Risk-Sharing and Student Loan Policy: Consequences for Students and Institutions

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Abstract

This paper examines the potential costs and benefits associated with a risk-sharing policy imposed on all higher education institutions. Under such a program, institutions would be required to pay for a portion of the student loans among which their students defaulted. I examine the predicted institutional responses under a variety of possible penalties and institutional characteristics using a straightforward model of institutional behavior based on monopolistic competition. I also examine the impact of a risk-sharing program on overall economic efficiency by estimating the returns to scale for undergraduate enrollment (as well as other outputs) among each of ten educational sectors.

I find that even a relatively small incentive effect of a risk-sharing would lead to a substantial decline in overall student debt. There is considerable heterogeneity across sectors, with 4-year for-profit institutions accounting for the majority of the savings. My estimates suggest that a risk-sharing program would induce a modest tuition increase, but that there is unlikely to be a substantial loss of economic efficiency in terms of costs due to a reallocation of students across sectors.

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1 Introduction

With total student loan debt and default rates at or near all-time highs, it is more important than ever to understand the impact that the high debt burden (and policies aimed at reducing this burden) will have on individuals and on the higher education landscape. From the individual's perspective, a high level of debt may delay or reduce financial self-sufficiency, which has implications for countless other markets such as housing, occupation choice, or marriage. Further, those with particularly high levels of debt may never realize a positive financial return on their investment in schooling. From a macroeconomic perspective, the approximately $1.2 trillion in outstanding debt from student loans (some economists go so far as to compare this to the real estate bubble which preceded the Great Recession) will impact the Federal budget for decades to come.

At the core of the problem is an increasing number of student loan defaults and delinquencies driven by rising tuition and poor initial job placements among recent graduates (the rate of defaults within 2 years of leaving school roughly doubled from 2004 to 2011). There is, of course, substantial heterogeneity in default rates across institutional characteristics, ranging from a low of 7.2% among private non-profits to a high of almost 20% among private for-profit institutions. The prior figures have spurred a number of policy proposals aimed at incentivising schools to reduce their student loan default rates. One such policy mandates that institutions to be ineligible for federal financial aid (such as Pell Grants) if their three-year cohort default rates are above 30% for three consecutive years, or above 40% for one year. Due to the small number of schools actually impacted by this policy (Gross et al., 2009), many have called for a higher bar (i.e. lower required default rates) in order to continue receiving federal funding. An obvious drawback to such a policy is the discontinuous nature of the punishment. Institutions which fall just over the required default rate will face a funding crisis, as federal aid is crucial to the operation of the vast majority of institutions. Similarly, students at these institutions will now be without a needed source of funding, even those for whom the education would have benefited. A second drawback is that this type of policy provides no incentives to improve student outcomes for those institutions not near the cutoff.

Another recently proposed policy to reduce defaults and overall student loan debt is to force schools to pay for a portion of the debt accrued by students who default on their student loans, also known as risk-sharing. While a policy of risk-sharing has received much less attention than federal aid eligibility cutoffs, it may be a theoretically more appealing option since it does not suffer from the drawbacks listed above. First, students are not deprived of the opportunity to receive federal funds or forced to attend a less conveniently located school (if one even exists). Second, replacing the sharp discontinuity with a smooth punishment function incentivises all schools to lower their default rates, not just the worst offenders. There are, however, potential downsides which are shared by both policies. Institutions could pass additional costs onto students in the form of higher tuition and/or reduce the number of students admitted.

This paper evaluates the response of postsecondary institutions to various risk-sharing policies both in terms of tuition and enrollment. This is accomplished by incorporating the parameters from cost function estimates into a simple model of university behavior based on monopolistic competition. I also present updated estimates of the returns to scale and scope among university outputs in order to look at a possible loss of allocative efficiency under a risk-sharing program.

I find that even under pessimistic assumptions about the degree of default reduction schools are able to achieve, a risk-sharing program could bring about a sizable reduction in total student loan debt. However, such savings would likely come at a cost of modestly higher tuition rates, a tradeoff which policymakers should consider when designing the program. Furthermore, I find no evidence that there would be a sizable loss of economic efficiency if students are induced to enter a different educational sector as a result of a risk-sharing program.

The paper is constructed as follows: Section 2 discusses the previous literature. Section

3 describes the data and empirical methodology used to estimate institutional cost functions and responses. Section 4 provides a discussion of the findings and their implications, and Section 5 concludes.

2 Previous Literature

This section presents a brief summary of the literatures which are touched on by this paper. For a broader overview of the higher education fiscal landscape, see Ehrenberg (2012) or Ehrenberg (2014).

A central focus of this paper is the estimation of cost functions among higher education institutions. The seminal paper in this literature is Cohn et al. (1989), the first study to estimate cost function parameters institutions of higher education and translate these parameters into the economically meaningful measures of economies of scale and scope. A number of studies have utilized the framework fromCohn et al. (1989) to provide similar measures for institutions in different countries or at different points in time (see Laband and Lentz (2003) or Sav (2011) to name just a few).

Since defaults on student loans are disproportionately concentrated among for-profit institutions, much of the political discussion surrounding defaults has focused on schools in that sector. While the literature which focuses specifically on for-profit institutions is still relatively small, primarily due to a lack of high-quality data, there are several recent excellent studies which examine multiple aspects of the for-profit sector..

Cellini (2010) and Cellini and Goldin (2014) both illustrate the large role that federal student aid plays in the strategic decisions of for-profit institutions. Cellini (2010) finds that entry of new for-profit programs is directly tied to the availability and generosity of federal aid such as Pell Grants.Cellini and Goldin (2014) show that increases in the generosity of these programs leads to increases in tuition at for-profit institutions, a confirmation of the so-called “Bennett Hypothesis”, and important evidence which supports the model of institution behavior which is used in this paper.

Recent work also tends to find that the costs (Cellini, 2012) and benefits (Cellini and Chaudhary, 2014; Lang and Weinstein, 2013) of attending a for-profit college tend to be less favorable to students relative to other sectors. However, it is important to note there is selection along several dimensions into attending a for-profit university, and that not all groups have equal access to all educational sectors (Chung, 2012).

The current paper also has substantial overlap with the growing body of research on student loans. For an excellent survey of both the practical and academic sides of student loans, see Avery and Turner (2012). The strand of this literature which deals with default rates is the most relevant to the current study. Dynarski (1994) and Hillman (2014) examine the characteristics which correlate with eventual default on their loans, finding unsurprisingly that borrowers from low-income households, college dropouts, and those with the lowest post-college earnings were the most likely to default on their student loans. Ionescu (2009) tests the impact of various student loan policies (e.g. repayment flexibility, eligibility requirements) on schooling decisions and default rates using a structural model of human capital accumulation.

3 Empirical Methodology

The goal of this study is to be able to predict how postsecondary institutions would respond to various student loan risk-sharing policies. This is accomplished in two steps: 1) estimate cost function parameters to obtain a marginal cost curve for each institution, and 2) use the cost curve estimates in a simple model of monopolistic competition to predict what the institutional response would be to a risk-sharing policy (modeled as a change in costs). Each step is described in turn below.

Cost Function Estimation

I estimate a panel data variant of the model originally estimated in Cohn et al. (1989), the seminal paper in the higher education cost function literature. Specifically, I estimate the following equation for each of ten institution types (Public Research, Private Research, Public Masters, Private Masters, Public 4-year, Private 4-year, Public 2-year, Private 2-year, For-profit 4-year, and For-profit 2-year).

$$C_{it} = \alpha_0 + X_{it}\beta + \sum_j \gamma_j Y_{ijt} + (1/2) \sum_k \sum_j \delta_{jk} Y_{ijt} Y_{ikt} + \mu_i + \varepsilon_{it} \tag{1}$$

C represents the total cost expended by institution i at time t. X is a vector of control variables (the average instructor's salary and year fixed effects), Y represents the total value of outputs j and k (where j and k both index undergraduate enrollment, graduate enrollment, and a measure of external research output), μ_i denotes institution fixed effects, and ε_{it} is the usual error term. The above formulation effectively forms a quadratic in each output, as well as interactions between each output pair[1]. Output categories were excluded from samples where all, or nearly all, institutions had no positive values of the output (e.g. research or graduate enrollment for community colleges).

The data for this study come from the Integrated Postsecondary Education Data System (IPEDS). The analysis utilizes an unbalanced panel of institutions which cover the 1987-88 to 2010-11 academic years. Undergraduate and graduate enrollment are measured in full-time equivalent (FTE) students. Following Cohn et al. (1989), research output is measured as spending on external research administration.

While the main focus of this paper is not to generate estimates of institutional economies of scale and scope, these quantities are nonetheless useful when considering the optimal response to a change in costs. Following Cohn et al. (1989), I present updated estimates of ray economies of scale, product specific economies of scale, and economies of scope for each

[1] Other parameterizations were tested, including a quartic in each output category and a translog cost function. Results are available upon request.

of the ten institutional types studied. These quantities are defined as follows:

$$Ray\,Economies\,of\,Scale\,(at\,time\,t):\ \frac{C_{it}}{\sum_j MC_i^j \times Output_{it}^j} \tag{2}$$

$$Product\,Specific\,Economies\,of\,Scale\,(for\,product\,j\,at\,time\,t):\ \frac{C_{it} - C_{it}^{-j}}{MC_i^j \times Output_{it}^j} \tag{3}$$

$$Economies\,of\,Scope\,(for\,product\,j\,at\,time\,t):\ \frac{C_{it}^j + C_{it}^{-j} - C_{it}}{C_{it}} \tag{4}$$

Ray economies of scale represent the impact on cost of a proportional increase of all products (i.e. undergraduate teaching, graduate teaching, and research), and are equivalent to product specific economies in the case of single-product firms. In the notation above, quantities with a superscript j refer to the item specific to product j (e.g. the marginal cost of undergraduate teaching), and quantities with a superscript -j refer to the item specific to all products *except* j (e.g. the total cost of all products *except* graduate teaching). The quantities above are calculated based on the estimates from Equation (1).

Estimating Institutional Responses

To predict how institutions will respond to a program such as risk sharing, we must first posit a model for their optimal choice of output. In this paper, I assume that firms make decisions based on a simple model of monopolistic competition, where they choose output (e.g. undergraduate teaching) and price (tuition) based on marginal cost, marginal revenue, and demand.

At first glance, a model based on profit maximization may seem inappropriate for schools in the nonprofit sector. However, I assume that each institution's current output and price combination represents an optimal allocation, and only assume that institutions will respond to small changes in costs in a profit-maximizing manner. In this way, my strategy makes no assumptions about what objective function institutions are attempting to maximize in a global sense (e.g. profit, prestige, research, school rank), but only assumes that they will respond to a small increase in costs in a way which minimizes the negative impact on their budgets. While the validity of this assumption still likely varies across institutional type, it is relatively unrestrictive in that many institutions are currently under substantial budgetary pressure and likely do take costs into account when making strategic decisions.

In a sense, assuming a model of monopolistic competition is akin to assuming that the "Bennett Hypothesis" holds. As noted above, the recent evidence is strongly in favor of this point among for-profit institutions (Cellini and Goldin, 2014). The evidence on other sectors of higher education still seems to support some degree of "Bennett Hypothesis" response, although the evidence is more mixed when examining in-state tuition at public universities (Long, 2004a; Stingell and Stone, 2007).

Based on the estimates from Equation (1), I can construct an approximation to the slope of each institution's marginal cost curve by taking the twice differentiating the cost function with respect to undergraduate enrollment (the output which this paper will focus on). Constructing the marginal revenue and demand curves is a more difficult task with administrative data which does not allow me to observe student choice. Therefore, I present estimates for a variety of assumed demand elasticities which have been estimated in the literature. By assuming a given demand elasticity, the slope of the marginal revenue curve is implicitly determined.

Next, I assume that the level of undergraduate enrollment observed for a given institution and year is the level at which the estimated marginal cost curve intersects the marginal revenue curve. By combining the estimated slope of the marginal cost curve above with the assumed equilibrium, I am able to fully characterize the line. Further, I assume that the observed in-state tuition level is the point at which this observed level of undergraduate enrollment hits the demand curve.

In order to assess the response of the institution to a risk-sharing program, I then shift the marginal cost curve up according to the following equation:

$$MC_{new} = \hat{MC} + riskpremium \times \%default \times \%loan \times averageloan \tag{5}$$

where $\hat{MC}$ is the estimated marginal cost curve derived from Equation (1), riskpremium is the fraction of default costs the institution is asked to pay for, %default is the fraction of defaults observed at the institution (this is defined at the institution type level based on data from the Department of Education), %loan is the share of each institution's students who receive student loans, and averageloan is the average dollar value of the loans held by students with a loan (the latter two variables are obtained from IPEDS). Finally, the new optimal undergraduate enrollment is calculated based on the intersection of the new marginal cost curve and the original marginal revenue curve, and the new tuition level is calculated based on where the new enrollment figure crosses the demand curve.

4 Results

Table 1 presents summary statistics for each of the ten institution types. All of the data come from IPEDS with the exception of the 3-year default rate, which is obtained from the Department of Education at the institution-type level. The substantial differences among the observable characteristics of institutions underscores the need to estimate all models separately by institution type. Of particular interest to this study are the differences in the student loan variables. The average loan amount at for-profit institutions is roughly double that of public institutions. The disparity grows even larger when taking into account that about four out of 5 students attending for-profit institutions receive student loans, while less than half of the student body at the typical public institution takes on debt (and only 11%

of students at public 2-year schools). These figures are important for interpreting the results below.

Coefficient estimates and standard errors (clustered at the institution level) from Equation (1) run separately on each institution type are shown in Table 2. The model fit is fairly strong for most institution types, and does not change much when other more flexible functional forms are utilized (e.g. quartic). Given that the focus of this paper is on predictions at individual institutions, a simpler functional form is actually preferable, since a quartic specification can lead to implausible responses for outlier institutions. While the estimates in Table 2 are not the focus of the paper (they are used to construct the marginal cost estimates), the results are in line with similar estimates from the prior literature (Cohn et al., 1989; Laband and Lentz, 2003; Sav, 2011).

Table 3 presents estimates of ray/product specific economies of scale and economies of scope for each institutional category. Each estimate represents the median institution's degree of scale or scope economies; standard errors are generated by bootstrapping the cost function regressions and scale/scope calculations together.

A value of greater than one for either ray or product specific economies of scale implies increasing returns to scale, while a value of less than one implies diseconomies of scale. Economies (diseconomies) of scope exist when the estimate is positive (negative).

Several interesting results stand out from the scale and scope calculations. First, private (both for-profit and non-profit) tend to have larger scale economies than their public counterparts. This is not at all surprising given the profit motives of for-profit institutions and the focus on small class sizes of private non-profits. Second, while not a perfect comparison, these estimates appear somewhat larger (greater economies of scale) than similar estimates using older data (Cohn et al., 1989; Laband and Lentz, 2003) despite considerable growth in enrollments. Anecdotally, this may be attributed to technological advances such as online learning. I am not aware of any work which rigorously examines the causes of such changes in cost structure over time, but it appears to be a potentially interesting question for future research.

Tables 4-6 show the predicted results of a risk-sharing program where the institution must pay for 20% or 50% of its students' defaults. Table 4 presents the results when the assumed demand elasticity is .1, Table 5 presents the results when the elasticity is .3, and Table 6 assumes an elasticity of .5. These elasticities approximately correspond to the low, middle, and high end of tuition elasticities estimated in the literature, see Long (2004b) for an excellent example of how such elasticities can be estimated using detailed individual-level data. The predictions are generated using data only from the most recent survey year (Academic Year 2010-2011). The standard errors for each prediction are obtained by bootstrapping the regressions and response models together.

The first row of each panel shows the median predicted increase in annual in-state tuition (in constant 2014 dollars). The largest increases, as would be expected, are seen in the institutions with the highest default rates, loan amounts, and prevalence of loans. Focusing on Table 5, tuition at for-profit institutions would be expected to rise by $165 per year for the typical institution under a 20% risk-sharing plan (1-2%), or between $400-$500 under a 50% risk-sharing system (3-4%). For all other institution types, the tuition hikes would be considerably smaller, rarely exceeding 2% even under 50% risk-sharing

The third row presents the expected decline in the entering cohort summed up over all institutions within an institution-type. A 20% risk sharing system is expected to reduce first-year cohorts at for-profit institutions by 14,000-15,000 students annually, substantially greater than the loss of about 400 students combined at public and private PhD institutions.

From a policy perspective, the loss of college graduates is likely of greater importance than the reduction of entering cohorts, these figures are presented in the fifth row of each panel. The model estimates suggest that 2,254 four-year degrees and 4,466 2-year degrees would be lost annually among for-profit institutions under the 20% risk sharing system (5,636 and 11,166 under the 50% rule). However, these figures essentially assume that institutions would reduce their enrollment in a fashion which is uncorrelated with the likelihood of graduation. Given that eventual default is most likely negatively correlated with the likelihood of graduate, institutions would be incentivised to target their enrollment cutbacks at students who are highly unlikely to graduate, and thus these figures represent upper bounds.

Finally, the seventh row in each panel calculates the total student loan debt which would be saved annually by a risk-sharing program. The for-profit sector would account for about \$13 million in lower student debt under a 20% risk-sharing plan, or up to \$80 million under the 50% proposal, far outpacing other sectors (assuming a tuition elasticity of .3).

The predictions up to this point have made the (hopefully) unreasonable assumption that institutions would make no efforts to reduce defaults, and would instead respond only by re-optimizing their tuition and enrollment levels. A more realistic assumption might be a small (10%) drop in default rates by investing more heavily in students' post-graduation outcomes, or at the very least by not recruiting students who are highly unlikely to benefit from a college education (and thus will have trouble repaying the debt they incur). Table 7 reports the same predicted outcomes from Tables 4-6, but with the assumption that default rates are lowered by ten percent. By assuming a lower default rate, the costs to each institution are lower, and thus the tuition and enrollment responses are less severe. Although the savings in total student loan debt are considerably larger (\$42 million annually under 20% risk-sharing and \$130 million under 50% risk-sharing among the for-profit sector).

One potential worry of any intervention is that there may be a loss of overall economic efficiency. Given that the above results imply that for-profit institutions, particularly 4-year for-profits, may see moderate enrollment declines, it is worth asking whether a risk-sharing program might push students into a sector where they are more costly to educate. Turing back to Table 3, we see that this is unlikely to be the case. The returns to scale at a 4-year for-profit are virtually the same as at 4-year private non-profits, and the returns to scale are greater at public 2-year institutions than at for-profit 2-year schools.

So is a risk-sharing program a good idea? The answer depends on how much institutions will focus on reducing student defaults due to the new incentives and the type of student who is likely to be pushed out of higher education as a result. The above results imply that even a relatively modest improvement in default rates would make the program a sensible one. While there is no way to know for sure that this type of behavior would occur, we can look at the implementation of stricter default standards in 1991 as a guide. Only the worst institutional offenders were punished with a loss of federal financial aid (default rates greater than 30%) as a result of the 1991 law change, but this also means that only a subset of schools faced any change in incentives whatsoever (a school with a 20% default rate had no incentive to change their behavior because they were not close to the threshold). Average 3-year cohort default rates dropped from 22.4% in 1990 to 15% in 1992 (a 33% drop!) and continued to decline over the next several years.

The downside to such a program is apparent from the above results, a potential reduction in college graduates and an increase in tuition. While there would almost certainly be some reduction in college graduates from a risk-sharing program, there are many reasons to believe the overall impact would be small. Non-profit institutions, particularly public 2-year institutions, would likely absorb many students displaced from their for-profit counterparts since their goal is definitionally not profit-maximization. Furthermore, there is substantial evidence that many students do not actually receive a financial benefit from going to college when balanced against the explicit tuition cost and the opportunity cost of time spent out of the labor force (Webber, 2015). Assuming that a disproportionate share of those who fail to enroll in higher education as a result risk-sharing would not actually benefit from the experience in the long run, then this negative aspect is less of a concern.

However, tuition increases are a much greater concern if some sort of risk-sharing program is implemented. Given the substantial increase in tuition over the past several decades, policymakers must be mindful of any additional cost pressure which is put on postsecondary institutions. Fortunately, since a risk-sharing program will save money, these funds could be reinvested in institutions which achieve low default rates, putting downward pressure on ballooning tuition.

5 Conclusion

As student loan debt continues to rise, a wide variety of policies aimed at reducing student debt and default rates have been proposed. This paper seeks to evaluate the costs and benefits of one such proposal, often referred to as risk-sharing. Under a risk-sharing program, postsecondary institutions would be obligated to pay for a portion of the debt which is defaulted on by their students. In contrast to current regulations involving default rates which are only binding for schools with very high default rates, a risk-sharing program would incentivise all institutions to reduce their default rates.

This paper examines the potential response of institutions to the introduction of risk-sharing under a variety of scenarios involving the magnitude of institutional penalties and the tuition elasticity of demand. I find that even a small degree of improvement in default rates (10%) would lead to considerable savings in national student loan debt, with the bulk of the gains coming from 4-year for-profit institutions. Tuition increases are likely to be modest at most schools based on the results of this analysis, but policymakers should be aware that risk-sharing would put positive pressure on tuition rates. Furthermore, I find no evidence that there would be a sharp decline in overall cost efficiency in the event that a risk-sharing program induced students to enroll in a different educational sector.

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Table 1: Summary Statistics

	Public PhD	Private PhD	Public Masters	Private Masters	Public 4-yr	Private 4-yr	Public 2-yr	Private 2-yr	For-Profit 4-yr	For-profit 2-yr
Undergraduate Enrollment	17787	6974	5822	2005	2323	1073	2235	224	465	170
Graduate Enrollment	3993	2660	949	500						
Research Exp. ($Millions)	57.3	11.7								
Average Faculty Exp.	55961	70554	58082	51802	52742	49840	57878	48957	32607	27800
Graduation Rate	.553	.724	.424	.542	.369	.551	.224	.516	.38	.628
% Students with loan	.44	.54	.49	.69	.50	.67	.11	.59	.82	.76
Average loan amount	3939	5270	3432	4779	3517	4347	2713	3979	6885	5109
Annual In-state Tuition	4284	22863	3590	15750	3138	15612	2013	9075	12397	9600
% Default within 3 years*	.089	.074	.089	.074	.089	.074	.171	.185	.186	.202
# Institutions	155	103	236	331	100	509	867	102	514	884
Total observations	3,461	2,259	5,232	6,796	2,033	10,890	18,153	1,528	4,746	4,852

*The default rates are obtained from the Department of Education at the institution-type level, and thus do not vary across schools of the same type. The default rates for 2 year institutions are the average between reported rates for less-than-2-year and 2-3 year institutions. Each cell represents the median value of the variable for each institution type.

Table 2: Cost Regressions

	Public PhD	Private PhD	Public Masters	Private Masters	Public 4-yr	Private 4-yr	Public 2-yr	Private 2-yr	For-Profit 4-yr	For-profit 2-yr
Under	13,631***	16,958**	8,840***	8,107***	-6,342	7,248***	6,377***	8,044***	5,476***	9,186***
	(2,470)	(7,831)	(926.4)	(1,386)	(5,642)	(1,006)	(420.3)	(2,064)	(1,147)	(1,085)
Under2	-0.0509	-0.847	0.0811*	0.578***	1.186**	-0.0996*	0.0915***	1.132***	0.00436	-0.744***
	(0.181)	(1.018)	(0.0426)	(0.222)	(0.474)	(0.0534)	(0.0308)	(0.356)	(0.00626)	(0.206)
Grad	12,039**	3,668	2,598	2,556						
	(5,214)	(12,844)	(1,710)	(1,573)						
Grad2	1.670	2.693	-0.0333	0.909***						
	(1.738)	(2.626)	(1.040)	(0.303)						
Research	1.520***	1.561***								
	(0.211)	(0.567)								
Research2	-2.33e-09***	-1.17e-09**								
	(7.98e-10)	(5.72e-10)								
Under*Grad	-2.199**	-1.365	0.0221	-1.962***						
	(0.940)	(3.184)	(0.416)	(0.503)						
Under*Research	3.64e-05**	0.000178**								
	(1.48e-05)	(8.87e-05)								
Grad*Research	0.000161***	-2.39e-05								
	(3.03e-05)	(0.000102)								
Faculty Salary	12.55	32.61	12.86	12.01	-5.255*	4.995**	11.03***	0.102	7.584	2.557**
	(8.862)	(155.6)	(9.163)	(9.708)	(3.164)	(2.225)	(2.758)	(0.127)	(6.792)	(1.082)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Institution FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,461	2,259	5,232	6,796	2,033	10,890	18,153	1,528	4,746	4,852
R-squared	0.899	0.841	0.782	0.605	0.295	0.438	0.640	0.666	0.894	0.379

Table 3: Economies of Scale and Scope

	Public PhD	Private PhD	Public Masters	Private Masters	Public 4-yr	Private 4-yr	Public 2-yr	Private 2-yr	For-Profit 4-yr	For-profit 2-yr
Ray Economies of Scale	1.309	1.121	1.339	1.855						
	(.0869)	(.1361)	(.0521)	(.0815)						
conomies of Scale (Undergrad)	1.258	.8580	.4907	.9659	.2296	2.667	1.518	1.621	2.614	1.238
	(.4839)	(.4925)	(.0695)	(.0958)	(2.813)	(.114)	(.0549)	(.4256)	(.3691)	(.0839)
conomies of Scale (Graduate)	2.367	4.145	30.83	-18.56						
	(2.559)	(1.753)	(14.67)	(7.936)						
conomies of Scale (Research)	1.24	1.6005								
	(.1508)	(.4946)								
onomies of Scope (Undergrad)	.1346	.0083	-.0009	.050						
	(.0977)	(.1170)	(.0183)	(.0083)						
conomies of Scope (Graduate)	.1229	.0823	-.0009	.0500						
	(.0748)	(.1085)	(.0183)	(.0083)						
conomies of Scope (Research)	-.1240	-.0536								
	(.0254)	(.019)								

Table 4: Response to Risk-Sharing (Demand Elasticity=.1)

	Public PhD	Private PhD	Public Masters	Private Masters	Public 4-yr	Private 4-yr	Public 2-yr	Private 2-yr	For-Profit 4-yr	For-profit 2-yr
Risk-sharing=.2										
Change in tuition	28	32	30	37	26	35	22	74	165	139
	(1)	(2)	(1)	(1)	(1)	(1)	(1)	(5)	(2)	(5)
Decrease in 1st-yr cohort	108	23	173	79	60	97	357	276	2160	2292
	(9)	(27)	(13)	(50)	(6)	(114)	(86)	(68)	(136)	(152)
Decrease in graduates	61	16	78	43	23	51	89	157	752	1249
	(5)	(18)	(6)	(28)	(2)	(60)	(22)	(37)	(57)	(78)
Decrease in debt	36386	30473	64034	131673	23721	183319	155409	140079	2778659	1484129
	(3671)	(4423)	(5449)	(6821)	(3427)	(9489)	(9883)	(20286)	(108785)	(101313)
Risk-sharing=.5										
Change in tuition	70	81	75	94	66	89	55	185	413	347
	(2)	(8)	(2)	(1)	(3)	(1)	(2)	(15)	(5)	(11)
Decrease in 1st-yr cohort	270	58	432	198	151	242	893	690.4843	5402	5730
	(20)	(70)	(32)	(91)	(14)	(231)	(197)	(152)	(402)	(346)
Decrease in graduates	152	40	197	109	58	129	222	394	1880	3123
	(12)	(48)	(15)	(50)	(6)	(124)	(51)	(89)	(159)	(196)
Decrease in debt	195071	168516	347869	727614	127868	1014881	847750	823687	1.68e+07	8632960
	(16905)	(25873)	(28384)	(42790)	(17476)	(62025)	(67585)	(122681)	(769339)	(618897)

Standard errors are obtained by bootstrapping Equation (1), Equation (5), and the process described in the Empirical Methodology section together. The first row in each panel represents the median predicted increase in tuition. The third and fifth rows present the total loss in first-year enrollment and expected college graduates summed over all institutions within each sector. The seventh row reports the expected savings in student loan debt calculated by adding the instititional penalty for defaults and the debt which is saved by lower enrollments.

Table 5: Response to Risk-Sharing (Demand Elasticity=.3)

	Public PhD	Private PhD	Public Masters	Private Masters	Public 4-yr	Private 4-yr	Public 2-yr	Private 2-yr	For-Profit 4-yr	For-profit 2-yr
Risk-sharing=.2										
Change in tuition	28	40	29	33	21	36	21	61	165	165
	(1)	(11)	(1)	(1)	(2)	(1)	(1)	(10)	(2)	(13)
Decrease in 1st-yr cohort	328	86	511	214	150	297	1053	688	6476	8194
	(32)	(143)	(36)	(128)	(21)	(372)	(217)	(163)	(483)	(780)
Decrease in graduates	185	59	233	118	58	158	262	393	2254	4466
	(17)	(97)	(17)	(70)	(9)	(198)	(53)	(101)	(190)	(428)
Decrease in debt	92769	96493	161807	312750	50693	489310	393790	328574	8027464	4864484
	(10726)	(28539)	(13263)	(21229)	(8948)	(28396)	(22216)	(60041)	(427280)	(473525)
Risk-sharing=.5										
Change in tuition	71	100	74	84	54	91	54	153	412	414
	(3)	(34)	(2)	(3)	(4)	(2)	(1)	(27)	(5)	(31)
Decrease in 1st-yr cohort	821	216	1277	535	375	742	2633	1721	16192	20486
	(69)	(296)	(91)	(453)	(51)	(1010)	(530)	(421)	(1288)	(1587)
Decrease in graduates	462	149	582	296	146	396	656	983	5636	11166
	(38)	(207)	(45)	(251)	(21)	(539)	(128)	(256)	(505)	(869)
Decrease in debt	547469	581138	958947	1859345	296446	2927325	2337635	2001786	4.96e+07	2.98e+07
	(52139)	(208901)	(84807)	(147036)	(55326)	(156261)	(123912.6)	(437334)	(2537678)	(2450506)

Standard errors are obtained by bootstrapping Equation (1), Equation (5), and the process described in the Empirical Methodology section together. The first row in each panel represents the median predicted increase in tuition. The third and fifth rows present the total loss in first-year enrollment and expected college graduates summed over all institutions within each sector. The seventh row reports the expected savings in student loan debt calculated by adding the institional penalty for defaults and the debt which is saved by lower enrollments.

Table 6: Response to Risk-Sharing (Demand Elasticity=.5)

	Public PhD	Private PhD	Public Masters	Private Masters	Public 4-yr	Private 4-yr	Public 2-yr	Private 2-yr	For-Profit 4-yr	For-profit 2-yr
Risk-sharing=.2										
Change in tuition	28	51	29	30	18	37	21	52	164	205
	(2)	(541)	(1)	(1)	(2)	(1)	(1)	(12)	(2)	(43)
Decrease in 1st-yr cohort	553	187	838	325	213	505	1725	981	10785	16896
	(48)	(6967)	(52)	(200)	(38)	(515)	(423)	(308)	(755)	(3280)
Decrease in graduates	311	128	382	179	82	269	430	560	3754	9210
	(26)	(4823)	(25)	(111)	(15)	(279)	(106)	(187)	(282)	(1786)
Decrease in debt	150331	201311	256530	461331	69634	808137	623832	462557	1.33e+07	9848272
	(14455)	(2128019)	(19346)	(43675)	(12610)	(49939)	(37328)	(108566)	(734915)	(1957362)
Risk-sharing=.5										
Change in tuition	72	129	73	77	46	93	53	131	412	513
	(6)	(443)	(3)	(3)	(8)	(2)	(1)	(39)	(7)	(98)
Decrease in 1st-yr cohort	1382	467	2096	812	533	1263	4312	2453	26963	42241
	(165)	(2126)	(126)	(695)	(101)	(1625)	(1053)	(729)	(2472)	(7513)
Decrease in graduates	779	322	956	449	207	674	1075	1402	9386	23025
	(95)	(1478)	(58)	(389)	(38)	(868)	(275)	(426)	(901)	(4275)
Decrease in debt	907230	1236258	1550969	2787977	414825	4919993	3775398	2839178	8.24e+07	6.09e+07
	(115675)	(3844087)	(111490)	(230218)	(94729)	(258830)	(258929)	(764441)	(5011809)	(1.10e+07)

Standard errors are obtained by bootstrapping Equation (1), Equation (5), and the process described in the Empirical Methodology section together. The first row in each panel represents the median predicted increase in tuition. The third and fifth rows present the total loss in first-year enrollment and expected college graduates summed over all institutions within each sector. The seventh row reports the expected savings in student loan debt calculated by adding the institional penalty for defaults and the debt which is saved by lower enrollments.

Table 7: Response to Risk-Sharing (Demand Elasticity=.3, Defaults Reduced by 10%)

	Public PhD	Private PhD	Public Masters	Private Masters	Public 4-yr	Private 4-yr	Public 2-yr	Private 2-yr	For-Profit 4-yr	For-profit 2-yr
Risk-sharing=.2										
Change in tuition	23	32	24	27	17	29	17	49	133	134
	(1)	(8)	(1)	(1)	(1)	(1)	(1)	(7)	(1)	(11)
Decrease in 1st-yr cohort	266	70	413	173	121	240	853	557	5246	6637
	(20)	(77)	(24)	(86)	(13)	(288)	(180)	(126)	(366)	(643)
Decrease in graduates	154	49	195	98	49	131	237	336	2003	3842
	(11)	(55)	(11)	(50)	(5)	(158)	(53)	(78)	(164)	(390)
Decrease in debt	15990260	4449106	9414291	7023420	1511678	4507397	1.27e+07	660429	3.55e+07	6908762
	(1366743)	(530557)	(739242)	(474896)	(158294)	(267076)	(818269)	(92627)	(8774235)	(477185)
Risk-sharing=.5										
Change in tuition	57	81	60	68	44	74	43	124	334	335
	(2)	(36)	(1)	(1)	(4)	(1)	(1)	(19)	(5)	(26)
Decrease in 1st-yr cohort	665	175	1034	433	304	601	2133	1394	13115	16593
	(54)	(242)	(74)	(372)	(29)	(545)	(414)	(304)	(919)	(1435)
Decrease in graduates	385	123	487	245	122	328	594	840	5009	9606
	(33)	(170)	(38)	(213)	(13)	(300)	(119)	(193)	(383)	(900)
Decrease in debt	4.02e+07	1.13e+07	2.39e+07	1.82e+07	3879408	1.23e+07	3.25e+07	2348058	1.06e+08	2.77e+07
	(4007171)	(1476842)	(1830645)	(1028977)	(397320)	(617440)	(2473291)	(329833)	(2.14e+07)	(1946011)

Standard errors are obtained by bootstrapping Equation (1), Equation (5), and the process described in the Empirical Methodology section together. The first row in each panel represents the median predicted increase in tuition. The third and fifth rows present the total loss in first-year enrollment and expected college graduates summed over all institutions within each sector. The seventh row reports the expected savings in student loan debt calculated by adding the institional penalty for defaults and the debt which is saved by lower enrollments.