Merger Employment Effects in Private Higher Education*

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Resumo

O Brasil possui um Sistema de educação superior com a coexistência de instituições públicas gratuitas e privadas pagas. Cerca de ¾ das matrículas estão em instituições privadas. Ainda bastante reguladas, instituições privadas podem adquirir outras instituições privadas. Apresentamos uma visão geral da dinâmica desta indústria para confirmar que as fusões foram a estratégia adotada por grandes grupos para expandir, dada as baixas taxas de entrada no setor, que apontam para significativas barreiras à entrada. A maior parte das fusões foram em mercados locais onde a mantenedora adquirente não atuava. Avaliamos o efeito destas fusões sobre o emprego, e também sobre a produção (número de matrículas), através de um modelo dif-in-dif, coerente com a teoria econômica de fusões. Os resultados indicam que as fusões geram uma redução no número de docentes das instituições adquiridas, de forma proporcional à redução nas matrículas destas instituições.
Palavras Chave : Emprego na Educação Superior; Análise de Efeitos de Fusões
Código JEL: L22, L40, J23

Abstract

Brazil has a dual higher education market with the coexistence of public no-tuition institutions and private tuition-funded enterprises. About ¾ of enrollments are in private higher education institutions (HEI). Still heavily regulated, since the market liberalization in 1997, private institutions can merge and acquire (M&A) other private HEI. We provide an overview of the recent growth of this sector and the significant role of mergers and aquisitions. We show that entry rates are small and fastest growing HEIs exploited M&A extensively. We evaluate the effects of mergers on employment. Using Difference-in-Difference analysis, we estimate smaller faculty size and a proportional to a reduction in enrollment after a merger, on average.
Key words: Employment, Higher Education; Merger effects
JEL Codes: L22, L40, J23

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1. Introduction

Higher education systems present different configurations over the world. In Brazil, there is a dual system, with the coexistence of tax-funded, tuition free public universities and tuition funded private institutions. The public universities are rationed by student admission exams that seldom have excess supply. Private universities, on the other hand, are responsible for about 75% of national enrollment.

It is a heavily regulated sector with government control over entry and quantity and quality. Tuition is unregulated and there is ample public student funding either through federally funded loans or tax breaks to universities. Recently (1997) for profit private higher education institutions (HEI) were allowed and mergers could be carried out between HEI. Following a surge in private equity funding and foreign institutional investors (IFC, BlackRock, Advent and others, e.g., Economist, 2012), a small group of firms started a sector consolidation. More than forty mergers were registered at the competition authority from 2009 to 2014.

Growth has been impressive. Enrollment almost doubled from 1980-2000 and almost tripled in the following fourteen years. From 2000-2014 private enrollment increased more than threefold. In the US, Kwoka and Snyder (2004) indicate that it took fourty years for enrollment to increase fivefold in the US, from 1955 to 1997.

In this paper we seek two goals. First, we provide a detailed account of industry dynamics and demographics including mergers and also review the competition authority (CADE) response to these mergers. Second, we conduct higher education sector merger impact evaluation on employment and enrollment.

The Brazilian case is very rich insofar there is a large private sector and the sheer pace of mergers creates significant variation in the data set to estimate merger effects even with a small time frame. Employment effects of mergers are evaluated with different methods after Conyon et al. (2002). Opposite effects are expected: if mergers are motivated by synergies opportunities such as economies of scale or more efficient allocation, employment should decrease after a merger; yet, better management (or financial standing) increase firm competitiveness that boost output expanding employment. The direction of the effect is not predictable ex-ante.

Closest to our impact analysis of higher education mergers is Garcia and Azevedo (2015) that focus on majors and student quality. Using a D-i-D method (with matching) on majors/degrees on limited sample of HEI experiencing mergers, they conclude that the level of student standardized test scores increase after a merger by a large "network" firm, i.e. a multi HEI institution. Instead of looking at quality we focus on employment and consider all courses in the HEIs.

We use a linear standard D-i-D model as prediction models for mergers (required for first stage matching models) often have difficulties in discriminating merging and non-merging HEI based on local and observed characteristics. This is seen in Garcia and Azevedo (2015), that evaluate large merger effects on quality. Few variables predict mergers and balancing tests change little from before and after reweighting across explanatory variables.

Our main identification hypothesis comes from merger motives (Motta, 2004, Mottis, 2007, inter allia). Mergers are profitable if they transform the acquired unit. Merger targets are generally inefficient or can be made more efficient or profitable after a change in management practices, technology or product mix. This points to permanent characteristics as relevant to identify merger targets and merger effects, instead of transitory profitability shocks to firms. This suggests that D-i-D in panel data is the required strategy, in the absence of natural experiments, instead of matching models. This point is made forcefully by Chabe-Ferret (2014, 2015).

Advancing our results, we see that the sector regulation pushed firms to grow through mergers and acquisitions. Entry and exit rates are very small and entrants are much smaller on average. More than 2/3 or mergers were in local markets where acquirers did not operate. The sector has followed a trend since liberalization in the 1990s, moving from non-profit only private institutions to a majority of for-profit private institutions. The fastest growing firms adjusted their major/degree portfolio to explore economies of scale with emphasis of distance learning.

Regarding the effects of mergers on employment and enrollment, using a standard Differences-in-Differences analysis we see that after a merger enrollment numbers drop with an accompanying effect on faculty; there is a lagged positive effect on the ratio of PhDs in faculty total. The drop in faculty seems to be proportional to enrollment reductions, as there is no significant effect on teacher-per-student ratio. Garcia and Azevedo (2015) also found positive effects of mergers on faculty PhD ratios.

This paper is organized in six sections including this introduction. In the following section we provide a short regulatory overview of higher education in Brazil, with a focus of firm dynamics. The following section presents an overall view of the industry, with entry and exit and merger level estimates. The four section summarizes the antitrust authority approach and outcomes to mergers between HEI. The effects of mergers (filed or not with the antitrust authority) on employment and enrollment are studied in section five and section six provides concluding comments.

2. Industry growth and dynamics

Higher education is an extensively regulated industry in Brazil, with oversight by the Education Ministry and other regulatory bodies, such as the Nation Education Council (*Conselho Nacional de Educação*) that write legislation on the sector. The ministry oversees HEI's entry and course openings, maximum enrollment levels and quality. Throughout we consider a *degree* a major such as Economics or Mechanical Engineering. HEI quality is evaluated permanently with overlapping three year course evaluation cycles. Product wise, there are three types of HEI degrees: 'Bacharelado' (B.A., taking 4 to 5 years); 'Tecnólogo' (2-year degrees, with a more practical approach) and 'Licenciatura' (3-4 year Basic, School, Education Teacher training). Tecnólogo should not be confused with technical or vocational training, that may be part of high school. The 2-years courses were regulated in 1997 ('Decreto 2208/1997') and 2001 ('Parecer CNE/CES 436/2001').

The Education Law (*Lei de Diretrizes e Bases da Educação - LDB*, 1996) consolidated a coexistence of public and private institutions. Decree 2307/1997 allows for-profit firms to control HEI. To segregate financial assets and liabilities from educational assets, HEIs are required to be funded by an institution called 'Mantenedora'. The above mentioned decree allowed these 'Mantenedora' to be private for-profit firms. There is partial control over course/major openings by the regulator. Universities and 'Centro Universitário' may decide to start a new course, with no pre-notification to the Ministry of Education. Small colleges ('Faculdades') are required a pre-authorization by the Ministry of Education (see e.g., Octavianni, 2013).

In the late 1990´s the National Education Council allowed higher education degrees be awarded through distance learning (DL). It started as means to reach basic education teachers in all corners of the country (Chaves, 2010). The 1996 LDB set the goal to have all basic education teachers with at least a 3-4 year degree. Since Decree 5622/2005, DL majors are allowed as long as there is support from a local base ('polo'), where students must cover at least exams and attend online classes with a tutor in the premises. Also note that Distance Learning/online courses as a teaching technique may be used in up to 25% of non-distance learning degrees, generating economies of scope. (Frazão, 2014, *inter allia*)

The sector had been growing quickly over the last 10-15 years as seen in Table 1. From 2004-2014 enrollments almost doubled, reaching about 8 million students. This is still shy from the national goal of 50% of all 18-24 year olds in absolute and relative terms. There is a significant number of higher education students 25 or older. The share of enrollments in private HEI has been hovering around the 25% mark since 2007 from a 30% share in 2003.

Distance learning experienced very fast growth with a level change in 2008. Currently, 17% of enrolled students are in distance learning courses. Interestingly, while distance learning degrees started at the public universities, private universities embraced this teaching mode with *gusto*. In 2014, 90% of distance learning students are in private universities. Economies of scale may be a reason behind this shift. There are significant cost savings in labor and the possibility to reach students in more locations with distance learning. (Economist, 2014). These savings are passed on to students, so that distance learning prices are 20-50% cheaper than same major non-distance learning degrees (based on 2013 data).

Table 1: Higher Education in Brazil – Enrollment – 2003-2014

Year	Total Enrollment	Public Share	DL Share	Public Share on DL
2003	3.936.933	30%	1,3%	80%
2004	4.223.344	29%	1,4%	60%
2005	4.567.798	27%	2,5%	48%
2006	4.883.852	26%	4,2%	20%
2007	5.250.147	25%	7,0%	25%
2008	5.808.017	27%	12,5%	38%
2009	5.954.021	26%	14,1%	21%
2010	6.379.299	26%	14,6%	20%
2011	6.739.689	26%	14,7%	18%
2012	7.037.688	27%	15,8%	16%
2013	7.305.977	26%	15,8%	13%
2014	7.839.731	25%	17,1%	10%

Source: Sinopse Ensino Superior /INEP 2003-2014. Note: Public – federal, state and local Higher Education Instutions (HEI). DL – Distance Learning.

Regarding degree types, from 2009 to 2014, the latest figures available, Table 2 indicates that private universities have expanded their BA/4year enrollments at the expense of teacher degrees ('Licenciatura'). Breaking up these figures by teaching method (distance and non-distance learning) on Table 3, BA and 2year degrees have expanded their role in distance learning. Firms are moving away from teacher education in distance learning and focusing on professional and other majors.

Table 2: Higher Education Enrollment in Private Instiutions – 2003-2014

Year	Total	NDL	DL	DL/Total
2009	4.428.084	3.762.655	665.429	15,0%
2010	4.735.946	3.987.369	748.577	15,8%
2011	4.966.293	4.151.290	815.003	16,4%
2012	5.197.088	4.251.263	945.825	18,2%
2013	5.437.373	4.424.440	1.012.933	18,6%
2014	5.903.351	4.698.666	1.204.685	20,4%

Year	Total NDL	4Yr	2Yr
2009	3.762.655	75%	14%
2010	3.987.369	77%	15%
2011	4.151.290	77%	15%
2012	4.251.263	78%	16%
2013	4.424.440	78%	15%
2014	4.698.666	80%	14%

Source: Censo Educação Superior (CES/INEP) 2009-2014. Note: Private HEI. NDL – Non-Distance Learning; DL – Distance learning; 4Yr – B.A. (Bacharelado) degree; 2Yr. – 2 year degree ('Tecnólogo') degree. Omitted category: Teacher education ('Licenciatura')

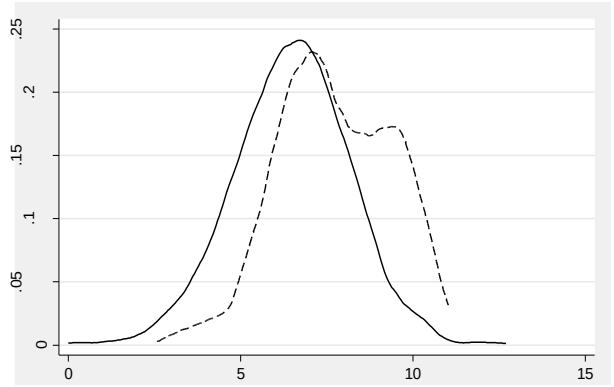
Table 3: Higher Education Enrollment in Private Institutions – by teaching method and degree type– 2003-2014

	NDL			DL		
Year	4Yr	Licentieteship	2Yr	4Yr	Licentieteship	2Yr
2009	75%	14%	11%	24%	50%	26%
2010	77%	12%	11%	28%	43%	28%
2011	77%	11%	12%	30%	40%	30%
2012	78%	10%	12%	33%	37%	31%
2013	78%	10%	12%	32%	35%	33%
2014	80%	9%	11%	32%	37%	31%

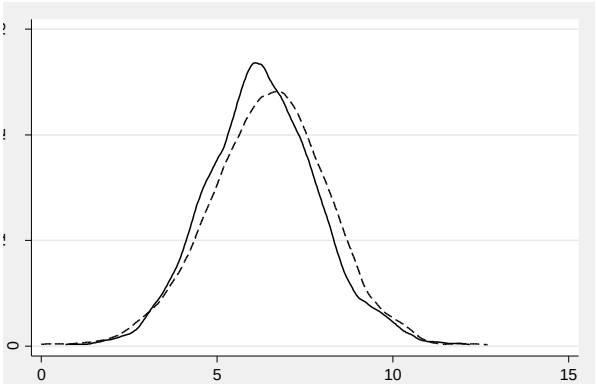
Source: Censo Educação Superior (CES/INEP) 2009-2014. Note:. NDL – Non-Distance Learning; DL – Distance learning; 4Yr – B.A. (Bacharelado) degree; Licentieteship (Teacher education /'Licenciatura'); 2Yr. – 2 year degree ('Tecnólogo') degree.

Firm size grew over time. From 2010-2014 average size increased from 2863 students to 3312.1 students. Given stability in HEI numbers, overall expansion was solely due to average firm size. Firm size distribution differ between private and public institutions (Figure 1-A). Public institutions are larger overall, but the largest institutions in the country are private. The firm size distribution for private institutions is surprisingly close to log-normal (although this can be rejected at standard significance levels). Over time, firm size growth is visible (Figure 1-B for private HEIs).

Figure 1 – Firm size distribution (log enrollments) public and private (2014) and private (2009-2014)



Note: Solid line: private institutions; Dashed lines: public institutions



Note: Solid line: 2009 - private institutions; Dashed lines: 2014 private institutions

Source: CES 2009-2014.

Firm dynamics can be measured in two complementary ways. First, we look at entry and exit and mergers by HEI. Second we look at entry and exit of majors/degrees within institutions. This allows us to explore two extensive margins: setting up new firms and setting up new 'product lines', using a manufacturing analogy.

Our data set is well suited to this task. The Higher Education Census by the Ministry of Education/INEP is a census of all HEI. Firms (HEIs) receive a unique identifier over its lifetime. There are also unique, different controller ('Mantenedora') identifiers. Entry is recorded as a new identifier in the data base and exit as a disappearance of an identifier in the data. INEP follows firms to guarantee that information is provided. The asynchronous evaluation cycle for degrees in the institutions and information requirements for funding from the government guarantee that firms file the Census information every year. Mergers are identified as change in 'Mantenedora' code. After a merger if a HEI *name* changes this does not imply an institution *identifier* change allowing us to track mergers.

Table 4: Higher Education Institution Firm Dynamics: unweighted (top) and enrollment weighted (bottom) – Brazil 2009-2014.

Year	Entry	Merger	Exit
2010	7%	5%	5%
2011	3%	5%	4%
2012	4%	3%	2%
2013	2%	2%	3%
2014	2%	1%	3%

Year	New Public	New Private	Merged
2010	0,17%	0,74%	4,97%
2011	0,05%	0,14%	10,88%
2012	0,03%	0,26%	4,24%
2013	0,09%	0,06%	2,32%
2014	0,14%	0,14%	1,65%

Source: CES 2009-2014. Note: Merger recorded as either a change in controller ('Mantenedora') for each HEI or filing of a merger case at CADE. Bottom part: entry rates and merger rates measures as ratio of enrollment in new/merged HEI w.r.t. total enrollment in higher education. E.g., 0,28% of total enrollment (bottom part) for 2014 were in the HEI that account for the 2% entry rate in that year.

Entry and exit rates are relatively small in this industry. Compared to nationwide rates of 12-8% for entry and exit in services (OECD, 2014) and 15-20% in manufacturing (Rezende, Ribeiro and Zaidan, 2015), churning is much smaller in the higher education sector. At the same time, mergers are quite active in higher education, often with rates higher than entry or exit. Our data points out that more HEIs traded controllers than new HEI started operating in 2011 (See Table 4).

Weighted by enrollments the figures are even more impressive (see bottom part of Table 4). In 2010 5% of all enrollments were in acquired firms. In the same year, new firms enrollment was only 0.2% of total. This difference is partly influenced by firm sizes (entrants are generally smaller), but nevertheless highlight the relevance of mergers in this industry.

Mergers are used as an entry strategy by large groups in new (local) markets. Out of the 348 local market mergers 85% were on markets where the acquirer did not operate previously.

Table 5: Enrollment Dynamics in Private Institutions – Degree/Course entry/exit/reallocation 2009-2014.

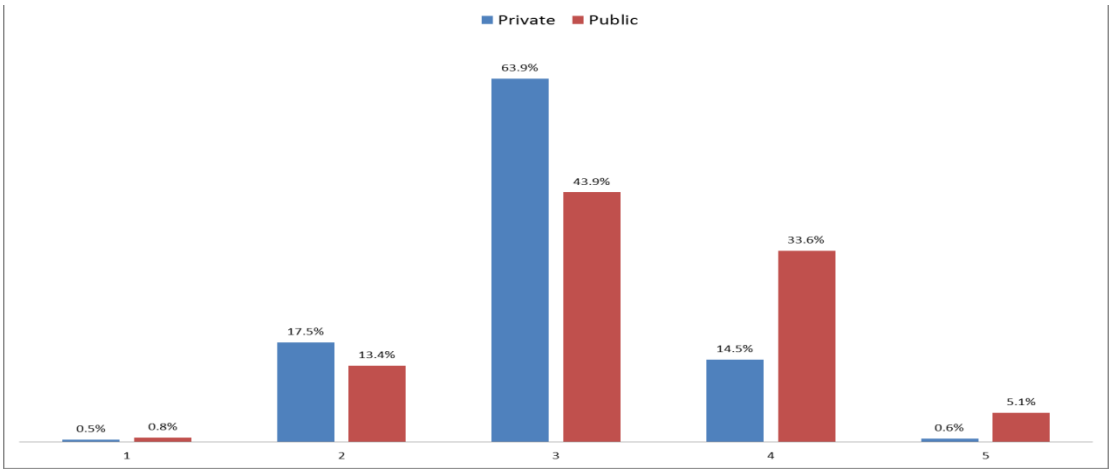
Year	Var. Enrollment	New Major Expansion	Existing Major Expansion	Existing Major Reduction	Extinct Major Reduction	Enrollment Realocation	New & Extinct Major Enrollment Realocation
2010	14%	14%	13%	-8%	-4%	38%	17%
2011	5%	3%	12%	-8%	-2%	25%	4%
2012	3%	3%	12%	-9%	-2%	25%	5%
2013	4%	3%	12%	-8%	-2%	24%	5%
2014	9%	3%	12%	-6%	-1%	22%	3%

Source: CES 2009-2014. Observation unit: enrollment in a given major/degree (e.g. Electrical Engineering at a specific HEI) *Var. Enrollment*: yearly net enrollment growth in private HEI measured by two-year average denominator. *New Major Expansion*: enrollment as share of biannual average total enrollment in courses that did not exist previously. *Existing Major Expansion*: expanding enrollment courses and levels in continuing courses in year *t* and *t-1* as share of biannual average total enrollment. *Existing Major Reduction*: contracting enrollment courses and levels in continuing courses in year *t* and *t-1*, as share of biannual total enrollment. *Extinct Major Reduction*: enrollment (at *t-1*) as share of biannual averate total enrollment in courses that existed at *t-1* and did not exist at *t.*. *Enrollment Reallocation*: sum of previsous four collumns in modulus. *New & Exiting Major Enrollment Reallocation*: sum of modulus of collumns New and Extinct.

We adapt job reallocation measures (Davis and Haltiwanger, 1999) to explore enrollment effects of entry and exit. We consider a major/degree a productive unit and enrollment figures its 'output'. Net yearly enrollment growth is broken up in four components: enrollment growth from new major (in either new or previously active HEIs) on continuing growing and contracting majors (active in the previous year) and from course/major closings. Growth is measured in gross levels, that is, we segregate degrees with positive net growth (enrollment creation) and negative net growth (enrollment destruction)[1]. The figures from Table 5 indicate that there is significant enrollment reallocation across majors, with rates higher than 20% for a net growth of 5% on average from 2010-2014. New/exiting majors respond for a quarter of this reallocation, with actual rates varying yearly. 2010 seems an outlier explained mostly the authorization of new courses, when firms took advantage of the impressive growth of worker wages and output in the economy (2010 experienced the largest GDP per capita growth since the 1980s).

Regarding quality, we use two indicators. First, the HEI overall evaluation rate (IGC) published by INEP/Ministry of Education. It is based on tri-annual major rotating student graduation national exams, *in loco* assessments and permanent evaluations of each course in the HEI. It is a relative score from 1 to 5. HEI with a score of 1 cannot contract new students and HEI with 2 are due *in loco* regulator visits and improvement agreements.

Figure 2 - HEI course evaluation grades (IGC) - 2013



Source: INEP. Authors' calculations.

As seen in Figure 2, 38.1% of public universities have a general grade of 4 or 5, while 15.1% private universities have such grades. The majority (64%) of private HEIs have a grade of 3. Relatively more private universities have a grade of 2 or 1 than public universities. The lower grades for private universities are not a surprise. According to one of the private HEI largest group financial statements

[1] See appendix for exact formulae.

"*While the public higher education institutions are directed to serve as centers of excellence and research, with extremely competitive admissions standards and a limited capacity for expansion, the private higher education institutions are focusing their attention on the professional requirements imposed by the labor market and they develop flexible programs to meet the needs of the working population.*" (Anima 2015)

Zoghbi et al. (2013) comparing HEI productivity in quality production form Brazil argued that once student characteristics are taken into account, private institutions seem more productive than public HEI regarding student quality growth over the college years as measured by standardized student exams.

Another view on quality is based on faculty skill level. Table 6 presents the evolution of faculty in the HEIs, highlighting the share of PhD(Doctorate) and public and private institutions. From 2003 to 2014 faculty numbers increased 56% and the number of those faculty with a PhD increased 152%. It must be noted that there was a significant expansion of the number of PhD/Doctorate programs in the country, growing from MA programs in the mid and late 1990´s. The share of PhD faculty increased from 21% to 35% in HE overall.

Regarding private institutions, the relative share of faculty in private institutions decreased from 65% to 57%. In private HEIs there was a 37% increase in faculty numbers. Given the almost doubling of enrollments in these institutions, enrollment/faculty ratio increased from 16 to more than 25. Part of this more intense use of labor inputs can be associated with the shift towards distance learning. Nevertheless, the *relative* share of PhDs in private faculty numbers actually increased (from 12% in 2003 to 20% in 2014), following the public universities trend.

Table 6 – Faculty numbers and share of PhDs – Public and Private HEI – 2003-2014.

Year	Total Faculty	Total of PhD	Share of PhD	Private's Faculty Share	Private's PhD Share
2003	254.153	54.487	21%	65%	12%
2004	279.058	58.431	21%	66%	12%
2005	292.504	63.294	22%	66%	12%
2006	302.006	67.583	22%	67%	12%
2007	317.041	72.931	23%	66%	12%
2008	321.493	77.164	24%	65%	13%
2009	340.817	89.850	26%	64%	14%
2010	345.335	98.195	28%	62%	15%
2011	357.418	107.013	30%	61%	17%
2012	362.732	115.087	32%	59%	18%
2013	367.282	121.190	33%	58%	18%
2014	396.595	137.554	35%	57%	20%

Source: Sinopse Ensino Superior /INEP 2003-2014.

Regarding antitrust evaluation, the first merger evaluated at CADE was in 2007 (Teodorovicz et al. 2015), under the 1994 antitrust law, requiring firms with more than BRL400 million (USD 100million in 2010) in revenues to file. From 2011 on there is a significant change in market definition. On a demand based relevant market definition, a degree/major, such as Economics, or Accounting, should be consider a product relevant market. Regarding geographical markets, catchment areas from the *acquired* institution were defined as geographical markets. There are small adjustments to specific degrees: for 'Tecnologo' (2yr degrees), product markets are defined as degree groups (e.g. '*business'*, including hospital management, logistics management, human resources management), as defined by regulation. Graduate degrees (MBA, MA and PhD) are taken as a separate product market and their geographical markets are state wide.

Concentration rates started to increase is specific locations, such as São Paulo and other metropolitan areas. An extensive list of mergers are seen in Teodorivcs et al. (2014) and Garcia and Azevedo (2015). Most cases concluded that entry is not effective to contest mergers. Regulation may take more than two years to allow firm entry even if start up size could be small (this is particularly acute in distance learning). Entrants start too small to effectively compete in this sector. Regarding rivalry, the market seems segmented in two dimensions: first from a quality x price perspective: prices vary significantly according to quality, such that there is limited substitution within major across HEI; second, brands are important (marketing are usually the largest expense of the largest firm, after labor) so national, marketing-intense brands compete with each other, mostly isolated from a fringe of small, 'faculdade' local institutions.

Firms recognize synergies from elimination of staff redundancies and administrative costs (markedly on marketing and class sizes). (Frazão, 2014) So far, efficiencies have not been recognized as a merger clearance argument by CADE.

3. Empirical analysis of merger effects

The analysis of merger effects has a small but growing literature (e.g. LEAR 2006). In many cases this evaluation use structural methods and simulation (Eaniv and Levin, 2010), but there is a growing range of papers using treatment effect analysis. This can be traced back to event studies (e.g., Eckbo, 2002). We evaluate the effect of all mergers in the industry from 2009 to 2014 using a difference-in-difference (D-i-D) approach. This method may be adequate to an ex-post evaluation of mergers where there is no information on prices and costs, as is our case (Angrist and Pischke, 2010).

Empirical analysis focuses of employment effects of mergers. As in Lehto and Böckerman (2008) we compare employment growth before and after the merge in relation to a control group of companies that did not merge. The identification hypothesis is that first, there are aggregate common effects on the companies, common trajectories between merged and not merged companies. They use matching methods to a more flexible semi-parametric control of observables in the treatment evaluation (see e.g., Cameron and Trivedi, 2010). This is the same avenue taken by Garcia and Azevedo (2015) for higher education mergers effects on quality in Brazil

We apply linear methods in order to control for unobserved factors using linear panel D-i-D approach. Using panel data allows us to control for HEI unobservables. In addition, Garcia and Azevedo(2015) results can be interpreted suggesting that predicting mergers is very difficult, limiting the contribution of more complex methods (such as matching) to calculate effects. In their study before and after sample balancing tests of observable characteristics on treated and non-treated groups change very little.

Compared to Garcia and Azevedo (2015) we consider *all* mergers between HEIs, identified by a change in controller firm ('Mantenedora'). Those authors considered only large 'Mantenedora' mergers (large enough to be filed with the competition authority, CADE). We have three times more mergers to evaluate. Contrary to previous work, we focus on HEI and not major/degree, as our focus is on employment and enrollment. It is very difficult to segregate employment by major, as a faculty may teach in more than one major and more than one major may use the same course in its curricula. Regulatory restrictions impede the merger of a specific major, only an entire HEI, suggesting a focus on the HEI institution as a whole.

As mentioned in the introduction, theoretical employment effects of mergers may be negative but could also be positive (Coyon et al. 2002). After a merger, better management or economies of scale may reduce employment. The efficiencies, on the other hand, may allow a firm to increase size and expand employment. It is not possible to tell which effect will dominate *ex-ante*.

Modelling starts with the estimation of a treatment prediction model, i.e., a model that would discriminate between merged and non-merged HEI. Merger models consider a myriad of reasons for a firm to be targeted and actually merged (Motis, 2007). In shareholder value creation models target firms may have inefficient outcomes (productive inefficiencies, overstaff). There may be accounting and economic synergies also. And target firms may provide strategic market space to enhance acquirer market power. Given that most mergers in this industry were regional market entry mergers, one can give less relevance to the latter argument. In any case it may be difficult to select observables to explain why a firm is merged but for simple efficiency indicators such as student/faculty ratios. Potential market size is also a relevant indicator, suggesting the use of regional income indicators.

Our prediction model uses firm time varying variables and regional aggregate variables. As first pass we seek a good prediction model, so claims on actual exogeneity of explanatory variables will be limited in scope. In non-experimental settings as ours, such exogeneity is difficult to prove requiring truly exogenous variables for evaluation (Angrist and Pischke, 2009). Different unobservable effects may be possible. We consider transitory unobservable (to the researcher, but known to the merging firms) shocks on profitability in no-fixed-effects model. We also consider permanent time invariant unobserved effects in fixed-effects models. Both are polar cases and we consider both as a robustness analysis. The first assumption motivates the use of lagged explanatory variables and the second one precludes the use of time invariant measures such as firm type (e.g. for-profit/non-for-profit). As additional robustness analysis we consider non-linear (logit) and linear models. Here, we highlight the predictive capacity of the models, so we limit the regressions output to Table A1 in the Appendix.

Table 7 – Observed and fitted values in merger prediction models

		Logit		
		Observed		
		0	1	Total
Fitted	0	3,674	70	3,744
	1	3,554	147	3,701
	Total	7,228	217	7,445

		Fixed Effects Logit		
		Observed		
		0	1	Total
Fitted	0	4	0	4
	1	7,742	244	7,986
	Total	7,746	244	7,99

		Fixed Effects LS		
		Observed		
		0	1	Total
Fitted	0	6,577	0	6,577
	1	651	217	868
	Total	7,228	217	7,445

		Least Squares		
		Observed		
		0	1	Total
Fitted	0	3,137	56	3,193
	1	4,091	161	4,252
	Total	7,228	217	7,445

Source: authors' estimates based on raw CES 2009-2014 data. Observed and Fitted values based on models on Table A1. Predicted 0/1 value calculated based on predicted merger probability larger than sample average. 1 indicates HEI *i* was acquired at year *t*.

Table 7 present the observed (columns) and fitted values (rows) for merger in HEI *i* at time *t*. The models without fixed effects (Logit and Least Squares) have reasonable predictive ability. 64% (74%) of mergers were correctly predicted in the Logit (Least Squares) model. About half (43%) of the non-merged HEI over time were correctly predicted as merged in the Logit (Least Squares) model. Fixed effects play an important role as expected. In the Logit model, given the nature of the model (see, *e.g.* Cameron and Trivedi, 2010), it predict mergers perfectly but misses almost all non-merger HEI activity. The linear fixed effect model has a more balanced result, with perfect

prediction of merged observations and extremely high correction prediction of non-merged (about 91%). The fixed effect can exactly predict merging firms but it is important to note than non-merged firms were predicted as merger-like even with those fixed effects, pointing to the role of time varying (firm or regional) variables. It should be noted that predicted probability in the fixed effects LS without using fixed effects for prediction yield very similar results to OLS, suggesting that unobservables are not significantly altering the prediction capacity of explanatory variables used in the model (while they may correct biases in the coefficient estimates).

After evaluating the predictive capacity of our explanatory variables we consider our D-i-D estimates with and without controls. We consider three different estimate methods: fixed effects least squares, fixed effects least squares with autocorrelation corrected standard errors (following suggestion that in panel D-i-D estimates may significantly underestimate standard errors due to error autocorrelation by Bertrand et al., 2004) and dynamic merger effects, using both current and lagged merger indicator. In all models we use time and HEI fixed effects. The basic, no-controls, estimating equation are

$$y_{it} = \delta M_{it} + \mu_i + u_t + \varepsilon_{it}$$

and

$$y_{it} = \delta_0 M_{it} + \delta_1 M_{it-1} + \mu_i + u_t + \varepsilon_{it}$$

where y_{it} is the target variable, M_{it} a dummy indicating that the HEI changed 'Mantendora' to an existing one (was acquired by another firm) at year *t*. As target variables we use log employment (total faculty number, total staff), faculty/enrollment ratio, faculty PhD share in total faculty and log enrollment (total, non distance-learning and distance learning). The μ_i and u_t are firm and time fixed effects and ε_{it} is an random error, possibly first-order autocorrelated.

Table 8 – Difference-in-Difference Analysis of merger effects on acquired HEIs

	Total Faculty			Total Staff			Faculty Enrollment Ratio			PhD Faculty Ratio		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
M&A	-0.0946***	-0.0541***	-0.1027***	-0.0313	-0.0050	-0.0046	0.0139	-0.0231	-0.0032	0.0001	-0.0006	0.0046
	(0.0196)	(0.0163)	(0.0223)	(0.0274)	(0.0293)	(0.0338)	(0.0227)	(0.0219)	(0.0270)	(0.0036)	(0.0038)	(0.0045)
M&A L1.			-0.0811***			-0.0069			0.0106			0.0077*
			(0.0197)			(0.0300)			(0.0239)			(0.0040)
_cons	3.9547***	1.3003***	4.0209***	3.5535***	0.6219	3.6161***	-2.4841***	0.6405***	-2.5509***	0.1031***	0.0676	0.1184***
	(0.0064)	(0.1646)	(0.0058)	(0.0090)	(0.4630)	(0.0088)	(0.0074)	(0.2707)	(0.0070)	(0.0012)	(0.0549)	(0.0012)
N	10079	7810	7790	10079	7810	7790	10076	7809	7790	10079	7810	7790
N_g	2300	2200	2200	2.3e+03	2200	2200	2300	2200	2200	2300	2200	2200

	Total Enrollment			NDL Enrollment			DL Enrollment		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
M&A	-0.1089***	-0.0287	-0.0995***	-0.1081***	-0.0294	-0.1001***	0.1481	0.1039	0.5056
	(0.0269)	(0.0190)	(0.0306)	(0.0265)	(0.0189)	(0.0301)	(0.3718)	(0.2055)	(0.4418)
M&A L1.			-0.0917***			-0.0913***			0.3462
			(0.0272)			(0.0267)			(0.3931)
_cons	6.4413***	0.4049***	6.5717***	6.4196***	0.3965**	6.5486***	7.1808***	7.7118***	7.2382***
	(0.0088)	(0.1789)	(0.0079)	(0.0087)	(0.1790)	(0.0078)	(0.0918)	(0.0552)	(0.0893)
N	10076	7809	7790	10056	7793	7774	980	860	970
N_g	2300	2200	2200	2300	2200	2200	384	286	316

Source: authors' estimates based on raw CES data. Note: * p<.1; ** p<.05; *** p<.01. (1) – Fixed Effect LS; (2) Fixed Effect GLS with autocorrelation correction; (3) Fixed Effect LS with lagged merger effects. N – sample size; Ng – number of HEI included. DL – Distance Learning enrollment. All variables in logs.

Table 8 estimates indicate that faculty figures fall between 9 and 5% in merger HEI and the dynamic effect may be even larger. Staff levels do not decrease or its estimates are not precise enough to allow us to claim that it is reduced after a merger. Interestingly faculty enrollment ratio is not altered with a merger, as well as PhD faculty ratio. Given the absence of faculty-enrollment ratio effects, it is expected that acquired HEI enrollment also decreases. This is confirmed in the bottom part of Table 8. The effect comes squarely from non-distance learning enrollment as there are no significant, precise, effects on distance learning enrollment. It must be pointed out that HEIs with distance learning are few, about 15% of overall estimate sample, contributing to the large standard errors.

In a D-i-D analysis a key point is selecting the control group. In Table 8, the control group includes all private HEI that did not merge, conditional on firm time invariant heterogeneity.

Table 9 below presents a robustness analysis in two directions. First, it restricts the analysis to regions (municípios) where there was at least one merger over the 2009-2014 period. This is equivalent to arguing that those markets have specific (unobserved) characteristics (static and dynamic) that interact with firm observables and non-observables and influence the comparison group. Second, we use explanatory variables, such as regional variables.

Table 9 indicates that restricting the sample has little effect on the results for columns (1)-(3), that are directly comparable to columns (1)-(3) in Table 8. Using control variables, in general do not change the sign of the effects but It is clear that observables reduce the size of the effects but do not change the conclusions overall, except for Total faculty, that becomes insignificant, and Distance Learning effects, that become significant.

Table 9– Merger effects: D-i-D fixed effects on regions with mergers only and models with explanatory variables – 2010-2014.

			Total Faculty		
	-1	-2	-3	-4	-5
Merge i t	-0.0939***	-0.0535***	-0.1042***	-0.0337*	-0.0238
Merge i t-1			-0.0826***		-0.0243
N	5514	4282	4267	4128	3026
			Total Staff		
	-1	-2	-3	-4	-5
Merge i t	-0.0306	-0.0070	-0.0079	-0.0274	0.0011
Merge i t-1			-0.0114		0.0139
N	5514	4282	4267	4128	3026
			Faculty / Enrollmnent		
	-1	-2	-3	-4	-5
Merge i t	0.0095	-0.0237	-0.0085	0.024	0.0132
Merge i t-1			0.0059		-0.004
N	5511	4281	4267	4127	3026
			Faculty PhD Ratio		
	-1	-2	-3	-4	-5
Merge i t	0.0218	0.0112	0.0487	0.0353	0.0234
Merge i t-1			0.0733**		0.0610*
N	4885	3722	3848	3674	2734
			Total Enrollment		
	-1	-2	-3	-4	-5
Merge i t	-0.1039***	-0.0283	-0.0958***	-0.0565**	-0.037
Merge i t-1			-0.0885***		-0.0203
N	5511	4281	4267	4127	3026
			Total Non-Distance Learing Enrollmnent		
	-1	-2	-3	-4	-5
Merge i t	-0.1032***	-0.029	-0.0967***	-0.0564**	-0.0397
Merge i t-1			-0.0884***		-0.0229
N	5496	4269	4255	4115	3017
			Total Distance Learning Enrollmnent		
	-1	-2	-3	-4	-5
Merge i t	0.143	0.1026	0.4894	0.2482	0.5096*
Merge i t-1			0.3209		0.4216
N	228	169	188	170	131

Source: authors' calculations based on raw CES data. Note: * p<.1; ** p<.05; *** p<.01. (1) – Fixed Effect LS; (2) Fixed Effect GLS with autocorrelation correction; (3) Fixed Effect LS with lagged merger effects; (4) Fixed Effect LS with explanatory variables; (5) Fixed Effect LS with lagged merger effects and with explanatory variables.

Concluding Comments

In this paper we provided an overview of higher education industry recent dynamics in Brazil. Higher education in Brazil grew significantly over the past decade, increasing three fold. There was an expansion of private institutions, attaining 75% of national enrollment. Expansion in this industry has pointed to a trend on distance learning and shorter, two-year, programs/degrees. Concentration has steadily increased, with the five largest groups controlling more than 20% of private higher education institutions (HEI) enrollment. Some of these firms are very large and are quoted in the stock exchange from 2009 on.

Mergers played a significant role in industry dynamics. Given the very small entry and exit rates, possibly due to regulatory restrictions, mergers were a natural expansion path for equity funded firms. At the competition authority (CADE), more than 50 mergers were filed from 2008 to 2015, some of them very large (reportedly reaching the billions dollar mark).

We reviewed how the competition authority dealt with these mergers. Relevant market definition changed. Currently, each undergraduate major/degree, such as Economics or Mechanical Engineering is considered a separate product market. Geographical market definition is based on enrolled students' catchment areas from acquired institutions. Some mergers required remedies that dealt with the transfer of majors/degrees to other HEI. This type of remedy is constrained by regulation. The Ministry of Education allows the sale of a major/degree only if those programs are bundled in a working accredited HEI. Other remedies imposed included capacity expansion constraints and quality targets.

The large proportion of mergers in this industry, the labor intensity of this service industry and the possibility of direct identification of control change provide an interesting opportunity to evaluate merger effects. For lack of information on prices we focus on employment and enrollment. We do not consider the effect on quality (as evaluated in Garcia and Azevedo (2015) for a limited set of large mergers) as industry discussion emphasize enrollment as a key output indicator.

Employment effects of mergers may be negative, if mergers are motivated by efficiency enhancing opportunities or market power (Croyon et al. 2002). The employment effect may be positive if the post-merger, more efficient, HEI expands output. The final direction of the merger effect is an empirical matter.

After presenting merger predictive models, where linear and non-linear models generated comparable results, we followed a Difference-in-Difference approach using panel data. The D-i-D model for panel data has as main identification hypothesis the role of unobservable permanent factors that differentiate treated and untreated firms, with a lesser or no role of transitory (time varying, mean reverting unobservable random variables) effects on treatment. This makes sense for mergers, are they are profitable only if targets were permanentely different and there is a permanent transformation of the acquired firm.

Our results suggest that a merger leads to a decrease in faculty numbers with no effect on staff. Enrollment seems to decrease also, and may explain the faculty reduction, such that average faculty-student ratio does not seem to change between merged HEI and the control group, before and after

the merger. Our employment quality indicator (faculty PhD ratio) does increase after a lag as previously in the literature. The results are robust to changes in estimation methods and comparison groups.

Our results may be limited in a number of directions. We have a limited time frame for mergers to reveal their full effect, as the merger boom in the industry is relatively new. Our merger prediction model did not use any financial or productivity information, which may be restrictive, given many merger motives. We considered the effect on the acquired HEI and not on the total merged entity only. While most mergers were entry strategies in local markets, there may be staff and student reallocation within the merged entity that we are not considering here. Last, but not least, we lack information on productivity and prices, that are generally the focus of competition policy. Given data availability, these are certainly venues for further research.

References

ANGRIST, J. and J-S PISCHKE (2009) *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton: PUP.

ANIMA (2015). The Brazilian Market. *Financial statements. Investors Relations*. http://ri.animaeducacao.com.br/anima/web/conteudo_en.asp?idioma=1&conta=44&tipo=49122

BERTRAND, M. et al. (2004) How Much Should We Trust Differences-in-Differences Estimates?, *The Quarterly Journal of Economics*, v.119(1), p. 249-275.

CHABE-FERRET, F. (2014) Bias of Causal Effect Estimators Using Pre-Policy Outcomes. *Mimeo.*

CHABE-FERRET, F. (2015) Analysis of the Bias of Matching and Difference-In-Difference under Alternative Earnings and Selection Processes, *Journal of Econometrics*, 185 (1), p. 110–123.

CHAVES, V.L. (2010) The expansion of privatization and mercantilization of brazilian higher education: the formation of oligopolies. *Educação e Sociedade*, 31(111), p. 481-500.

DAVIS, S. J. and HALTIWANGER, J, (1999). Gross job flows. in: O. Ashenfelter and D. Card (ed.), *Handbook of Labor Economics*, volume 3, p. 2711-2805.

EINAV, L. and LEVIN, J. (2010) Empirical Industrial Organization: A Progress Report. *Journal of Economic Perspectives*, 24(2):145–162.

ECONOMIST (2014). A Winning recipe. *The Economist*, Jun 28, 2014.

ECONOMIST (2012) The mortarboard boom. *The Economist*, Sep 15, 2012.

FRAZÃO, A. (2014). Voto Ato de Concentração Kroton Anhanguera. CADE.

GARCIA, C. e AZEVEDO, P.F. (2015) Impacto de fusões e aquisições sobre a qualidade do ensino superior. ANPEC Meetings 2015.

KWOKA, J. and SNYDER, C. (2004) Dynamic Adjustment in the U.S. Higher Education Industry, 1955–1997. *Review of Industrial Organization* 24(4), p 355-378.

LEAR (2006) *Ex post review of merger control decision. A study for the European Commission*, Laboratorio di economia, antitrust, regolamentazione Roma, Italy, 2006.

MOITA, R. et al. (2015) Permanent demand excess as business strategy: an analysis of the Brazilian higher-education market. Revista de Administração (São Paulo) – RAUSP v.50(1).

MOTIS, J. (2007) Mergers and Acquisitions Motives. *Mimeo*.

MACHADO, C.; SZERMAN, C. (2015) The Effects of a Centralized College Admission Mechanism on Migration and College Enrollment: Evidence from Brazil?. SBE Meetings 2015

NEVO, A. and WHINSTON, M. (2010). Taking the dogma out of econometrics: Structural modeling and credible inference. *Journal of Economic Perspectives*, 24(2):69–82.

OCTAVIANNI, A. (2013). Voto Ato de Concentração Anhanguera-Anchieta. CADE.

OECD (2014) Unleashing innovation in firms – Entry and exit. Mimeo.

REZENDE, M. (2010). The effects of accountability on higher education. Economics of Education Review 29 842–856.

RESENDE, M.; RIBEIRO, E.; ZEIDAN, R. (2015). Dynamic Entry and Exit Linkages in the Brazilian Manufacturing Industry: an Econometric Investigation. *International Journal of the Economics of Business*, 22(3), 279-292.

SCHWARTZMAN, S. (1990). The Future of Higher Education in Brazil. *Mimeo*.

TEODOROVICZ et al. (2014) The evolution of a methodology for relevant market definition: an analysis of CADE's jurisprudence on private higher educational markets. *Economic Analysis of Law Review*, v. 6 (2), 246-268.

WENR. (2012) Evaluating academic credentials from Brazil. *World Education News and Reports*, March 1, 2012.

ZOGHBI, A.C. et al. (2013) Education production efficiency: Evidence from Brazilian universities. *Economic Modelling*, v. 31, p. 94–103.

Appendix

Enrollment – course reallocation formulae.

All statistics are adapted from Davis and Haltiwanger (2009). Let n_{cit} be the enrollment in degree/course *c*, in HEI *i* at time *t*. Total HEI enrollment is given by $n_{it}=\Sigma_{c\in i}\, n_{ict}$. Total enrollment at time *t* is given by $n_t= \Sigma_i\, n_{it}= \Sigma_i\, \Sigma_{c\in i}\, n_{ict}$. Average biannual enrollment is given by $N_t=(n_t+n_{t-1})/2$. Average biannual enrollment is used as denominator for a symmetric percentage growth rate.

New courses enrollment = $\Sigma_i\, \Sigma_{c\in i}\, n_{ict}/N_t*I(\, n_{ict}\neq . \text{ and } n_{ict-1}=.)$

Existing Expanding enrollment = $\Sigma_i\, \Sigma_{c\in i}\, (n_{ict} - n_{ict-1})\, /N_t*I(\, n_{ict}-n_{ict-1}>0)$

Existing Expanding enrollment = $\Sigma_i\, \Sigma_{c\in i}\, (n_{ict} - n_{ict-1})\, /N_t*I(\, n_{ict}-n_{ict-1}<0)$

Extinct enrollment = $\Sigma_i\, \Sigma_{c\in i}\, - n_{ict-1}/N_t*I(\, n_{ict}=. \text{ and } n_{ict-1}\neq .)$

Table A1 – Dependent Variable: Merger at time *t* – 2009-2014.

Variable	Logit	Fixed Effects Logit	LS	Fixed Effects LS
Enrollment (it-1)	-0.2077	0.4886	-0.0058	0.0025
Enrollment² (it-1)	0.0197	-0.0735	0.0005	-0.0013
Enroll/Facult (it-1)	0.0143*	-0.0152	0.0006	-0.0013**
Enroll²/Facult² (it-1)	0	0	0	0.0000*
Non-Profit(i)	-0.3395**		-0.0100**	-0.0012
Entry year(i)	57.0537***		1.1182***	
Share Pop w/ High School (gt-1)	0.0065		0.0003	0.0175
GDPpc(gt-1)	-0.3845	-0.0539	-0.0101	-0.0118
Svc GDPpc(gt-1)	0.4845	-33.507	0.0133	-0.0376
r2			0.009	0.0064
N	7445	882	7445	7445
N_g		229		2000

Note: legend: * p<.1; ** p<.05; *** p<.01. All variables in logs except Non-Profit and share of population in region *g* with completed high school. Blank spaces imply omitted.