspect that institutions are correlated within clusters over time – justifying the specification of an AR(1) process – there is little risk in specifying an AR(1) process over another correlation structure (Cui & Quian, 2007). Second, as a marginal approach, GEEs allow us to examine the average effect of efficiency and competition on degree production across the entire population of community colleges as opposed to within specific institutions as is the case with fixed-effect approaches (Gardiner et al., 2009). Third, the GEE approach is preferable to a random effects approach given the interest in the average effects of the covariates of interest *not* in effect of average effects on individual units. As such, I estimate the following equation:

$$ln(degreecount)_{it} = \alpha_0 + \alpha_1 COMP_{it} + \alpha_2 EFF_{it} + \alpha_3 X_{it} + \varepsilon_{it} \tag{2.5}$$

where i and t index individual community colleges and academic years respectively; *COMP* is a measure of competition; *EFF* is a community colleges efficiency score in a given academic year; X is a vector of institutional controls; and $\varepsilon_{it}$is the error term which follows an AR(1) process and takes the following form:

$$\varepsilon_{it} = \rho\varepsilon_{t-1} + \omega_t \tag{2.6}$$

In order to account for organizational inertia an AR(1) error term was used in place of a lagged dependent variable $ln(degreecount)_{it-1}$ for two reasons. First, the AR(1) process gives the lowest variance (e.g. most efficient) estimates for a given amount of data. Second – and pragmatically — the inclusion of a lagged dependent variable leads to a suppression of statistical power of the other independent variables in the model (Achen, 2001). Given the interest of the current analysis in the estimates on *EFF* and *COMP* an AR(1) process in the error term is preferred while still accounting for the inertial behaviors of community colleges.[2]

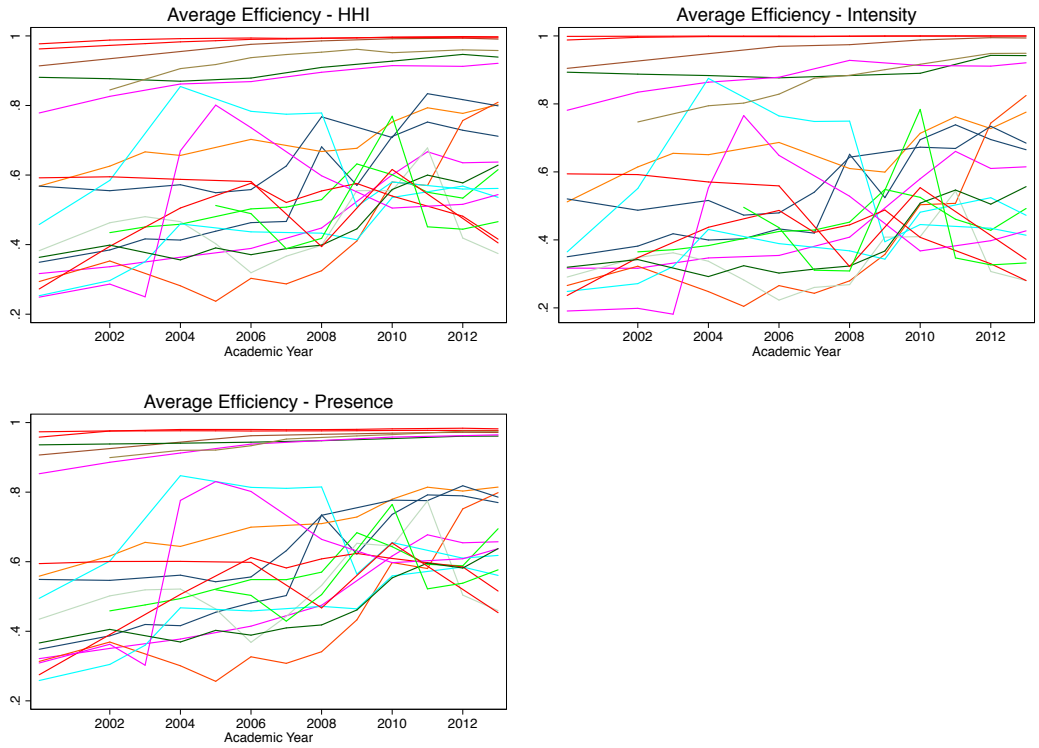
The utility of the specified GEE model is the inclusion of the *EFF* term which allows for an examination of whether a community college's efficiency contributes to degree production. Ranging from 0 to 1, each institution's efficiency score was produced by the preceding stochastic frontier analysis and represents the degree to which an institution is operating in terms of technical inefficiency with 0 illustrating complete inefficiency and 1 illustrating perfect technical efficiency. A visual representation of the efficiency scores for each institution over time is presented in Figure 2.

As illustrated by Figure 2, there is substantial variation between and within institutions in terms of technical efficiency, such differences allow any estimator to capture the statistical relationship between efficiency and productivity if the relationship exists. The results of the GEE specification are found in Table 2.4.

Across all three sets of GEE estimates, only the model operationalizing competition as the presence of a FPCU in a county finds that as a college's efficiency in enrollments increases, an

[2]The role of statistical power is even more important in the present context where n is small.

Figure 2.2: Average Efficiency Scores Over Time



institution's degree production decreases. Given the heavy weighting of enrollment in funding formulas for higher education institutions, both the lack of relationship between efficiency and productivity as well as the negative relationship between efficiency and productive is not unexpected: in the absence of outcomes-based performance funding, institutions have a greater incentive to increase enrollments than to increase degree production (Hillman et al., 2014, 2015; Rutherford & Rabovsky, 2014). This statement is additionally supported by the significant on the competition coefficient in model operationalizing competition as the HHI: in the instances where a community college's share of the market becomes more monopolistic, community colleges have less incentive to increase degree production. Across all three models spending on instruction is significantly and positively related to increases in degree production, suggesting that only those expenditures directly concerning student academic performance may lead to increased degree production (Ryan, 2004).

Table 2.4: AR(1) GEE Estimates

	HHI		Intensity		Presence	
Efficiency	-0.265	(0.364)	-0.195	(0.353)	-0.785**	(0.358)
Competition	-0.995*	(0.520)	0.027	(0.064)	0.218	(0.204)
First Stage Residual	0.416	(0.452)	-0.004	(0.054)	-0.144	(0.134)
Ln (AcadSupp)	0.084	(0.072)	0.091	(0.074)	0.100	(0.064)
Ln (InstSupp)	0.108	(0.146)	0.125	(0.141)	0.268**	(0.109)
Ln (Instruction)	0.353**	(0.155)	0.388**	(0.185)	0.262*	(0.154)
Ln (Operations)	-0.021	(0.055)	-0.014	(0.053)	-0.043	(0.053)
Ln (StudServ)	0.011	(0.075)	0.006	(0.076)	0.054	(0.074)
Ln (Enroll)	1.410	(1.143)	1.323	(1.085)	1.819*	(1.068)
Ln (Enroll) $\times$ Ln (Enroll)	-0.050	(0.064)	-0.043	(0.062)	-0.066	(0.059)
Ln (PTEnroll)	0.089	(0.116)	0.112	(0.101)	0.139	(0.120)
Ln (BlackEnroll)	-0.037	(0.065)	-0.046	(0.060)	-0.035	(0.065)
Ln (HispEnroll)	0.065	(0.045)	0.064	(0.046)	0.062	(0.050)
Ln (PTFac)	0.032	(0.070)	0.027	(0.074)	0.039	(0.078)
Constant	-5.989	(5.679)	-7.293	(5.075)	-9.977**	(4.703)
N	185.000		185.000		185.000	
χ^2	205.208		90.745		254.191	

Bootstrapped standard errors (1000 reps) in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

2.4 Discussion and Conclusion

The purpose of this study was to examine the degree to which competition from for-profit colleges and universities influences the efficiency and productivity of community colleges. Results indicate that competition – in the form of FPCUs – does increase the efficiency of community but these efficiency gains do not translate into gains on degree production. This finding is particularly relevant given the prevailing rhetoric surrounding the idea of a competitive market in higher education.

With microeconomic theory suggesting that competition will lead to increase efficiency – and many government interventions justified on the basis of increasing allocative efficiency – the results presented suggest the possibility of a higher education market in the two-year sector (Misra et al., 2012; Vining & Boardman, 1992; Vining & Weimer, 1988). In the absence of such competition, community colleges are monopolistic providers that may lead to welfare losses - a notion supported by the coefficients for *HHI* in both the SFA and GEE estimates (Seim & Waldfogel, 2010). Not

only does an increase in the market share of a community college lead to a decrease in technical efficiency, the empirical estimates also find support for the positive effects of competition with the number of FPCU competitors leading to efficiency gains in community colleges. The positive effect of competition on efficiency, however, may not necessarily capture the degree to which a FPCU and community college are actually competing for resources in the form of students but rather a community college reacting to the presence of competitors. Conceptually, this behavior aligns with a microeconomic framework: regardless of whether FPCUs are in actuality draining resources from community colleges, institutions may react to the mere threat of competition (Bridgman et al., 2008).

Whereas the SFA estimates provide evidence regarding the positive effects of competition – and the negative effects of monopoly – on the efficiency of community colleges, the GEE estimates illustrate that such efficiency may have either no impact of a negative impact on degree production. Although this may appear counterintuitive to some, such a relationship speaks to the larger discussions surrounding the rationale for performance-based funding policies in both public two- and four-year institutions: whereas traditional funding formulas were heavily weighed by inputs (e.g. enrollment), performance-based funding seeks to incentivize institutions to improve outcomes (e.g. degree production) in order to receive state appropriations (Dougherty et al., 2016). Given that Ohio did not implement performance-based funding for public two-year institutions until 2014 – and the present sample ends in 2013 – such a relationship is expected. Furthermore, these estimates illustrate the ineffectiveness of input-based funding: in the absence of an incentive to increase performance – in the form of graduation, completion, or attainment rates – institutions will seek to improve enrollment numbers without a corresponding improvement in outcomes (**?**). The results presented are especially salient in an era where researchers have begun to criticize or question the adoption of performance-based funding policies. In the absence of such policies it is quite possible that – in order to increase appropriations – community colleges will enroll students with no intention of or incentive to help the student successfully complete their course of study.

By focusing on the two-year sector, this study is able to minimize the concern of the extant

literature regarding the degree to which distance measures of competition are necessary in the study of higher education markets (Linick, 2014). As less selective institutions, both community colleges and FPCUs have been shown to compete on a geographic market dimension (Cellini, 2009, 2010). Considering the geographic location of community colleges – counties – it is plausible assumption that students deciding between a community college and a for-profit institution will be doing so among a geographically-bound set of alternatives (Iloh & Tierney, 2014). Similarly, although focusing on a single geographic location – the State of Ohio – sacrifices some external validity for internal validity, this study has the advantage of holding constant state-level variables such as regulatory environment and political support for public higher education (Nicholson-Crotty & Meier, 2002). Given the lack of information regarding the degree to which states are able to regulate the entry of FPCUs, an examination of the impact of FPCU entry on public institutions within a single state alleviates the degree to which omitted measures of the state's regulatory environment bias empirical estimates.

With the primary concern of this study being the impact of increased competition on the efficiency and productivity of community colleges, the results are unable to capture the mechanisms through which community colleges are increasing said efficiency. This question remains empirically difficult to examine and requires researchers to crack open the "black box" of postsecondary institutions as well as establish the degree to which there is a causal relationship between operations and performance. In light of the estimates noting both a negative as well as a lack of relationship between efficiency and productivity, a promising line of future research is the examination of the degree to which a focus on increasing input efficiency comes at the expense of increased degree production.

Overall, this study contributes to the larger policy discussions surrounding the degree to which public sector institutions are able to become more efficient when faced with private sector competition. Illustrating that community colleges – when faced with competition from FPCUs – increase technical efficiency but such increases in technical efficiency *do not* lead to increases in productivity, results converge with findings of others which suggest that future policies

must take into account the relationship between community colleges, FPCUs, and the incentives embedded in performance-based as well as regulatory policies (Cellini, 2009, 2010). Specifically, both policymakers as well as researchers would be wise to consider the policies and incentives embedded in these policies to increase efficiency. For example – are community colleges changing admissions practices to target students who are likely to enroll but less likely to complete their degree? Moreover, do the results presented here change following the adoption of performance-based funding policies which shift the incentive structure of postsecondary institutions from inputs to outputs? While these questions remain unanswered, results illustrate that one segment of a higher education market may be empirically realized even if in unexpected ways.

Chapter 3

Modeling For-Profit College Entry and Exit: An Application of the Split-Panel Jackknife

3.1 Introduction

From 2000 to 2010 undergraduate enrollments in for-profit colleges increased from 0.4 million to 1.7 million students, considerably altering the postsecondary education landscape. Despite the sector's exponential growth – as well as the interest of policymakers in the behavior of for-profit colleges – much of the extant research remains descriptive (Cellini, 2005). Those studies examining for-profit colleges are often performance evaluations focused primarily on student labor market outcomes without accounting for the environment in which for-profit colleges operate (Cellini & Chaudhary, 2014; Cellini & Turner, 2016; Hillman, 2014; Jaquette & Parra, 2016). Furthermore, few studies examine why there are more institutions operating in some markets than others – an oversight compounded by several other factors.

First, while there have been criticisms leveraged against for-profit colleges for engaging in predatory marketing and enrollment strategies aimed at specific communities – typically, urban minority populations – these assumptions are rarely evaluated empirically (Holland & DeLuca, 2016). Those studies examining such claims tend to focus on the decisions of students as opposed to the behavior of institutions. Or rather, studies examine the enrollment decisions and patterns of students – the demand for for-profit education – as opposed to the location decisions of for-profit colleges which is the supply of for-profit education (Chung, 2012; Iloh & Tierney, 2014). Second, although there is an emerging body of literature concerning educational deserts – areas

where students have few postsecondary options from which to choose – this set of studies provides static estimates of institutional counts and focus on the degree to which educational deserts are systematically drawn around traditionally disadvantaged populations (Hillman, 2016). This study remedies such oversights by empirically modeling the entry and exist decisions of for-profit colleges at the county level. Specifically, these decisions are modeled by the split-panel jackknife probit estimator, which allows for the inclusion of unbiased fixed effects in a nonlinear model. Through applying this estimator to examining the supply decisions of for-profit colleges, this study evaluates the degree to which the normative claims of the extant literature are empirically realized.

3.2 Review of the Relevant Literature

Little research directly examines the local conditions that lead to the market entry and/or exit of for-profit colleges. Two major exceptions, however, examine the impact of the broader policy environment on the market share of for-profit colleges. Finding that an increase in taxpayer support for community colleges – in the form of bond measures providing institutions with an additional source of revenue – decreases the entry of for-profit colleges into a given market, Cellini (2009) notes "policymakers should consider these two types of institutions together in designing effective policies in the two-year college market" (25). A later study by Cellini (2010) also found that an increase in the per-student award of federal and state grant programs encourages the entry of for-profits into a market – defined as a county – while also increasing community college enrollments – findings that suggest "need-based financial aid programs...provide incentives for [for-profit] entry" (549). Cellini also notes, however, the need for further research determining the specific market characteristics incentivizing for-profit entry. Despite Cellini's results illustrating the interaction of for-profits with their larger policy environment, the generalizability of Cellini's studies is unknown for several reasons.

First, Cellini examines for-profit colleges in one state: California. While little is known regarding the extent to which the regulation of for-profits varies by state, an examination of market entry across states would provide a more generalizable estimation of the phenomena.

Specifically, as one of the first states to pass major legislation regarding for-profit colleges – as well as having one of the largest systems of public institutions in the country – California may not be generalizable to other state environments (Cellini, 2005). With policy analysis being interested in the development of generalized statements regarding relationships, a more generalizable estimation of the relationship between market structure and firm entry and exit is critical (Smith & Sweetman, 2016). Second – and perhaps stemming from the first limitation – Cellini's studies provide reduced-form estimates of for-profit entry with little examination of the local market characteristics which impact a for-profit's decision to enter or exit a market. Finally, Cellini's theoretical foundation rests on the market entry models of Bresnahan & Reiss (1987) as well as Bresnahan & Reiss (1991). Modeling the entry of firms into small isolated markets, the models of Bresnahan and Reiss are best suited for markets with a small number of entrants. In the present context, this assumption is problematic due to the expectation that in some markets there will be few – if any – for-profit colleges while others may have a large number of entrants. Due to these limitations, as well as the limited number of studies directly examining for-profit entry/exit, other bodies of literature are explored.

In addition to the literature examining postsecondary education markets, a body of literature examines the location decisions of both charter and private schools. While several criticisms of the higher education markets research also apply to the K-12 markets research, the utility of studies examining the supply decisions of private and charter schools stems from the use of comparable measures of educational supply and demand. Several studies, for example, note the need for any empirical specification of market entry to capture the heterogeneous demand for education within a specific market. Stated differently: alternative forms of education service delivery are more likely to locate in areas served by low-performing public schools (Bifulco & Buerger, 2015; Downes & Greenstein, 1996; Glomm et al., 2005; Zhang & Yang, 2008). A major limitation of generalizing the findings of studies examining the supply decisions of charter and private schools to the supply decisions of for-profit colleges, however, stems from the lack of comparable performance measures in the postsecondary sector. While several proxies for school

quality – such as per-pupil expenditures – have been used and have comparable measures in the postsecondary sector, the relationship of such measures to supply decisions is unknown (Downes & Greenstein, 1996; Webber & Ehrenberg, 2010). Theoretical and empirical developments, however, illustrate that increases in support for public firms can both decrease the likelihood of private firm entry as well as increase the likelihood of private firm exit (Dinerstein & Smith, 2014; Turner, 2003). Overall, the K-12 literature is limited due to the absence of a widely accepted model of firm behavior as it relates to the non-profit status of private and charter schools (Downes & Greenstein, 1996). In other words: it is unknown what private and charter schools are attempting to maximize in the absence of a profit generating mechanism. Deriving an objective function of for-profit colleges, however, is possible after examining research on the economics of hospitals.

Offering several parallels to studies on the economics of higher education – in both health and education, firms, which can be non-profit, for-profit, or government operated, produce experience goods – studies on the market share of various hospital service arrangements also provide a proxy for regulatory climate: with research finding higher tax rates decrease the market share of for-profit hospitals (Gulley & Santerre, 1993; Hansmann, 1987; Marwell & McInerney, 2005). As profit-maximizing firms, it is assumed that for-profit colleges will take into account the compliance costs of local regulation – such as income and property taxes – when deciding to enter a specific market (Levinson, 1996; Lin & Sun, 2016). The degree to which there is an empirical relationship between firm entry and state regulatory environment, however, remains unclear with recent studies finding that the behavior of existing firms is often a stronger predictor of firm entry and exit than any formal regulatory structure (Espínola-Arredondo & Muñoz-García, 2016; Hollingsworth, 2014). Research on the economics of hospitals also illustrates the role of consumer base in firm behavior: whereas non-profits tend to serve a relatively elite consumer-base, public and for-profit institutions often compete for a relatively disadvantaged clientele (Hansmann, 1987). As such, it can be expected that in the presence of a larger number of disadvantaged consumers, the probability of a for-profit firm entering a specific market will increase. Additionally, the economics of hospitals literature recognizes the role of transit costs on the behavior of for-profit firms: both firms and individuals

will attempt to minimize the transportation costs associated with consuming a good (Dranove et al., 1999). As profit-maximizing producers, the probability of for-profit colleges entering a market will be greater in markets where the search and travel costs imposed upon individuals consuming a good decreases (Hoxby, 1997; Reum & Harris, 2006).

While still meager, the research on firm entry is robust when compared to the research on firm exit as it relates to both K-12 schools as well as postsecondary institutions. Given that for-profit colleges often establish themselves as efficient alternatives to cumbersome public institutions, modeling the exit decisions of for-profit colleges proves just as important as modeling for-profit entry: a for-profit college cannot remain a viable alternative to public and non-profit institutions if it does not remain in the market (Pandey et al., 2009). Furthermore, while several studies explicitly examine the drivers of postsecondary institution closure, these studies focus almost exclusively on the enrollment characteristics of schools and not the market in which these institutions operate (Bates & Santerre, 2000; Porter & Ramirez, 2005). As such, this study provides – to the author's knowledge – one of the first studies to empirically and systematically examine the market-level variables related to postsecondary firm exit.

3.3 Conceptual Framework

This study draws upon microeconomic theory. For-profit colleges – as firms – operate in quasi-markets where they must compete with other institutions for resources such as funding, students, faculty, and other indicators of market position (Winston, 1999). Due to the wide variation across markets – where tuition levels, public subsidies, and financial aid packages all vary considerably across sector – many studies question the extent to which a generalizable objective function of firm behavior exists in higher education (Hoxby, 2013; Zemsky et al., 2001). Given the focus of the present study being on one segment of the higher education market, such concerns are alleviated and objective function of for-profit college behavior can be specified (Coates & Humphreys, 2002). Specifically, it is assumed that for-profit colleges seek to maximize profits while public and non-profit colleges seek to maximize a mission (aside from profit maximization) given a budget

constraint. Since it is logically impossible to maximize more than one dimension at the same time, it is assumed that for-profit colleges are solely profit maximizers and will only enter a market if such an action is expected to be profitable (Jensen, 2001; Kofoed, 2013). Therefore, the probability of a firm (*i*) entering a market (*j*) is a function of the expected total revenue (*TR*) and expected total costs (*TC*) associated with each market:

$$U_{ij} = U(TR_j, TC_j)$$

As fully profit-maximizing firms, for-profit colleges will only locate in markets where $TR_j \geq TC_j$ (Walrath, 2010). Following this logic, it can be assumed that in the absence of any exit barriers a for-profit will exit when they are unable to obtain a normal rate of profit (Bates & Santerre, 2000).

3.4 Research Design

3.4.1 Data

To examine the impact of local market structures on the entry and exist decisions of for-profit colleges, this study draws on a dataset of United States counties from 2007 to 2012. While there is little agreement upon how to define a higher education market, previous research notes that students attending for-profit colleges often do so within a 14-mile radius from their home (Cellini, 2010). Therefore it is a plausible assumption that students will not travel outside of their counties to attend a for-profit college. The Delta Cost Project from the U.S. Department of Education IPEDS Database provides information on the number of for-profit colleges operating within a county in a given year. Data on the demographics and market structures of counties is provided by the American Community Survey, the Bureau of Labor Statistics, and the Tax Foundation.

3.4.2 Estimation Strategy

From the utility function outline above it is natural to use discrete choice estimation techniques. Under a discrete choice framework, each for-profit college chooses one of two possible actions: to enter/exit a market or not (Bresnahan & Reiss, 1991). As such, the following probit model is estimated:

$$Y_{jt}^{*} = X_{jt}\beta + d_j + d_t + \rho_{jt} + \varepsilon_{jt} \tag{3.1}$$

where Y_{jt}^{*} is a latent variable correlated with the likelihood of a for-profit exiting or entering county j at time t. While Y_{jt}^{*} is a function of supply and demand factors, it is not observable. Instead a binary variable Y_{jt} is observed, taking on a value of 1 if there is for-profit entry (or exit) in county j at time t and 0 otherwise using the following rule:

$$Y_{jt} = \begin{cases} 1 & Y_{jt}^{*} \geq 1 \\ 0 & otherwise \end{cases} \tag{3.2}$$

$X_{jt}$is a vector of explanatory variables including tax rates, wages, unemployment rate, educational level, veteran population, for-profit density, non-profit/public institution density, transportation costs, and population; β is a vector of corresponding estimated coefficients; d_j and d_t capture county and time fixed-effects respectively, and ε_{jt} is the error term (Draganska et al., 2008; Wong et al., 2010)

In order to solve the potential endogeneity problem of market entry and/or exit being driven by the presence of unmeasured, time-invariant county characteristics, a fixed-effects approach is employed. The use of fixed-effects in nonlinear panel models, however, are often biased due to the incidental parameter problem: any estimate will be a function of the estimated fixed effects (Bargain & Melly, 2008; Fernández-Val & Weidner, 2016). In order to correct for any incidental parameter bias that may be introduced by the inclusion of fixed-effects, a panel jackknife bias correction is applied. To illustrate the correction let $\hat{\theta}$ represent the bias corrected estimates

produced by the following equation:

$$\hat{\theta} = (\tau + 1) * \gamma - (\tau - 1) * \gamma_1 - \gamma_2 \tag{3.3}$$

Where γ is the uncorrected fixed effect estimator using the entire sample, γ_1 is the mean of the τ uncorrected fixed effect estimators for each of the τ subpanels in which one time-period is left out; γ_2 is the mean of the two sub-panels in which half of the sample is left out (Fernández-Val & Weidner, 2016).

An automatic method of bias correction, the jackknife technique requires a researcher to meet relatively few assumptions when compared to other bias-correction techniques (Efron & Gong, 1983). When applied to panel data, however, the jackknife correction assumes stationarity over time for the processes of the observed variables (Dhaene & Jochmans, 2015; Fernández-Val & Weidner, 2016; Kunsch, 1989). In the instance that the processes of the observed variables are not stationary test statistics no longer follow expected distributions and estimates may be wildly inflated (Choi, 2001; De Wachter et al., 2007). In order to avoid violating this assumption – and producing spurious estimates – two separate unit root tests for panel-data were conducted: the Augmented Dickey Fuller test and the Phillips-Perron test. For both tests the null-hypothesis states that all panels contain a unit root and a rejection of the null hypothesis indicates that at least one panel is stationary. Both tests reject the null hypothesis and provide evidence that the assumptions for the jackknife correction are met.

3.4.2.1 Variable Selection

Returning to the model specified in Eq. (2.1), the choice of explanatory variables is informed by the empirical literature from related fields. In addition to several conventional measures of demand for postsecondary education – such as high school enrollment *(HSENROLL)* and population age 25 and older without a college degree *(EDU)* – Eq. (2.1) also includes measures related to firm entry and exit broadly speaking. One such measure – the total number of for-profits divided by a county's population (*STRUC*) – allows for an examination of the degree to which the market niche

for a for-profit education is filled. In the instance that this niche is already filled, there will be a negative relationship between for-profit density and the probability of firm entry in county *j* during year *t* (Arauzo-Carod & Teruel-Carrizosa, 2005; Harrison & Laincz, 2008). Ignoring the potential endogeneity of *STRUC* – or the possibility that a county's market structure is likely correlated with unmeasured locational factors that influence the market structure of its neighbors – runs the risk of producing estimates which are only descriptive in nature. To address this endogeneity, I explicitly model the spatial correlation of market structure by including a spatial lag of the raw number of for-profit institutions in neighboring counties. Similar to a lagged dependent variable model, the inclusion of a spatial lag allows for the possibility that counties with specific market structures, resulting in a spatial trend in the decision to enter or exit a specific county. The inclusion of the spatial lag - ρ - is efficiently estimated via maximum likelihood and unbiased when corrected via the jackknife technique (Hahn & Newey, 2004; Kalenkoski & Lacombe, 2008). Given the interest of the present study in simply controlling for the possibility of spatial spillovers, *not* the interpretation of such spillovers, the marginal effects for direct, indirect, and total impacts are not calculated.

In addition to *STRUC*, *TRANSP* also captures the potential costs incurred by for-profits in specific markets. Operationalized as the share of a county's population which commutes via public transportation, *TRANSP* represents the ease in which an individual can travel to an institution of their choice. It is expected that as the ease with which an individual can travel to an institution increases – and the costs associated with doing so decrease – the probability of firm entry is higher and the probability of firm exit is lower (Arthur, 1990; Reum & Harris, 2006). Vector *X* in Eq. (3.1) also contains two additional explanatory variables of interest: *MILITARY* and *BUSINESS*. The inclusion of *MILITARY* – the percentage of a county's population having served in the military – is necessary due to claims of for-profits preying on military populations and the federal funds attached to such students (Deming et al., 2012). As profit-maximizing firms, it is expected that as *MILITARY* increases the probability of firm entry also increases.

Adopting a strategy similar to that of Hansmann (1987), Chang & Tuckman (1990), as well

as, Gulley & Santerre (1993) who all find that a market's tax structure influences the share of for-profit hospitals, *BUSINESS* captures the impact of a state's business climate on the entry and exit decisions of for-profit colleges. An operationalization of the Tax Foundation's *State Business Tax Climate Index*, each state's *BUSINESS* score is generated through a comparison of states on more than 100 variables in the five major areas of taxation: corporate, individual, unemployment, insurance, and property tax. Following this comparison, each state is assigned a score from 0 to 10 representing a state's relative position with 0 representing the state with the worst relative business climate Walczak et al. (2017). The inclusion of *BUSINESS* allows for an assessment of the degree to which for-profit colleges behave in a manner similar to traditional for-profit businesses. An additional measure, *LABOR* – the annual median wage for postsecondary vocational educators – captures the labor costs incurred by for-profit colleges within a specific market. It is expected that as *LABOR* increases the probability of for-profit entry decreases and the probability of for-profit exit increases.

In order to isolate the effects of the aforementioned variables, vector X in Eq. (3.1) includes several other socioeconomic controls: total population (*POP*), per capita income (*INCOME)*, and the percent of the population which is white (*DIVERSITY)*. *DIVERSITY* is included due to claims that for-profit colleges specifically target minority communities and studies; if this is the case *DIVERSITY* will be significantly and negatively associated with for-profit entry. In order to facilitate ease of interpretation all variables were standardized. Table 3.1 presents summary statistics of all variables.

3.5 Results

Table 3.2 reports the probability of firm entry from three different specifications: pooled maximum likelihood estimates which ignore the cross-sectional, time series nature of the data; uncorrected fixed-effect maximum likelihood estimates which are shown to produce biased estimates; and

Table 3.1: Summary Statistics

	M	*SD*	*Min*	*Max*
Entry	0.31	0.46	0.00	1.00
Exit	0.10	0.30	0.00	1.00
zPOP	0.39	1.39	-0.47	16.53
zHSENROLL	-0.01	0.91	-3.73	3.28
zEDU	-0.07	0.94	-1.40	2.44
zINCOME	0.22	1.09	-2.17	6.15
zMILITARY	-0.25	0.95	-2.68	3.54
zDIVERSITY	-0.30	1.06	-4.10	1.21
zTRANSP	-0.04	1.02	-1.40	8.30
zLABOR	-0.03	1.00	-2.53	3.36
zBUSINESS	-0.04	1.02	-2.08	3.10
zURATE	-0.03	0.95	-2.01	3.63
zSTRUC	0.47	1.00	-0.96	6.41
zCOMP	-0.00	0.85	-1.07	4.58
Observations	1927			

maximum likelihood estimates corrected for bias via the split-panel jackknife. All three sets of estimates are presented in order to address the changes between coefficients across model specifications as well as illustrate the dangers with interpreting either naive (i.e. pooled) or biased (i.e. uncorrected) estimates as causal in applied policy research.

Table 3.2 illustrates an almost universal switching of signs between the naive estimates and the estimates corrected for bias via the split-panel jackknife. Although the importance of such changes should be obvious, the difference between models also illustrate the potential dangers associated with naive and/or bias estimation strategies utilized across applied policy research. Given the popular discussions and assumptions surrounding the behavior of for-profit institutions, the interpretation of the naive estimates as causal could result in ineffective or counterproductive policies and regulation. For example, while the naive estimates suggest that as the diversity of a county's population increases so does the probability of for-profit entry, the bias-corrected estimates illustrate that the probability of for-profit entry increases with increases in a county's *white* population. This relationship is mirrored in the switch on the directionality of the estimate

Table 3.2: Estimates for Firm Entry

	MLE		F.E. MLE		B.C. MLE	
zPOP	0.435***	(0.109)	2.828*	(1.639)	-18.829***	(1.309)
zHSENROLL	-0.050	(0.035)	0.103	(0.106)	0.093	(0.099)
zEDU	-0.043	(0.033)	0.401*	(0.219)	-0.505***	(0.181)
zINCOME	0.156***	(0.042)	0.638*	(0.328)	-0.593*	(0.303)
zMILITARY	-0.165***	(0.047)	-0.326	(0.268)	-0.714***	(0.213)
zDIVERSITY	-0.161***	(0.036)	0.074	(0.389)	1.247***	(0.368)
zTRANSP	-0.211***	(0.045)	-0.063	(0.122)	0.191*	(0.114)
zLABOR	-0.017	(0.038)	-0.206*	(0.111)	-0.218**	(0.089)
zBUSINESS	0.044	(0.038)	-0.928***	(0.275)	-1.473***	(0.204)
zURATE	0.105***	(0.035)	0.085	(0.179)	-0.576***	(0.154)
STRUC	0.581***	(0.050)	3.410***	(0.368)	-2.190***	(0.246)
COMP	-0.087**	(0.034)	-0.953	(0.599)	0.894**	(0.380)
ρ	-0.035***	(0.013)	-0.495	(0.396)	10.290***	(0.245)
Constant	-1.282***	(0.049)	0.103	(1.085)		
N	4457.000		1927.000		1927.000	
χ^2	384.533		.		861.745	
Loglikelihood	-1346.916		-756.989		-756.989	

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

for *URATE* – whereas naive models would lead an analyst to believe that for-profit entry increases with increases in unemployment rate, the bias corrected estimate suggest the opposite.

As illustrated by Table 3.3, the naive pooled maximum likelihood estimates indicate a significant relationship between firm exit and almost every explanatory variable. The difference in the strength, significance, and direction between the naive estimates and the bias correct model, however, illustrate the dangers in the assumptions made by the naive model: specifically, that there is no correlation between individual counties across years or between counties within the same year. The misleading estimates produced by the naive estimates are illustrated by examining variables of interest. For example, whereas the naive estimates present no statistical relationship between veteran population and for-profit exit, the bias-corrected estimates display a negative, statistically significant relationship between veteran population and for-profit exit. Similarly, whereas the naive estimates would lead an analyst to believe that there is a negative relationship

Table 3.3: Estimates for Firm Exit

	MLE		F.E. MLE		B.C. MLE	
zPOP	-0.149*	(0.088)	-1.112	(2.042)	-6.950***	(1.572)
zHSENROLL	-0.006	(0.036)	-0.006	(0.131)	-0.381***	(0.116)
zEDU	0.144***	(0.038)	0.259	(0.219)	2.898***	(0.205)
zINCOME	0.205***	(0.040)	-0.001	(0.424)	-0.040	(0.378)
zMILITARY	-0.030	(0.041)	0.310	(0.294)	-0.817***	(0.252)
zDIVERSITY	-0.158***	(0.033)	-0.433	(0.399)	-0.499	(0.412)
zTRANSP	-0.136***	(0.038)	-0.204	(0.164)	-0.313**	(0.151)
zLABOR	-0.023	(0.035)	0.077	(0.142)	0.595***	(0.114)
zBUSINESS	-0.023	(0.040)	1.382***	(0.338)	2.363***	(0.259)
zURATE	0.038	(0.036)	-0.146	(0.239)	-0.124	(0.207)
STRUC	0.051	(0.032)	-1.463***	(0.286)	3.416***	(0.224)
COMP	0.004	(0.036)	0.751	(0.533)	2.687***	(0.378)
ρ	0.039***	(0.013)	0.247	(0.348)	-3.516***	(0.284)
Constant	-1.814***	(0.052)	-1.147	(1.506)		
N	4457.000		1136.000		1136.000	
χ^2	127.037		.		243.266	
Loglikelihood	-880.410		-469.351		-469.351	

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

between a county's white population and for-profit exit, the bias-corrected estimates reveal that there is no statistically meaningful relationship between the diversity of a county's population and for-profit entry. Likewise, the naive model understates the relationship between several variables and firm-exit: while *TRANSP*, *POP*, and *EDU* remain significant and maintain the same directionality across models, the magnitude of the relationship is greater for all three in the bias-corrected model. Finally, *HSENROLL*, *LABOR,* and *BUSINESS* – which would be interpreted as non-statistically significant in a naive estimation strategy – are all statistically significant when applying the bias-corrected estimator. Additionally, Table 3.3 presents an almost total lack of statistical significance and the absence of a χ^2 statistic in the uncorrected fixed-effects model; providing evidence for the incidental parameters problem known to plague non-linear models.

While a comparison of the coefficients in Tables 3.2 and 3.3 allow for an examination of the different conclusions that can be drawn between the naive, biased, and bias-corrected estimators, the main interest in discrete choice models is identifying the effects of changing a regressor on the

Table 3.4: Average Partial Effects

	Entry		Exit	
zPOP	-0.162***	(0.219)	-0.258***	(0.136)
zHSENROLL	0.009	(0.115)	-0.012**	(0.007)
zEDU	0.032**	(0.031)	0.092***	(0.026)
zINCOME	0.057	(0.050)	0.010	(0.022)
zMILITARY	-0.073***	(0.029)	-0.007**	(0.032)
zDIVERSITY	0.067***	(0.036)	-0.047	(0.046)
zTRANSP	-0.002	(0.012)	-0.024*	(0.020)
zLABOR	-0.035*	(0.016)	0.020***	(0.010)
zBUSINESS	-0.172***	(0.062)	0.177***	(0.126)
zURATE	-0.020***	(0.157)	-0.016	(0.018)
zSTRUC	0.328***	(0.218)	0.005***	(0.133)
zCOMP	-0.137*	(0.071)	0.131***	(0.071)
ρ	0.256***	(0.040)	-0.086***	(0.028)
N	1927		1136	
χ^2	861.745		243.266	

Standard errors in parentheses
* $p < .1$, ** $p < .05$, *** $p < .01$

conditional probability of firm entry or exit which is captured through the average partial effects presented in Table 3.4.

Turning first to for-profit entry the average partial effects illustrate that a one standard-deviation increase in population reduces the probability of a for-profit entering county j in year t by approximately 16.2%; likewise, a one standard-deviation increase in population also reduces the probability of a for-profit college exiting county j in year t by approximately 25.8%. In terms of demographic explanatory variables, the educational characteristics of a county's population are statistically significant in predicting both firm entry and exit. First, for every standard deviation increase in a county's high school enrollment, the probability of for-profit exit increases 1.2%. Suggesting that for-profit colleges and universities may be more interested in entering markets with a larger "untraditional" study body, this estimate is supported by the estimate on *EDU*: for every standard deviation increase in the proportion of a county over the age of 25 without a college

degree, the probability of for-profit entry increases 3.2%. Conversely, for every standard deviation in the proportion of a county over the age of 25 without a college degree, the probability of for-profit exit also increases 9.2%. One possible explanation for this result is the differing mission of for-profit colleges and universities: although often treated homogeneously, some for-profits are more likely to target untraditional students than others such as institutions which focus on vocational skills as opposed to business or other professional programs.

Other estimates suggest that for-profit colleges and universities may be relatively risk adverse and avoid predominately minority counties as well as those counties in which students are unable to afford the costs of their programs. Whereas *DIVERSITY* illustrates that the probability of for-profit entry increases approximately 6.7% for every standard deviation increase in a county's white population, *URATE* shows that the probability of for-profit entry decreases approximately 2.0% for every standard deviation increase in unemployment rate. Likewise, the partial effect for *MILITARY* indicates that for every standard deviation increase in the percentage of a county's veteran population, the probability of for-profit entry decreases 7.3% – casting further doubt upon the assumptions of the extant literature. The relationship between *LABOR* and for-profit entry as well as exit is expected: a standard deviation increase in a county's labor costs decreases the probability of firm entry by approximately 3.5% and increases the probability of firm exit by approximately 2.0%.

Finally, the relationship between for-profit entry/exit and the last variable of interest – *BUSINESS:* for every standard deviation increase in the "friendless" of a state's business climate the probability of for-profit entry decreases by approximately 17.2%. Conversely, for every standard deviation increase in the "friendliness" of a state's business climate the probability firm exit increases by approximately 17.7%. Although at face value unexpected, literature on the economics of entry-deterrence provides an explanation for this relationship: in the absence of any formal for-profit regulation the behavior of existing firms in a market conveys the marginal costs and benefits associated with a specific market environment (Espínola-Arredondo & Muñoz-García, 2016; Milgrom & Roberts, 1982). In this scenario, a less friendly business environment

(e.g. one with more "regulations") may enhance the profit of existing firms while deterring new ones. Specifically, for-profit firms who are able to survive and adapt in an unfriendly business environment may increase their outputs or inputs – such as student enrollments – to deter potential entrants from entering the market due to the strong market hold of existing firms (Dinerstein & Smith, 2014). Future research may benefit from exploring this relationship in further detail as well as examining the extent to which such behaviors cause welfare losses.

3.6 Discussion and Conclusion

The purpose of this study was to structurally model and quantitatively analyze the county-level market factors associated with the probability of for-profit college entry and exit. The results – which illustrate no meaningful relationship between for-profit entry/exit and disadvantaged populations – cast doubt on the popular assumptions and discourse surrounding for-profit colleges. With much of the current literature on for-profit colleges presenting the institutions as predatory actors targeting disadvantaged – often minority – populations, the coefficients and partial effects on measures of these populations – *URATE, MILITARY, DIVERSITY* - suggest for-profits are more likely to enter predominately white, well employed, civilian counties. Furthermore, those measures which are statistically significant suggest the structural characteristics of markets are stronger predictors of firm entry and exit: for-profits are more likely to enter counties where a high number of for-profit colleges already operate. The exception to this generalization are those counties with less friendly business environment; a finding which suggests that for-profits are engaging in a more complex game of entry than one of simply weighing the marginal costs and revenues of specific markets. Overall, however, these results are not unexpected when considering the current literature: those studies analyzing for-profit colleges often examine only one side of the supply and demand equation. Stated differently: much of the extant literature examines the decisions of students to enroll in a for-profit institution and then infer from such decisions that students were purposefully misled by the for-profit in which they enrolled (Holland & DeLuca, 2016; Iloh, 2016; Iloh & Tierney, 2014). This shortcoming is further compounded by the fact that

these studies are often qualitative and lack generalizability outside of the context in which they were conducted (Iloh & Tierney, 2014; Iloh, 2016; Kutz, 2010). As such, the estimates presented above represent a generalizable approach to examining the behavior of for-profit colleges while also providing one of the first applications of a novel bias correction method in the policy analysis literature.

In addition to the substantive contribution of this study, the results presented also contribute methodologically. Given the interest of policy analysts in analyzing the change of a specific economic actor over time while also accounting for endogeneity, a fixed-effects approach represents a convenient and appropriate means of doing so (Cellini, 2008). The use of fixed-effects, however, becomes complicated in the context of non-linear models due to the possibility of the incidental parameters problem producing biased estimates (Fernández-Val, 2009; Neyman & Scott, 1948). Such a problem is unfortunate due to the utility offered by structural models to the realms of policy analysis and program evaluation, warranting the study and use of novel methodologies for inclusion in a policy analyst's methodological toolbox (Low & Meghir, 2017; Pathak & Shi, 2017). While the technical details of the bias correction are summarized above, this study represents one of the first applications of the jackknife bias correction technique for panel data to a substantive policy area (Clapp et al., 2017; Dubois et al., 2017). Given the divergence between the bias corrected estimator and the conventional fixed effect estimator in Tables 2.2 and 2.3, further application of the technique would prove fruitful across policy realms.

Outside of the methodological contributions of the present study outlines above, the results presented also illustrate the need for a more nuanced understanding of for-profit college behavior. Aside from those studies examining the labor market outcomes of students enrolled in for-profit colleges, much of the literature concerning for-profit colleges is riddled with normative claims of for-profit behavior without providing generalizable estimates supporting such claims. By providing evidence that for-profit entry and exit is influenced heavily by existing market structures, this study attempts to move the extant literature away from descriptive – and often normative – accounts of for-profit college behavior and toward a body of literature providing methodologically rigorous

and generalizable estimates of for-profit behavior.

Chapter 4

Information Disclosure Policies as Policy Instruments: a Comparison of Methods

4.1 Introduction

A great amount of scholarly – as well as journalistic – attention has been devoted to the topic of college affordability as it relates to public postsecondary institutions; relatively fewer studies, however, have examined the relationship between public policy and private postsecondary institutions (Delaney & Kearney, 2015; Jaquette & Hillman, 2015). Given the substantial growth in the cost of attending for-profit institutions in recent years, emerging evidence that students attending for-profit institutions earn less than their public and non-profit counterparts, and rising borrowing and default rates in the for-profit sector, scholars and policymakers have begun expressing interest in the relationship between public policy and the costs of for-profit institutions (Cellini & Daroila, 2013; Cellini & Turner, 2016). Despite the growing concern over college affordability – especially as it relates to for-profit institutions – there exists no clear consensus regarding the factors associated with tuition levels in the private sector. In attempts to examine possible drivers of for-profit institution tuition levels, this study leverages an under utilized resource: the Department of Education's *Financial Responsibility Composite Scores* (FRCS/scores).

Established to offer protection to taxpayers and students, an institution's score serves as a *regulatory transparency policy*: a form of information disclosure that attempts to correct market failures while improving welfare (Weil et al., 2006). Although the impact of information disclosure

policies are widely discussed in the realm of environmental policy, the empirical impact of these programs remains understudied in different policy settings (Bae, 2012; Delmas et al., 2010). Given the recent expansion of regulation-through-information policies – as opposed to traditional command-and-control approaches – this study attempts to provide insight into the effectiveness of information disclosure policies when applied to education policy issues as well as the various strengths and weaknesses of information disclosure and similar regulation-through-information strategies broadly speaking. As such, this study contributes to the growing body of literature examining the intricacies of various policy instruments as well as providing insight into the differential behavior of private postsecondary institutions – specifically for-profit institutions. To do so, I discuss the goals of the FRCS program and similar information disclosure policies, briefly survey previous research on the tuition setting behaviors of postsecondary institutions, followed by an econometric analysis of the impact of an institution's score on tuition levels using several methods to control for endogeneity. Finally, I discuss the implications of this study's results for both postsecondary education policy as well as policy instrument design broadly speaking.

4.2 Financial Responsibility Scores as Policy Instruments

Reflecting the relative financial health of private non-profit and for-profit postsecondary institutions, an institution's score helps the Department of Education determine whether an institution maintains the financial standards necessary to participate in Title-IV programs – the primary source of federal funding for higher education.[1] Although similar to traditional command and control regulations – the scores allow the government to monitor institutional compliance with federally mandated standards of financial health with non-compliance punished through the removal of Title-IV eligibility – the scores are in actuality regulatory transparency policies. Seeking to change the behavior of consumers and/or sellers in specific ways, regulatory transparency policies – such as the FRCS program– attempt to remedy an instance of information

[1] Title-IV programs include loans (e.g. Direct Loans), grants (e.g. Pell Grants), as well as the federal work study program.

symmetry known as the "consumer protection problem:" the FRCS program attempts to incentivize financially responsible practices of institutions while also attempting to insure that potentially uninformed parties – such as students and/or their parents – are adequately informed regarding the good they are purchasing (Dill & Soo, 2004; Fraas & Lutter, 2016). Specifically, each score is calculate from three ratios taking into account the financial health of an institution:

1. An institution's *Primary Reserve Ratio* – a measure of viability and liquidity – is an institution's adjusted equity divided by total expenses.

2. An institution's *Equity Ratio* - a measure of capital resources and ability to borrow – is an institution's modified equity divided by modified expenses.

3. An institution's *Net Income Ratio* - a measure of profitability - is an institution's income before taxes divided by total revenues.

Following the weighted sum of the above ratios, each institution's score ranges from -1.0 to 3.0. Institutions receiving a score of less than 1 are considered "not financially responsible" and are subject to provisional Title-IV certification and cash monitoring; institutions receiving a score between 1.0 and 1.4 are considered financially responsible but require additional oversight; institution's receiving a score between 1.5 and 3.0 are considered financially responsible and require no further oversight. While the language forwarded by the policy suggests that an institution's score is a command-and-control regulation, there has – at the time of this study – been no known case of an institution being stripped of its Title-IV eligibility as a result of the policy (Fain, 2017). As such, the FRCS program is in practice an information disclosure instrument. The logic of the FRCS as a form of information provision, however, rests on a long and complex causal chain – a chain resulting in the use of information by users purchasing a good or service (Dill, 1997). Yet, the research on information disclosure policies suggests that there are three separate avenues through which regulatory disclosure policies may have an impact on firm behavior regardless of whether the information conveyed by the policies is used by consumers: *market pressures*, *political pressures*, and *internal pressures* (Bennear & Coglianese, 2012).

Considering market and political pressures in tandem, a political economic perspective suggests that the mandating of information disclosure may signal the state's willingness to impose future regulations on a sector of the economy unless firms self-regulate (Delmas et al., 2010). Therefore, the policy as currently implemented may itself act as an incentive to prevent shirking on the behalf of institutions lest the state impose a traditional command-and-control policy under which an institution's Title-IV eligibility would be revoked once an institution is deemed financially irresponsible. In order for this threat to be valid, however, an institution must have both the incentive and capacity to comply with the mandated standards (Lane & Kivistö, 2008). In the current context, both an institution's sector as well as the composition of an institution's student body may influence both the capacity and incentive to comply – if only symbolically – with the mandated standards in a related manner. In terms of enrollment composition, institution's serving predominately disadvantaged, part-time populations are likely to have less incentive to comply with the mandated standards due to the assumption that such students often make enrollment decisions in terms of convenience factors as opposed to matters related to institutional reputation (Iloh & Tierney, 2014). Similarly, for-profit and non-profit colleges – on average – appeal to different stakeholder constituencies. Whereas non-profits are assumed to use their finances in a responsible manner that helps them realize their mission, however defined, they are also expected to provide their investors and donors with access to a mechanism through which to influence the investment and management decisions of the institution. On the other hand, for-profit institutions rarely encounter "activist investors" and are less concerned with external stakeholders attempting to keep the firm "on mission" (Doshi et al., 2013; Toutkoushian & Raghav, 2017; Tuckman & Chang, 1992). Such differences are compounded by the fact that for-profits, as firms often not expected to produce a good that also furthers a broader mission, predominately serve those consumers less likely to use information to begin with. Given this discussion, the question asked by this study is *does the mandatory disclosure of an institution's financial health lead to responsible institutional behaviors?* To help answer this question, the discussion now turns to previous research examining the impact of similar information disclosure policies.

While the relatively low cost of information disclosure strategies has much such policies attractive compared to command-and-control regulations, there is growing debate as to whether information disclosure may be counterproductive (Bae, 2016). Although supporters of information disclosure policies assert that the provision of information corrects for market failures in the form of information asymmetry, skeptics of information disclosure not only point to the lack of systematic evidence regarding the effectiveness of the policies but also suggest that information disclosure may exacerbate the "information gap" (Bae, 2012; Dranove et al., 2003). For while information disclosure strategies are fundamentally designed to correct the information asymmetries between transaction parties, the strategies often favor those groups that can incur search costs in gathering information (Graham, 2002; McEwen, 1978; Stigler, 1961). Stated differently: those students more likely to use the information – typically, white relatively wealthy students and their parents – are able to afford the transaction costs associated with finding and comparing institutions on selected information criteria (Lovenheim & Walsh, 2017). Given that firms will only respond to any legally mandated standard if their stakeholders care enough about the information being release, it can be assumed that firms with a larger number of those students less inclined to make use of information disclosure policies are more likely to respond to regulation in less-than-ideal ways. Despite the different theoretical expectations regarding the effectiveness of information disclosure polices, two additional aspects of information disclosure policies must be recognized. First, there is little systematic empirical research on the impact of information disclosure policies on social welfare outside of the environmental policy area (Delmas et al., 2010; Fraas & Lutter, 2016). Although the environmental policy has contributed greatly to the understanding of the various intricacies of information disclosure, this literature relies heavily on data from the Toxics Release Inventory (TRI); a body of literature which has produced no clear consensus regarding the effectiveness of information-based policy instruments (Taylor et al., 2012). The inferences drawn from the TRI and similar right-to-know policies, however, have been called into questions due to regulatory nuances – such as reporting thresholds – leading to biased estimates (Bennear, 2008). Furthermore, the effects of information disclosure on the behavior of

regulated firms – as opposed to the behavior of consumers – remains unclear (Bennear & Olmstead, 2008). As such, an analysis of the FRCS program is a fruitful lens through which to address both of these issues – as well as speak to the broader issue of college affordability – in several ways.

First, information disclosure policies are most effective when applied to experience goods: goods and/or services whose value can only be determined by consuming or experiencing it (Vining & Weimer, 1988). Specifically, information disclosure policies may minimize the deadweight loss associated with additional regulatory interventions by correcting information asymmetries prior to a consumer selecting a good and/or service (Miceli et al., 1996). As an experience good, postsecondary eduction offers a theoretically appropriate and econometrically convenient context in which to examine the impact of information disclosure policies. Second, an examination of changes in the tuition of postsecondary institutions allows for an explicit measurement of the costs information disclosure policies impose on firms (Romanosky et al., 2011). Third, the examination of the tuition-setting behaviors of postsecondary institutions – as it relates to information disclosure strategies – allows for an examination of the unforeseen consequences of regulations and the differential impact of those consequences across sector and demographic (Ambrose & Diop, 2016). Prior to discussing the impact of regulations on postsecondary tuition, however, it is necessary to review the previous research on the drivers of tuition levels in *private* postsecondary institutions.

4.3 Postsecondary Education and Tuition Setting Behaviors

Recent studies examining postsecondary policies often do so to evaluate the effectiveness of performance-based funding policies that policymakers will hope motivate institutions to increase postsecondary degree production (Hillman et al., 2015; Rutherford & Rabovsky, 2014). Far fewer studies examine the impact of public policies on the tuition setting behaviors of *private* postsecondary institutions (Kelchen & Stedrak, 2016).[2] Most of the research which does examine the tuition setting behaviors of private postsecondary institutions tend to rely on the *Bennett*

[2]Note the emphasis on *private* postsecondary institutions. While there are number of studies examining tuition levels in public institutions, private institutions receive relatively little attention (Zumeta, 1992).

Hypothesis – or the idea that increases in governmental aid will lead to tuition increases across all higher education institutions (Conner & Rabovsky, 2011; Deming et al., 2013; Jaquette & Hillman, 2015). Specifically, the Bennett Hypothesis posits that even if financial aid leads to lower sticker prices for students, institutions will raise overall tuition costs in order to offset the loss of revenue (Dynarski & Scott-Clayton, 2013). Despite not being empirically proven, analysts continue to rely on the Bennett Hypothesis as an explanation for institutional behaviors with more nuanced approaches suggesting that the relationship between governmental aid and tuition levels is dependent on institutional type within the private sector (Delaney & Kearney, 2015).

While Singell & Stone (2007) find that each increase in federal financial aid received by institutions is matched nearly one-for-one with an increase in tuition only by private non-profits, Cellini & Goldin (2014) illustrate that Title-IV eligible for-profit institutions are priced 78 percent higher than comparable institutions who cannot receive federal financial aid. A major contribution of Cellini and Goldin's study comes from the authors' identification strategy: acknowledging the potential sample selection problems due to nonrandom, meaningful differences between those institutions eligible for Title IV funding and those who are not, the authors restrict their sample to institutions offering programs comparable among as many dimensions as possible such as credit hour requirements in addition to institution fixed effects. Using similar sample restriction techniques – such as excluding specialized vocational schools and institution fixed fixed effects – Gibbs & Marksteiner (2016) find that a $1,279 loss in Cal Grants – California's version of Pell Grants – leads to a sticker price decrease of approximately $1,000. While both Cellini and Goldin as well as Gibbs and Marksteiner illustrate the need to address the nonrandom heterogeneity within the for-profit sector, neither study directly examines the behavior of institutions while they institutions are being regulated. In one of the few studies examining institutions while they are being regulated, Kelchen (2016) found that for-profit institutions with sanctionable loan default rates may charge students less in an effort to reduce borrowing levels. Kelchen's use of regression discontinuity, however, assumes that institution's approaching the sanctionable cutoff are unable to change their behaviors in order to avoid sanctions and further regulation. Given the lack of

empirical evidence on the ways in which firms behave under regulation, such an assumption is disputable.

In order to assess the impact of the FRCS program on the behavior of firms, operationalized as tuition levels, an objective function of firm behavior must be explicated.

4.4 Conceptual Framework and Hypothesis

While early literature on the objective function of postsecondary institutions of education rejected the notion that institutions behave to maximize financial profit, the rise of the for-profit institution has lead to a segment of the postsecondary market with an explicitly profit-maximizing objective function (Coates & Humphreys, 2002; Rothschild & White, 1993; Winston, 1999). *As such it is assumed that for-profit institutions seek to maximize profits while non-profit institutions seek to maximize social welfare given a budget constraint*. Since it is impossible for for-profit institutions to pursue other objectives at the expense of profit-maximization it is assumed that for-profit institutions are solely profit maximizers and engage only in behaviors they believe are profitable (Jensen, 2001; Wheeler & Clement, 1990). Moreover, whereas the costs incurred by for-profits are simply a function of producing a good, non-profit institutions incur both the costs of producing the good as well as the cost of producing a specific mission (Erus & Weisbrod, 2003). Given these differing objective functions, as well as the previous discussion on sector and consumer characteristics, it is possible that information disclosure as a form of regulation may exacerbate the differences in regulated firms – with firms in the present context being postsecondary institutions of education (Delmas et al., 2010; Netz, 1998). As such, I hypothesize the following:

> **Hypothesis 1:** Following the publication of a "poor" score, for-profit institutions will increase tuition and non-profit institutions will lower their tuition.

Seeking to alter the behavior of institutions through information provision, the FRCS program may inadvertently lead to increases in tuition levels at for profit institutions (Dill, 1997, 2001). While non-profits may fear the harm a tuition increase may incur on their "trust capital" with their specific

stakeholder groups – such as alumni and donors – for-profit institutions make this decision simply in terms of monetary costs (Silverman & Skinner, 2001). In order to illustrate these assumptions, imagine the following scenario:

Suppose two institutions – one non-profit, one for-profit – are both labeled "not financially responsible" under the FRCS program. Under the assumptions outline above, by producing a mission good – whether that be social welfare or prestige for institution – non-profits are constrained in terms of seeking additional sources of revenue in the form of tuition increases. Stated differently, the stakeholder groups served by non-profit institutions would accept a tuition increase only if they believed that the additional revenue will ultimately be used to support the mission of the institution (Hansmann, 1987; Tuckman & Chang, 1992). Conversely, for-profit institutions are indifferent to the traits of their consumers and lack "activist" stakeholders (Harrison & Antweiler, 2003; Winston, 2003). Therefore, if the marginal gains associated with increasing tuition outweigh the costs of being subjected to government regulations, for-profit institutions will do so.

Discussion now turns to testing the proposed hypothesis.

4.5 Research Design

4.5.1 Data

Title-IV eligible private non-profit and for-profit postsecondary institutions are the primary unit of analysis for this study. While public community colleges traditionally serve as a control group against which to compare for-profit institutions, the finances and costs of for-profit institutions are more similar to non-profit institutions than community colleges (Gibbs & Marksteiner, 2016; Kutz, 2010). The Delta Cost Project provides institutional-level data for all institutions within the final sample. The Office of Federal Student Financial Aid provides the composite score of each institution.

4.5.2 Identification Strategy

The objective of this study is the examination of the impact of information disclosure policies on the behavior of regulated firms as captured through tuition setting behaviors of private postsecondary institutions. The outcome of interest is the change in an institution's total tuition and fees. As with most empirical examinations of the effects of information disclosure policies – especially as it relates to a heterogenous product – it is difficult to establish the degree to which information disclosures influence the revealed preferences of individual consumers (Delmas et al., 2010). It is, however, possible to examine the effect of disclosures on the behavior of regulated firms – an under examined aspect of information disclosure policies (Bennear & Olmstead, 2008). In this regard, the FRCS program exhibits two features desirable for econometric identification. First, as previously mentioned, an institution's score not only conveys a level of risk to potential consumers, each score corresponds to a specific dosage of oversight administered by the federal government. Second, an institution's score is temporally dynamic: scores vary overtime an allow for the identification of differential effects not only across institutions but also within institutions over time.

Table 4.1: Summary Statistics

	M	*SD*	*Min*	*Max*
Tuition Change	2.69	6.35	-68.65	111.02
Sector	0.11	0.31	0.00	1.00
Treatment	0.16	0.48	0.00	2.00
Ln(Grant)	7.56	0.28	4.62	8.68
Ln(Size)	7.06	1.29	2.82	11.26
Ln(Intensity)	2.80	1.32	-3.98	5.47
Ln(Diversity)	4.07	1.01	-3.09	5.42
Observations	6326			

In order to address the above hypothesis, predictor variables were selected in order to approximate the various marginal costs and gains associated with institutional compliance. I first examine the regulation-tuition relationship by estimating the following random-effects model:

$$\Delta Tuition_{it} = \alpha_0 + \beta_1 TREAT_{it} + \beta_2 SECTOR_{it} + \beta_3 (TREAT_{it} * SECTOR_{it}) + \beta_4 X_{it} + \beta_5 (tU_i) + \varepsilon_i \quad (4.1)$$

where the dependent variable $\Delta Tuition_{it}$ is the percent change in real dollar tuition at institution *i* in time *t* from real dollar tuition at institution *i* in time *t-1; TREAT* is an interval variable representing the various degrees of financial oversight corresponding an institution's FRCS; *SECTOR* takes on a value of 0 for private non-profit institutions and 1 for private for-profit institutions; *TREAT*SECTOR* is the interaction between *TREAT* and *SECTOR* allowing for an examination of whether for-profit institutions have a differential response to information disclosure; *X* is a vector of institutional controls; *tU* is the interaction between state fixed effects and a time trend allowing for any trends that would impact institutions to vary by state over time; and ε_{it} is the error term. Summary statistics for all variables are located in Table 4.1.

The explanatory variable *TREAT* is an interval measure taking on three values: 0, 1, and 2 with each value corresponding to an institution's score and subsequent oversight where:

- *TREAT* takes on a value of 0 if an institution's score falls between 1.5 and 3.0; corresponding to a status of "financially responsible" and no oversight.
- *TREAT* takes on a value of 1 if an institution's score falls between 1.0 and 1.4; corresponding to a status of "financially responsible" and minimal oversight.
- *TREAT* takes on a value of 2 if an institution's score falls between -1.0 and 0.9; corresponding to a status of "not financially responsible" and provisional Title-IV certification and cash monitoring.

The interval measure, as opposed to an institution's raw score, is used since this study is interested in various across categories not *within* a score category. Additionally, the use of an institution's raw score offers no utility over the interval measure since in terms of the policy, a score of -1 is no

different than a score of 0.5: both scores convey the same status of "not financially responsible" to both the government and other stakeholder groups.

Turning to Hypothesis 1: while previous studies find that for-profit institutions may lower tuition costs in attempt to recruit students less likely to engage in risky financial behaviors, other research notes that students selecting into for-profit colleges are willing to pay higher prices for the convenience and flexibility of for-profit institutions regardless of the risks associated with doing so (Iloh & Tierney, 2014; Kelchen, 2016). The broader literature on information disclosure reveals that both public and non-profit firms are more susceptible to stakeholder pressures when it comes to financial behaviors – a finding which suggests that for-profits may charge more than their non-profit counterparts (Kofoed, 2013; Sloan, 2000). In order to isolate the impact of an institution's FRCS on tuition levels, several other covariates of interest are included in Eq. (4.1). An additional source of revenue – *FEDGRANT* – is also included to measure the reliance of institutions on government funding. In line with the Bennett Hypothesis, it is assumed that institutions – both non-profit and for-profit – will increase tuition levels in response to greater federal funding (Cellini & Goldin, 2014; Singell & Stone, 2007; Turner, 2014). Additionally, an institution's capacity (e.g. profile of students) may influence an institution's response to specific policies (Fryar & Hawes, 2011; Hillman, 2013; Hillman et al., 2014). As such, three measures of students characteristics are included: *SIZE, INTENSITY,* and *DIVERSITY.*

SIZE – or the total enrollment of an institution – is included due to the ability of size to moderate a firm's sensitivity to the pressures generated by information disclosure (Doshi et al., 2013). Conversely, *INTENSITY* – the proportion of an institution's students enrolled part-time – captures both the differing revenue and cost structures of institutions with large part-time enrollments as well as the fact that part-time students often have a different level of commitment to their institutions than their full-time counterparts (Toutkoushian & Raghav, 2017). As such, it can be expected that institutions with large amounts of part-time students are less likely to face pressures from their stakeholders (e.g. alumni) in terms of management and financial decisions

Table 4.2: Naive Estimates

	Naive Estimates	
Non-Profit x No Oversight	Reference Category	
Non-Profit x Some Oversight	0.397	(0.492)
Non-Profit x Cash Monitoring	0.766*	(0.402)
Proprietary x No Oversight	-0.964**	(0.430)
Proprietary x Some Oversight	-0.896	(1.681)
Proprietary x Cash Monitoring	-0.296	(0.832)
Ln(Grant)	0.007	(0.308)
Ln(Size)	-0.193*	(0.104)
Ln(Intensity)	0.059	(0.066)
Ln(Diversity)	0.144	(0.099)
Constant	4.076	(2.679)
N	6326.000	
RMSE	6.089	

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

(Konar & Cohen, 1997). Finally, *DIVERSITY* – or the proportion of an institution's students who are not an ethnic minority – captures the degree to which an institutions have the propensity to use disclosed information (Decker et al., 2005; Teske et al., 2006). The expectation is that as *DIVERSITY* decreases – or the proportion of white students decreases – institutions have less incentive to respond to the FRCS program in a responsible manner.

A significant challenge of any empirical study comparing for-profit and non-profit institutions – as it relates to the impact of a specific policy – is the problem of omitted variable bias and the failure to model the mechanism of selection into the treatment or control groups. In the present context, "selection bias" arises out of the unobserved characteristics affecting both the likelihood of an institution being a for-profit institution and the response of an institution to the FRCS program. Without accounting for the selection mechanism, an institution's error term (ε_{it}) will be correlated with explanatory variables and bias parameter estimates. As such, in addition to the fixed-effects estimator y outlined above this study accounts for selection bias in three ways: a Heckman two-step estimator for panel data, a doubly robust propensity score estimator, and instrumental variable estimator. The appropriateness of each of these strategies, however, is a function of the treatment effect of interest to the analyst.

If an analyst is interested in estimating whether a treatment has an effect on the population to which the treatment is applied – the average treatment on the treated (ATT) – propensity score matching (PSM) or similar matching methods are the appropriate estimators. If, on the other hand, the analyst is interested in the potential effects of a treatment when expanded to other units in the greater population – the average treatment effect (ATE) – a Heckman-like model is appropriate (Carley, 2012). Finally, if an analyst is interested in the effect of a treatment for units whose treatment status is influenced by an exogenous characteristic – the local average treatment effect (LATE) – an instrumental variables model is appropriate (Angrist & Imbens, 1994). Given the interest of the present analysis in the impact of information disclosure as a policy instrument writ large, discussion will focus on the ATE but estimates of the ATT and the LATE are also presented.

4.5.2.1 Heckman Correction

When applied correctly the Heckman correction is an unbiased estimator of potential outcomes by modeling the systematic differences between groups (Carley, 2012). The Heckman correction, however, has been applied almost exclusively to cross-sectional or pooled regression estimates, posing an empirical challenge when it comes to panel estimation (Rochina-Barrachina, 1999). In the present analysis, a Heckman-like correction is estimated by applying the logic of control function approaches to endogeneity. The correction is applied in three steps: 1) estimate via a probit model the likelihood of an institution being either a for-profit or non-profit institution, 2) calculate the inverse mills ratio (λ) for each observation, and 3) estimate the outcome equation using λ as a predictor (Fernández-Val & Vella, 2011). This can be represented by the following reduced-form equation:

$$\begin{aligned}\Delta Tuition_{it} = {} & \alpha_0 + \beta_1 TREAT_{it} + \beta_2 SECTOR_{it} + \beta_3 (TREAT_{it} * SECTOR_{it}) \\ & + \beta_4 X_{it} + \beta_5 (tU_i) + d_i + d_t + \beta_6 [\lambda (SECTOR_{it}) - \lambda (-SECTOR_{it})] + \varepsilon_{it} \quad (4.2)\end{aligned}$$

where λ is produced from the following probit model:

$$Pr(SECTOR_{it} > 0) = \Upsilon_0 + Z_{it} + d_t + d_s + \nu_{it} \tag{4.3}$$

where Z is a vector of institutional characteristics described above as well as indicator variables representing whether individual institutions report their information separately or under one parent institution. Well-documented among users of the Delta Cost Project, this variable satisfies the "exclusion restriction" necessary to estimate a Heckman Correction Model. Similar to the logic in identifying a valid instrumental variable, in the present analysis the exclusion restriction necessitates a variable that is related to the sector of an institution while unrelated to changes in tuition. As documented in the Delta Cost Project, for-profit institutions are more likely to report their information under one "parent" campus than their non-profit counterparts (Jaquette, 2014; Jaquette & Parra, 2016). The reporting variable also satisfies the second condition of the exclusion restriction: the results of a Spearman rank correlation test find no evidence that grouped reporting is related to changes in tuition levels. Results of the Heckman selection model are found in Table 4.3.

Table 4.3: Treatment Effect Estimates

	ATT		ATE		LATE	
Non-Profit x No Oversight	Reference Category		Reference Category		Reference Category	
Non-Profit x Some Oversight	0.861	(0.932)	1.084	(0.654)	1.839***	(0.690)
Non-Profit x Cash Monitoring	0.805	(0.787)	1.782***	(0.585)	3.394***	(1.199)
Proprietary x No Oversight	-2.986	(2.273)	-1.901	(1.181)	-1.869***	(0.401)
Proprietary x Some Oversight	-7.423**	(2.923)	-4.508**	(2.088)	-1.750	(1.153)
Ln(Grant)	-0.486	(1.486)	1.575***	(0.569)	-0.782**	(0.383)
Ln(Size)	-3.288*	(1.810)	-0.978	(1.587)	-0.173**	(0.088)
Ln(Intensity)	-0.574	(0.467)	0.025	(0.295)	-0.024	(0.076)
Ln(Diversity)	-1.986	(2.423)	-0.224	(1.188)	0.139	(0.104)
Inverse Mills			-3.084	(2.112)		
Constant	40.083*	(22.415)	5.117	(13.028)	9.295***	(2.819)
N	6326.000		6305.000		3572.000	
RMSE	7.675		5.464		5.706	

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.5.2.2 Doubly Robust Estimates

Combining two approaches to estimating the causal impact of a treatment on an outcome of interest, one possible doubly robust estimator combines traditional regression estimation with propensity score reweighing. In order to derive the doubly robust estimator, an analyst first estimates the propensity of an observation receiving a treatment and then reweighs the outcome regression using the inverse of the conditional probability that an observation received said treatment (Funk et al., 2011; Nicols, 2008). Whereas the outcome equation remains the same as in Eq. (4.1) above, the outcome equation is now reweighed using the propensity score derived from the following logit model where X is a vector of institutional controls as outlined above:

$$Pr(SECTOR_{it} > 0) = \beta_0 + \beta_1 X_{it} + \upsilon_{it} \tag{4.4}$$

Although initially resembling the Heckman correction model outlined in Eq. (4.2) and Eq. (4.3), there are notable differences between the two estimators. First, although doubly robust estimators are – as the name suggests – robust to most forms of misspecification, the underlying assumption of propensity score models is that the all differences between the two sectors are observable (Jung & Pirog, 2014). In the instance that there are unobservable differences that are not perfectly correlated with the observables, the propensity score model is misspecified and the outcome regression will produce biased estimates. Unlike the Heckman correction, which is biased toward zero, the direction of bias in propensity score models is unknown (Jung & Pirog, 2014; Vandenberghe & Robin, 2004). Additionally, while the Heckman model allows for an examination of the Average Treatment Effect (ATE), doubly robust models estimate the average treatment-on-the-treated (ATT). Whereas the ATE provides information on the effect of a treatment when expanded to other units within the greater population, the ATT only provides information on the impact of the FRCS program on Title-IV eligible for-profit institutions in the present sample (Fortson et al., 2015). Given the interest in this study in speaking to the broader implications of

information disclosure policies, the ATE estimates are preferred; the results of the doubly robust estimators, however, are found in Table 4.3.

4.5.2.3 Instrumental Variable Estimates

Although both of the methods above address endogeneity in the systematic differences between private for-profit and non-profit institutions, an additional potential source of endogeneity exists in the form of the an institution's FRCS being determined simultaneously with changes in tuition. Given the potential of an additional source of endogeneity, the robustness of the above estimates are checked by specifying an additional model using instrumental variable (IV) estimation. One of the most common approaches to addressing endogeneity in policy analysis, IV estimation addresses issues of endogeneity by using only part of the variability in an endogenous variable – the part uncorrelated with the error term – to estimate the relationship between an endogenous regressor and dependent variable (Angrist & Krueger, 2001; Cellini, 2008). The instrumental variable used in this study are based on the the total executive and managerial employees of an institution. The use of such an instrument is supported by the existing literature, which shows that management size is linked to financial management practices (Dunn, 2004) and unrelated to tuition (Archibald & Feldman, 2012). As such, the following equation was estimated using 2SLS:

$$TREAT_{it} = \gamma + \lambda Z_{it} + \theta X_{it} + \eta_{it} \tag{4.5}$$

where Z_{it} the total executive and managerial employees of an institution acting as an instrument for the endogenous financial responsibility score of an institution. The predicted values of *TREAT,* $\hat{TREAT}$ are then used in the second stage regression equation to estimate:

$$\Delta Tuition_{it} = \alpha_0 + \beta_1 \hat{TREAT}_{it} + \beta_2 SECTOR_{it} + \beta_3(\hat{TREAT}_{it} * SECTOR_{it}) + \beta_4 X_{it} + \beta_5(tU_i) + d_i + d_t + \varepsilon_i \quad (4.6)$$

where aside from the predicted values of *TREAT*, the equation remains the same as the originally specified. Results from the instrumental variables regression are found in Table 4.3.

4.6 Results

All four model specifications presented in Table 4.3 indicate a significant, differential impact of the FRCS on the tuition setting behaviors of postsecondary institutions across various "doses" of oversight and categories of financial responsibility. Across all four models, for-profit institutions lower tuition costs when subjected to additional financial oversight and a "worse" label. The magnitude of this difference, however, varies by the treatment effect of interest. Whereas the ATE – or estimates derived via the Heckman correction – suggest that for-profit institutions lower their tuition by approximately 4.7%, the ATTT – or estimates derived via doubly robust estimation – suggest that for-profit institutions lower their tuition by approximately 7.4%. The difference in magnitude, however, is expected: Heckman model produces estimates that are biased toward zero (Puhani, 2000). Conversely, the LATE – or the estimates derived via instrumental variable estimation – suggest that there is no statistically significant relationship between a for-profit receiving a "worse" label and changes in tuition. Due to the properties of the different treatment effects and the dangers of overestimating the impact of policies when conducting policy analysis, the remainder of this study will focus on the ATEs as opposed to the LATEs or ATT (Currie, 2003; Manski, 2011).[3]

[3]While there are dangers in underestimating the impact of policies, these dangers are typically associated with the ethical ramifications of not implementing policies which may benefit some members of society. Given the focus of this study is analyzing information provision from an economic viewpoint rather than an ethical one, the dangers associated with wasting government resources is assumed to be of more concern (Bougherara et al., 2005).

In addition to for-profit institutions decreasing tuition prices when labeled "financially responsible but requiring additional oversight," the average treatment effects indicate that non-profit institutions increase their tuition by approximately 1.8% ($p \leq 0.01$) when faced with cash monitoring and labelled "financially irresponsible."[4] Similarly, the LATEs support the ATE estimates in suggesting that non-profit colleges receiving the "worst" label increase their tuition by 3.39%. While these results are in opposition to the hypothesis stated above, the findings are consistent with the broader economics literature that has yet to agree upon the differential behaviors of non-profit and for-profit organizations in response to external pressures (Horwitz & Nichols, 2007). Turning to institutional controls, only one variable is statistically significant in the Heckman model: federal grant aid. Specifically, for each percentage increase in the amount of federal grant aid received by an institution, tuition increases 1.5%. While not a large change, this estimate finds support for the Bennett Hypotheses (Singell & Stone, 2007; Turner, 2014).

4.7 Discussion and Conclusion

Evaluating the impact of information disclosure policies on the behaviors of regulated firms, this study exploits the Department of Education's Financial Responsibility Composite Scores, which – in terms of an information disclosure policy – is a relatively aggressive measure. Not only does an institution's score convey information to potential consumers regarding an institution's financial behaviors, an institution's score also dictates the amount of oversight an institution is potentially subject to. Whereas many studies attempt to assess the effectiveness of information disclosure policies they are often unable to establish a causal connection between consumer use of information and the reaction of a firm to consumer use. Leveraging the FRCS alleviates this limitation while also speaking to an under examined aspect of policy instruments: *to what degree are the impacts of information disclosure policies on regulated firms different between the for-profit and non-profit sectors?*

[4]The statistical difference across both sectors and "treatment groups" was determined using a Wald test of equality of coefficients which yielded $F = 4.29$ and $p < 0.01$

Results illustrate that both for-profit and non-profit institutions exhibit significant changes in tuition prices: whereas for-profit institutions subject to additional oversight and a "poor" score decrease tuition, non-profit institutions subject to oversight and a "poor" score increase tuition. What remains unexplained however is what drives the differential impact of this specific information disclosure policy across dosages and sectors. One possible explanation is the nature of the FRCS as a policy instrument combined with the unique characteristics of postsecondary markets – such as an institution's stakeholders.

Predicated on the assumption that consumers (e.g. students and parents) can make informed decisions about a good, information disclosure policies – as discussed – do not necessarily have to be understood or utilized by the intended populations in order to have an effect (Goshorn, 1996) First, even if individual consumers are not responding to information disclosure it can be assumed that an institution's executives are aware of an institution's score and respond appropriately (Decker et al., 2005). In the crudest sense, this may occur at the level of public relations where executives will put pressure on lower-level administrators to respond to the ratings in a manner that does not negatively influence their reputation (Craig et al., 2015). It is through this concern for reputation to stakeholders – such as alumni and donors – that allows a second process to occur: whereas prospective students may not possess perfect information regarding the financial health of institutions, the reactions of institutions to information disclosure may signal the information institutions wish to convey to consumers. In an overly heterogenous market – in terms of both providers and consumer preferences – information asymmetries favor the providers of an eduction over the consumers of an education (Vining & Weimer, 1988). In this second process, the non-profit providers are at a distinct advantage over their for-profit counterparts: in a sector where students serve as both inputs and outputs, non-profit institutions tend to serve a relatively elite clientele with for-profit institutions representing the low-price/low-quality end of the postsecondary market (Hansmann, 1987; Rothschild & White, 1993).

From the processes outlined above, for-profit institutions are more likely to suffer reputational damage because of a lower FRCS. In the instance that a non-profit is sanctioned, the non-profit's

"trust capital" may buffer adverse effects of information disclosure; stated differently, there's an inherent trust among alumni and donors that financial decisions of non-profit institutions – such as the raising of tuition – are necessary for a non-profit to successfully fulfill and pursue its mission (Tuckman & Chang, 1992). For-profit institutions, however, are more likely to be perceived as low quality when receiving a score that labels the institutions as financially irresponsible: even when not labeled as financially irresponsible, for-profit institutions may signal a lower probability of success and lower lifetime benefits to prospective students (Cellini et al., 2016). One way for a for-profit to circumvent this reputational blow is to lower tuition costs in order to increase the return on investment for students. To illustrate the effect of the FRCS on for-profit tuition levels, consider the following expanded model of college choice outlined in the introduction and adopted from Long (2004) and Cellini et al. (2016):

$$U_{ij} = \alpha_0(I(X_i) - P(X_i, Z_j, S_j)) + \alpha_1 A(Z_i, S_j, S_{-jc}) + \alpha_2 D_{ij} + \gamma X_i + \varepsilon_{ij}$$

Where institutions are characterized by their expected out-of-pocket price paid by student P_{ij} with prices varying both within and across institutions dependent on student characteristics X_i (i.e. family income, academic ability) and college characteristics Z_i (e.g. listed tuition, sector, reputation). Therefore, institutions that are deemed financially irresponsible must then increase a student's utility (U) of selecting their specific institution (j_k). Whereas the time invariant – or nearly time invariant – characteristics of institutions such as sector and reputation may buffer institutions from the impact of a low score on an institution's longterm reputation, a mechanism through which for-profit institutions are are able to increase a student's utility of attending is by *decreasing* tuition. Put plainly: by decreasing tuition for-profit institutions are decreasing the pecuniary costs of students attending their institution and thereby increasing the utility of a student doing so. Conversely, in the non-profit sector a decrease in tuition would lead to a perceived decrease in quality by specific stakeholder groups – an action that may have a larger negative impact on the institution's reputation than being labeled as financially irresponsible (Dills & Rotthoff, 2013; Winston, 2000). While such behavior initially conflicts with the previously

posited hypothesis, a for-profit institution's primary goal is one of survival: when faced with the treat of decreased enrollments and ceasing operations – as a result of the disclosed information – for-profit institutions will lower tuition levels to attract students who may have otherwise not enrolled in their programs. Although this assessment of college choice explains the *reason* for the differential impact of information disclosure policies across sectors, this assessment does not fully capture the degree to which the FRCS program is an effective policy instrument for correcting information asymmetries.

Explicitly stating that one of the goals of the FRCS program is to protect consumers from making a poor financial investment, estimates reveal that in light of regulation-through-information policies, for-profit institutions decrease tuition levels. While this may signal an increase in the return-on-investment to students such a response may exacerbate the information gap associated with most information disclosure policies. Specifically, information gaps tend to be the widest at the lowest rung of the socioeconomic ladder – a population served primarily by for-profit institutions (Cellini, 2005; Teske et al., 2006). While the lowering of tuition may signal a greater return on investment to students in choosing a for-profit institution, this effect has no impact on the quality of or the risk associated with attending an individual institution; therefore, the market is not corrected (Mocan, 2007). Although not intended to assess the quality of education with an institution, the FRCS program may still influence the decisions of students who are shown to make postsecondary enrollment decisions based on quality as well as cost – a relationship that is highly differentiated across demographic groups (Perna & Titus, 2004). In the context of for-profit institutions, the convenience of for-profit institutions often increases the utility of students more than the quality of education they may receive (Iloh & Tierney, 2014). As such, these results hold several implications for both postsecondary education policy as well as policy instrument design broadly speaking.

First, the use of information disclosure policies must take into account the utility functions of both consumers as well as regulated firms. In the case of for-profit institutions, the FRCS program has the inadvertent effect of decreasing the tuition of attendance which results in a short term

increase in the utility of students which may lead to long term welfare losses in the form of a weak labor market. Second, while previous research has noted that increased public oversight – similar to that embedded in the FRCS program – leads to more responsible financial management practices in the non-profit sector, little research has examined the same call for accountability in mixed-markets (St. Clair, 2016). Given that the results presented here display differential impacts of information disclosure across the private sector, more research may prove fruitful. Finally, little research on the impact of information disclosure policies has been conducted across policy realms; with a vast majority of research taking place in the environmental policy realm. By assessing the impact – or lack of impact – of such policies in the education domain, this study is able to paint a broader picture of the various intricacies of information disclosure and similar regulation-through-information strategies.

Chapter 5

Conclusion

"A very wide gulf separates the ethos of the policy analyst, who delights in insightful, back-of-the-envelope calculations, challenges to the status quo, and the debunk of dubious (and devious) partisan claims, from the detached, peer-reviewed ethos of the scrupulous academic social scientist..." - Lynn 1999, p. 417

5.0.1 Summary of Dissertation

This dissertation consisted of three empirical studies examining the economics of for-profit colleges and universities. Study one begins by examining the impact of for-profit colleges and universities on the behaviors of existing community colleges within a specific higher education market. With much of the extant research focusing on theoretical discussions of higher education markets, study one empirically examines whether a specific aspect of higher education markets exists and whether the existence of such market has any impact on the efficiency and/or productivity of community colleges within that market. Utilizing Stochastic Frontier Analysis and a Generalized Estimating Equation technique, study one illustrates that while the presence of a for-profit college or university increases the efficiency of community colleges, such increases in efficiency are either negatively or unrelated to degree productivity. Given the ongoing debate surrounding the incentive structures embedded in government policies as it relates to increasing the performance of public institutions of higher education, the results provided by study one also speak to the larger debate surrounding the tradeoffs between input and output based funding structures.

Building off study one, study two explicitly examines the drivers of for-profit college and

university entry and exit into local education markets. Positing that entry and exit decisions are function of local market structures, study two dispels many of the widely-held assumptions regarding for-profit colleges and universities targeting minority and disadvantaged communities. With the results of study two being derived from one of the first substantive applications of the split-panel jackknife, study two also illustrates the dangers of using naive estimators to produce causal claims in policy research. Therefore, study two contributes not only to the substantive policy aspect of this dissertation but to the methodological toolbox of policy analysts as well.

Whereas studies one and tow examined the macro-level environments in which for-profit colleges and universities operate, study three explicitly evaluates the differential impact of information disclosure policies on non-profit colleges and universities as well as for-profits. Finding that being labeled with a "poor" financial responsibility score leads to non-profits increasing their tuition and fees while for-profits decrease their tuition and fees, study three directly speaks to the implications of the incentive structures embedded within regulatory policies. With consistent results derived from several different treatment effect estimators that account for the systematic, nonrandom differences between non-profits and for-profits, study three provides robust evidence on the differential responses of for-profit colleges to government policies.

5.0.2 Limitations

As with all empirical studies, this dissertation possesses limitations. Some of these limitations are theoretical and/or conceptual and some of these limitations are empirical. Not discussing such limitations would be a disservice to both the dissertation itself as well as future research.

The major empirical limitation of this dissertation is the assumption of physicality. Stated different: this dissertation assumes that for-profit colleges and universities are operating in a physical space that creates competition. This assumption was made for one major reason: data availability. Specifically, it is extremely difficult to find a valid measure of the degree to which a for-profit college or university is operating online as opposed to in-person. At the federal level, the Integrated Postsecondary Education Data System (IPEDs) does provide a distance learning

Table 5.1: Student Enrollment in Online Courses

Institution Type	All Courses	Some Courses	No Courses
Public, 4-year	11%	15%	75%
Public, 2-year	10%	18%	72%
Non-Profit	10%	8%	82%
For-Profit	34%	6%	60%

Source: McPherson & Bacow (2015)

indicator variable but this measure simply indicates whether distance learning is *offered* and not the degree to which a for-profit college actually operates online. Additionally, this measure is not limited to learning but includes video lectures as well as mailed materials. The measurement error at the federal level is also reflected at the institutional level where there is a growing tend for online course offerings across institutional types which is depicted in Table 5.1.

As illustrate by Table 5.1, approximately 34% of students in for-profit colleges and universities take the entirety of their course work through online courses but approximately 60% of students enrolled in for-profit colleges and universities do not take *any* courses online. Although the percentage of students taking the entirety of their coursework online is higher at for-profits than other institutional types, it is unclear how this distribution would impact the empirical estimates presented in this dissertation. From a purely empirical perspective the estimates presented in chapter two would be biased in the direction of those counties which offer large incentives for online schools to operate out of those counties. Similar to how large credit card companies are attracted to those states with appealing tax breaks, online-based programs would likely operate out of areas where they have the financial incentive to do so.[1] Future research would benefit from identifying the areas in which online for-profit colleges operate and then adjusting empirical specifications appropriately.

An additional empirical limitation of this dissertation also stems directly from one of the major contributions: the application of sophisticated econometric techniques. Given the interest of this dissertation in speaking directly to policymakers and possessing direct implications for policy,

[1] Of note: an institution's enrollment must be at least 50% in-person for students to qualify for federal tax credits, tax deductions, grants, loans, and other financial aid (Hoxby, 2017). Given the focus of this dissertation on for-profit colleges and universities that receive federal financial aid, the assumption of *some* operational physicality is a safe one.

the utilization of such econometric techniques may cause some of the major policy implications to get lost in translation. Using study two as an example: while the split-panel jackknife is a mathematically straightforward bias correction, the description of the correction itself is rather technical. It was a hope of this dissertation that by applying the bias correction to a substantive policy domain that the utility of such correction would become more obvious. With most of the extant discussions of the split-panel jackknife being theoretical, future substantive applications of the split-panel jackknife would be wise to continue working toward an easy-to-digest description of the procedure itself.

Finally, some may see the reliance of a purely microeconomic framework as the major limitation of this dissertation. As with adopting any particular framework, the researcher must be aware of the various tradeoffs associated with the framework of their choosing. In the present context, a microeconomic framework offers benefits in the form of assuming the existence of a "market" due to the policy goals of the 1972 reauthorization of the Higher Education Act of 1965. Additionally, a microeconomic framework allows for an examination of the ways for-profits would compete with other institutions through the specification of both individual and institution utility functions: in order for an institution to compete for a student it must target a specific term of a student's utility function such as distance to home, cost, or programmatic offerings. The benefit of utilizing a microeconomic framework, however, also comes at a cost: allocative efficiency is assumed to take precedence over all other policy outcomes such as equity and effectiveness. For illustrative purposes let us return to study one where the use of a microeconomic framework allows for the explicit assumption of market existence, the impact of competition (even if only through the threat of competition), and the exogeneity of enrollment patterns in community colleges. Frameworks from traditional public administration, on the other hand, may make explicit assumptions regarding the behavior of admissions officers as bureaucrats in helping enroll students of similar demographics into their institutions. In the latter case, the model specified in study one is both theoretically and empirically flawed; in the former (and present) case, the model specified is both theoretically and empirically correct. And while a debate regarding the validity of specific

frameworks is beyond the scope of this dissertation is important to keep in mind the assumptions made by the theoretical framework chosen by a researcher and the facets of reality which are either ignored or deemed less important. Recognizing the limitations if this dissertation that stem from the selected framework, this dissertation hoped to avoid what Manski (2011) calls "the rhetoric of science" by explicating the assumptions made within models based on the adopted conceptual frameworks as well as recognizing what is outside of the scope of the frameworks utilized.

5.0.3 Contributions, Recommendations, and Next Steps

One of the primary purposes of this dissertation was the utilization of sophisticated yet appropriate econometric techniques in the analysis of an over politicized policy domain – which in the current context is for-profit higher education. Specifically, through the application of traditional policy analytic techniques this dissertation represents a return to the scientific analysis of a specific policy issue that is currently dominated by discussions void of empirical evidence. Just recently, for example, discussions regarding the regulation of the for-profit sector have oscillated between calling the sector "agile, disruptive, [and] Darwinian" and a sector that "dramatically falls short" of its promise of providing students with an efficient route to career boosting credentials (Carroll, 2018; Hilliard & Chaban, 2018). Given the discussions throughout the dissertation regarding the lack of empirical evidence for such claims, it is unknown as to which body of evidence individuals are drawing on to make such statements. Additionally, the shear amount of similar claims illustrates just how politicized the discussion surrounding for-profit colleges and universities has become. It is such hollow claims that this dissertation attempts to tackle by providing some of the first longitudinal studies of for-profit college and university behavior.

Utilizing stochastic frontier analysis – which allows for the possibility of inefficiency in the error term – study one explicitly examines the efficiency of public organizations. By modeling the relationship between the predictors and dependent variable for the most efficient observation as opposed to the average observation, study one unpacks the existence of markets in higher education. Given the ceaseless argumentative dialogue surrounding the existence as well as

impacts of education markets, study one provides robust empirical estimates of the positive impact of markets on the efficiency of community colleges. Study one also illustrates, however, the potential problems associated with markets operating in input based funding structures: competitive forces lead to increased efficiency in terms of enrollment but have no positive impact on productivity in the form of degree counts. Such findings also hold direct implications for future policies: despite claims of opponents of performance-based funding policies who posit that performance-based funding policies increase the perverse incentives of public organizations, input-based funding structures also create a situation where institutions will enroll students who they have no incentive of guiding through to completion. As such, policymakers must decide between two second-best alternatives: either a system in which markets lead to increases in enrollments but not in outcomes, or a system in which markets increase outcomes that may also be accompanied by "cream-skimming" or institutions devoting resources to those who are the "easiest" to guide through a completion agenda (Agasisti, 2009). Future analysis would benefit from conducting a comparative analysis that directly examines the interaction of markets within both input- and output-based funding environments to more explicitly speak to the possible welfare losses associated with each funding environment.

While study two represents the application of a novel estimator – the split-panel jackknife – to a substantive policy area – for-profit higher education – study two also tackles major assumptions regarding the behaviors of for-profit colleges and universities. Finding that entry and exit decisions of for-profit colleges and universities are a function of the local market structure as opposed to the demographics of the individuals within that market, study two provides further evidence regarding the degree to which markets may mediate many of the assumed behaviors of for-profit colleges and universities. Additionally, study two illuminates the dangers of policy analysts in using naive estimates to make causal claims regarding policy matters. In the context of study two, the estimates provided by the naive estimator tell a story much aligned with the current, popular narrative surrounding for-profit colleges and behaviors: that for-profit colleges and universities specifically enter predominately minority and disadvantaged communities. The bias corrected estimators,

however, tell the opposite story: for-profit colleges and universities are more likely to enter predominately white, employed, civilian counties. Such a finding – while not surprising given the lack of literature empirically testing this assumption – poses a challenge in terms of policymaking. Given that study two presents results illustrating how for-profit colleges and universities are *not* making entry and exit decisions, it may appear to skeptics and critics that this equates to advocating for a lack of regulation on such entry and exit decisions. This is not the case. What is illustrated by chapter two is that for-profit colleges and universities are looking to the existing market structure as a signal as to whether they are capable of entering and successfully surviving within a market. Future policies then would benefit from looking at whether such markets are leading to *strong* or *weak* entrants (Ashiya, 2000). In the present context, a weak entrant would be a for-profit college or university, which poorly operated and managed, then exits leaving individual students with a meaningless degree or credential. In order to avoid such entrants future policies must strengthen the existing public institutions who would then be strong enough to deter such weak entrants. One possible mechanism through doing so is the increase in public subsidies and support – a proxy for quality in a higher education setting where there is an absence of one objective performance measure (Turner, 2003).

Finally, study three highlights the importance of policy instrument design. Finding differential impacts of the same policy instrument between non-profit and for-profit colleges and universities, the results of study three emphasize the need to take into account the incentive structures of institutions. In the context of study three, the information disclosure policy analyzed assumes the same incentive structure and student price elasticity regardless of institutional type – which as the results of several treatment effect estimators illustrate – is an inaccurate assumption and leads to differential institutional tuition changes. As discussed throughout the study, these results produce direct implications for what is already perceived as the information gap in college decision making: through lowering tuition for-profit colleges are most likely appealing to student bodies – such as ethnic minorities – who while being influenced heavily by tuition in the college choice process also misinterpret the real price of attending specific institutions (Perna & Titus, 2004; Perna, 2006).

Given the findings presented in study three, any future regulations examining higher education would be wise to design the policies in a manner which takes sectoral differences, such as the student bodies they serve, into consideration. Similarly, as the Financial Responsibility Composite Scores and other regulatory policies targeting for-profit higher education continue to age, it will be same well spent to examine whether it is the threat of enforcement or actual enforcement of such policies that leads to changes in institutional behavior.

All three of the chapters discussed contribute to several bodies of literature. First, all three studies provide longitudinal, robust evidence on the behaviors of for-profit colleges and universities which up to this point has remained unexplored by the extant literature (Jaquette & Parra, 2016). Through doing so the chapters provide policymakers with evidence regarding the for-profit sector aside from labor market returns. Second, all three studies utilized sophisticated econometric techniques applied to a specific policy domain. Through doing so the chapters provide policymakers with robust evidence regarding these behaviors, explained in plain language that can be easily understood without having to read proof-laden econometrics papers. Finally, this dissertation hoped to remedy what some may see as a lack of traditional policy analytic work by public administration scholars who, as remarked by one prominent scholar, often leave the evaluation of public programs and policies to economists (Meier, 2005). With empirical, objective research establishing causality between policy and outcomes lacking in the current political environment, advancing such evaluative research is critical. As policy outcomes continue to draw attention in perpetually resource-constrained, as well as an intellectually-adverse, political arena it is the hopes of this dissertation to have long-lasting impacts in the field of public administration and in shaping the knowledge to formulate policy and understand policy analysis broadly speaking.

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