Forty Years of Inequality across U.S. Colleges

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VERY PRELIMINARY

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Abstract

The paper presents series on dispersion of expenditures per student, revenues and faculty per student across colleges from 1980 to 2016 in the United States using IPEDS data. Inequality across students have been slowly and steadily increasing over the period. All measures of inequality suggest that the increase is half as large as the increase in annual income inequality. The trend is entirely driven by four-year colleges, with an increase in inequality within-public, within non-profit private institutions and between non-profit private and public colleges. I also show that the average and the progressivity of government transfers to higher education institutions have sharply declined over the period, especially at four-year institutions. This, together with the rise of household income inequality, may explain the rising inequality across colleges, as I have argued in a companion paper Capelle [2019a].

1 Introduction

The higher education system is often viewed as an engine of opportunity. However resources per student vary greatly across colleges and even if all students are equal, some are definitely more equal than others. In this short paper, I document the patterns of these inequality in resources spent by institutions on their students with a particular focus on the trends in the past forty years.

This paper shows that inequality in resources per student across colleges are large and about the same order of magnitude as the dispersion of after tax and transfers annual income—with a Gini of about .42. Since 1980, inequality across students have been slowly and steadily increasing. The increase has been half as large as the increase in annual income inequality. The trend is entirely driven by four-year colleges, with an increase in inequality within-public, within non-profit private institutions and between non-profit private and public colleges.

The series are constructed using the Integrated Postsecondary Education Data System (IPEDS) which is a set of surveys conducted annually since 1980 by the National Center for Education Statistics gathering information from every college about their finances and enrollment (among other variables). Four measures of inequality are considered: the Theil T index, the Gini coefficient, and the top 10% and top 5% shares. While the last three are the most standard measures of inequality in the literature, the first one allows us to decompose inequality within and between types of institutions. Finally, three measures of resources per student are considered: expenditures per student, revenues per students and faculty over student ratio.

The increase in income inequality across households in the U.S. since 1980 and the decrease of state subsidies to public colleges may be the two main reasons behind these trends in the distribution of resources across colleges. While the former has already been well-documented [Piketty and Saez, 2003], this paper's second contribution is to document the latter: both the average transfers and the progressivity of transfers have sharply declined over the past forty years. In a related work, I show how an increase in household income inequality—originated in an increase in the labor market returns to human capital—can lead in general equilibrium to an increase in the dispersion of resources across colleges in Capelle [2019a]. In the same paper, I also show that the decline in state subsidies to colleges also leads to an increase in inequality among colleges if it leads to a decrease in the progressivity of subsidies. Finally, I show in another related paper how an increase in income inequality can lead to an increase in the dispersion of alumni donations, endowments and in the end, resources per student across colleges [Capelle, 2019b].

This rise in inequality of resources per student across colleges has efficiency and equity implications. Expenditures per student and the faculty-student ratio have been shown to matter for student achievements and labor market outcomes, both in secondary and post-secondary education [Jackson et al., 2016, Deming and Walters, 2017, Lafortune et al., 2018, Hickman and Mountjoy, 2019, Biasi, 2019]. Unequally shared resources have therefore implications for the accumulation of human capital and the shaping of labor earnings, but also potentially for the access to top

executive positions and political power. From an efficiency point of view, the optimal distribution of expenditures across colleges depends on the distribution of students across colleges and on the complementarities between students' own ability and college expenditures[1]. I have shown in the previously mentioned work that there is reason to think that the current increase in the dispersion of resources across colleges goes hand in hand with a worsening of the positive assortative matching of students along the quality ladder of colleges. Beyond efficiency, one might also be concerned by the inequality of college consumption across individuals, for equity reasons. Finally, from an intergenerational perspective, because the transmission of abilities from parents to children is strong and both ability and parental income play an important role in the sorting of students across colleges, the unequal distribution of resources across colleges amplifies the intergenerational transmission of privileges.

The large dispersion of resources and expenditures among colleges has long been acknowledged [Bowen, 1981, Desrochers and Wellman, 2011]. There is disagreement regarding the evolution in the past four decades. Several papers have find that inequality has been stable. Lau and Rosen [2016], who focus on expenditures, revenues and endowments, and Halffman and Leydesdorff [2010] who focus on publications, find that measures of inequality have remained flat over the period 2001-2010. A longer term perspective, however, offers a different picture. In his book, Clotfelter [2017] document the widening gap in endowment and compensation for professors since 1970. Over the same period, Davies and Zarifa [2012] shows that the Gini coefficient of expenditures and income has increased among US colleges and universities. My results confirm their findings. The reason why our conclusion differs from the ones of Lau and Rosen [2016] is mainly the sample period and the length of the sample: inequality have increased steadily in the eighties and nineties. Zooming at the years 2001-2010 make them seem flat. I see this paper as a complement to the literature in two directions: first I extend the analysis to the recent period 2006-2016, I show that the findings also hold for other popular measures of inequality, such as the share of the top 5 and top 10% and I offer decompositions by subsector of higher education (public/non-profit private/for-profit private; two/four years). Second, I offer a tentative narrative to explain those evolution: the rise of household inequality on the one hand and the decrease in the overall progressivity of governments transfers to institutions of higher education.

The remaining of the paper is organized as follows. Section 2 describes the data, the construction of the variables and the methodology, section 3 displays the main results for the trend in inequality as well as the decomposition by subgroup of higher education institutions. section 4 shows the trend in the average and the progressivity of government subsidies to colleges and section 5 concludes.

[1] A perfectly egalitarian distribution of expenditures is an efficient allocation of resources only in the absence of complementarities or if students are randomly allocated to colleges. If strong complementarities exist and students sort according to their abilities, then it is no longer efficient to maintain an egalitarian distribution of resources.

2 Data and Methodology

2.1 IPEDS Data and the Delta Cost Project Database

The Integrated Postsecondary Education Data System (IPEDS) is a set of surveys conducted annually by the National Center for Education Statistics gathering information from every college participating in the student financial aid programs, commonly called Title IV institutions. Almost all institutions participate so that the coverage of IPEDS can be thought as virtually universal. Institutions report data on enrollments, finances, faculty and staff among others. There are about 7500 institutions completing IPEDS surveys each year, including research universities, state colleges and universities, private religious and liberal arts colleges, for-profit institutions, community and technical colleges and non-degree granting institutions[2]. It started collecting data in 1980 after the creation of the U.S. Department of Education in 1979. The set of variables and institutions covered have expanded over time.

The Delta Cost Project Database has compiled a large set of variables from the original IPEDS surveys for a large set of years—1987-2015—in order to construct a readily usable longitudinal dataset. The dataset has another appealing feature for researcher: data series have been adjusted to harmonize changes in financial reporting standards that occurred over time and they have imputed some of the missing data. The Delta Cost project has two limits: it doesn't compile data for 1980-1986 and it drops the less than two-year for-profit institutions from the sample. It is also unclear if they will continue to update the database in the future.

Most of our results use the Delta Cost Project database. In appendix A.4 I investigate whether using the original IPEDS data gives different results. Using the original data also allows us to go back further in time—1980 instead of 1986. For this robustness check exercise, I collected myself the relevant surveys, compiled them for a large set of years—the dataset covers half the years between 1980 and 2016—and constructed the variables to consistent with the ones in the Delta Cost Project.

2.2 Definition of Variables

The measure of expenditures used in this paper is constructed as the sum of expenditures for instructions, research and core activities. This corresponds to the sum of items 1 to 6 in table 1, which displays a simplified classification of the expenditures of colleges. It includes instruction, research, academic support, student service and institutional support. Total expenditures includes core educational spending, operation maintenance, student aid and others (hospitals, auxiliary services, etc...). Public service includes expenses for activities established primarily to provide non-instructional services beneficial to individuals and groups external to the institution (conference, institute for example). Academic support includes expenses of activities and services that support

[2] NCES

the primary missions of instruction, research and public service (libraries, museums, information technology, for example). Student services include expenses for admissions, registrar activities and activities whose primary purpose is to contribute to students emotional and physical well-being and to their intellectual, cultural, and social development outside the context of the formal instructional program (student organization, cultural events, supplemental instruction outside of normal academic program for example). Institutional support includes expenses for the day-to-day operational support of the institution (general administrative services, central executive-level activities, employee personnel and records, for example)[3].

Total Expenditure	Total Core Education	1	Instruction
		2	Research
		3	Public Service
		4	Academic Support
		5	Student Service
		6	Institutional Support
	Total Non-Core	7	Operation Maintenance
		8	Aid
		9	Others

Table 1: Classification of Expenditures

In the same way, the measure of revenues used in this paper is a measure of core revenues, constructed as the sum of items 1 to 7 in table 2, which displays a simplified classification of revenues of colleges. It includes tuition and fees, federal, state and local appropriations, grants and contracts, private gifts and contracts, earnings from endowment and investments and revenues from sales and services of educational activities. All items are quite self-explanatory except the last one which includes the sales of goods or services that are incidental to the conduct of instruction, research or public service (film rentals, sales of scientific and literary publications, testing services, university presses, data processing services, etc...). This measure of revenues excludes hospitals which is for some institutions a non-negligible part of their budget and auxiliary enterprises (residence halls, food services, student health services, movie theaters etc..).

I also consider time-adjusted version of these two variables that take into account the length of study at these institutions. I multiply expenditures per student by four (two and one resp.) at four(two and one resp.)-year institutions. Not all students starting in a two or four-year institution will finish, but the availability of the graduation rates variables for a large number of colleges in the dataset is too recent for a more refined analysis to be possible. I do not report these adjusted measures as they show very similar patterns to the non-adjusted ones.

Finally, I also consider the faculty over student ratio, a common measure of educational quality and a much more narrow measure than core educational spending. I divide the sum of full time faculty plus half the sum of part-time faculty by the full-time-equivalent number of students

[3]Delta Cost Project Database

Total Revenues	Core Revenues	1	Tuition and fees
		2	Federal Appropriations, Grants and Contracts
		3	State Appropriations, Grants and Contracts
		4	Local Appropriations, Grants and Contracts
		5	Private Gifts, Grants and Contracts
		6	Investment and Endowment Returns
		7	Sales of Educational Activities
	Total Non-Core	8	Revenue from Auxiliary Enterprises
		9	Revenue from Hospitals
		10	Independent Operations and Others

Table 2: Classification of Revenues

(FTE enrollment thereafter). The data for this variable has been less systematically reported by institutions in IPEDS, therefore the quality is not as good as balance-sheet data. This is the reason why I focus primarily on core educational expenditures.

2.3 Measures of Inequality

I consider four measures of inequality, the Gini coefficient, the Theil T index and the shares of expenditures, revenues and faculty going to the top 10% and the top 5% of students.

Importantly, all measures are FTE-enrollment weighted and are measures of inequality at the student level and not at the college level. Denote the set of college $\mathscr{J}$, $\mathbf{n}$ the vector of FTE-enrollment and $\mathbf{I}$ the vector of spending per FTE-student, where n_j and I_j are the entries corresponding to college j. The measures of inequality are computed by weighting the vector $\mathbf{I}$ with $\mathbf{n}$, i.e. where entry I_j counts n_j times.

The Theil T index is a special case of the generalized entropy index. Using the same notations, it writes:

$$
\begin{aligned}
T_T &= \frac{1}{N} \sum_{j \in \mathscr{J}} n_j \frac{I_j}{\mu} \ln\left(\frac{I_j}{\mu}\right) \\
\text{with} \quad \mu &= \frac{1}{N} \sum_{j \in \mathscr{J}} n_j I_j \\
\text{and} \quad N &= \sum_{j \in \mathscr{J}} n_j
\end{aligned}
$$

For specific distributions, the Gini coefficient and the Theil T index are analytically related. For example, if the distribution is log-normal, denoting Δ^2 the variance of the associated normal

distribution, the Gini and the Theil T are given by

$$\text{Gini} = 2\Phi\left(\sqrt{\frac{\Delta^2}{2}}\right) - 1$$
$$T_T = \frac{\Delta^2}{2}$$

where $\Phi()$ is the cdf of a standard normal. I use the Theil index because of its decomposability, a property that the Gini coefficient does not offer. For example, let's divide colleges into subgroups indexed by $m \in \mathscr{M}$. This implies a similar divide across students. Denoting $\bar{I}_m$, the (FTE-enrollment-weighted) mean expenditures in group m and N_m the number of FTE-students in group m, the Theil T index can be written:

$$T_T = \sum_{m \in \mathscr{M}} s_m T_{T,m} + \sum_{m \in \mathscr{M}} s_m \ln\left(\frac{\bar{I}_m}{\mu}\right)$$
$$\text{with} \quad s_m = \frac{N_m}{N}\frac{\bar{I}_m}{\mu}$$

where the first term is the within component and the second term is the between group component of inequality.

2.4 Data Transformation and Quasi-Panel

I apply some transformations to the data for robustness purposes. Zeros are counted as missing. All observations above the top .5% are censored at the .5% percentile to avoid outliers to drive our results. All series displayed in this paper have been smoothed.

Despite their small share in total enrollment, one might be worried that the exclusion of less than two-year institutions in the Delta Cost Project dataset might affect our findings. I check the robustness of our result to this exclusion by constructing the same series from the raw data in appendix A.4.

Even though the Delta Cost Project imputes some of the missing data, their interpolation method is conservative and one can be worried that institutions non-random missing values might bias our results. To address that issue I construct a quasi-panel of colleges by excluding institution for which I do not observe at least one observations per decade. I compare the results with what one would obtain by working of the full and unrestricted sample in appendix A.5.

2.5 A Snapshot at the U.S. Higher Education System

Overall, inequality are large and especially concentrated at the top. Figure 3 reports summary statistics for the distribution of educational expenditures per FTE-Student in 2015 in hundreds of

2015-dollars. The first column reports for the entire sample, FTE-enrollment weighted, the second column reports the same statistics without weighting by enrollment—one college counts for one observation—, the next two columns restrict the sample to public 2-year and 4-year institutions respectively, the next two do the same for private non-profit and the last two for private for-profit. The first line report the mean, while the next lines report selected percentiles. The last two lines report the number of institutions and the FTE-enrollment (in thousands). For space reason, I do not report statistics on less than two years institutions.

In the overall distribution, the 90^{th} student gets 2.6 as much resources as the median. But the 99^{th} student gets 3.4 as much as the 90^{th} student. This fat right tail is driven by the private non-profit colleges. In general inequalities are larger within 4-year than 2-year institutions. In contrast with the public and non-profit sector where inequality within 4-year on the one hand and between 2-year and 4-year institutions on the other are large, inequality within the for-profit sector are rather small along both dimensions.

	Expenditures per FTE Student							
	All		**Public**		**Private Non-Profit**		**Private For-Profit**	
Stat.	**Weighted**	**Unweighted**	**2-yr**	**4-yr**	**2-yr**	**4-yr**	**2-yr**	**4-yr**
Mean	222	200	103	243	149	337	133	133
50^{th}	155	153	96	184	124	221	135	125
75^{th}	255	223	114	324	164	343	171	174
90^{th}	405	344	139	435	236	729	211	219
95^{th}	585	474	160	554	283	1295	234	267
99^{th}	1374	1201	206	926	449	1728	381	368
No. Colleges	4868	4868	902	591	155	1572	738	618
FTE Students	15457	15457	3565	7036	34	3465	321	989
Weighted	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes

Legend: Expenditures are in hundreds of 2015-dollars. FTE Students is in thousands. Weights refer to FTE enrollment. Source: Delta Cost Project.

Table 3: Summary Statistics on the Distribution of Expenditures per FTE Student, in 2015

3 Inequality Across U.S. Colleges, 1980-2016

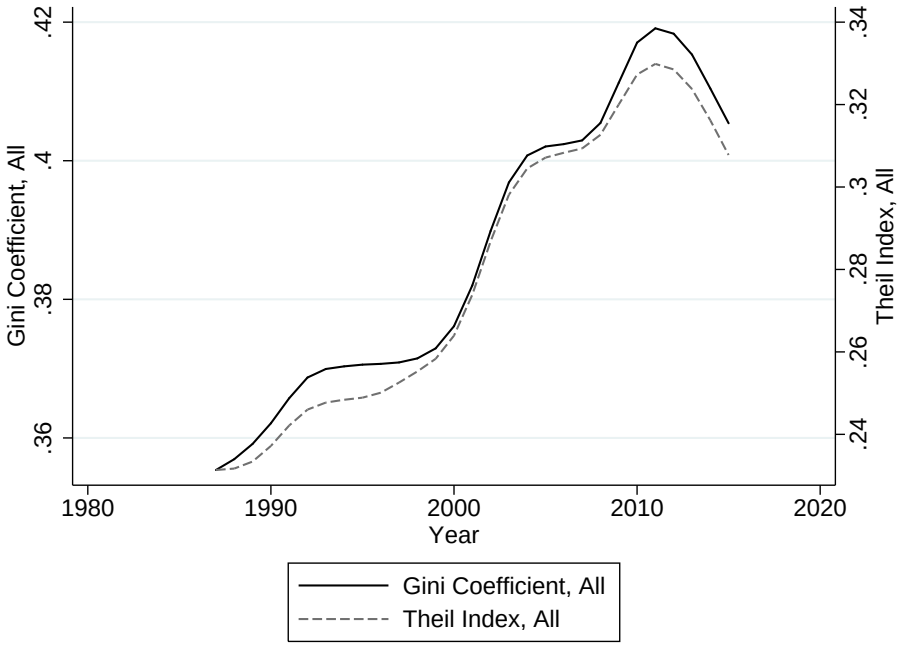
3.1 General Trend

Figure 1 shows a clear upward trend in the four measures of inequality over the period 1987-2015. The Gini coefficient has gone up from .35 to .41, the Theil index from .23 to .31, the top 10% from 29% to 33%, and the top 5% from 19% to 22%. It means that the amount of educational resource students have been exposed to have been increasingly unequal over time. For example, at

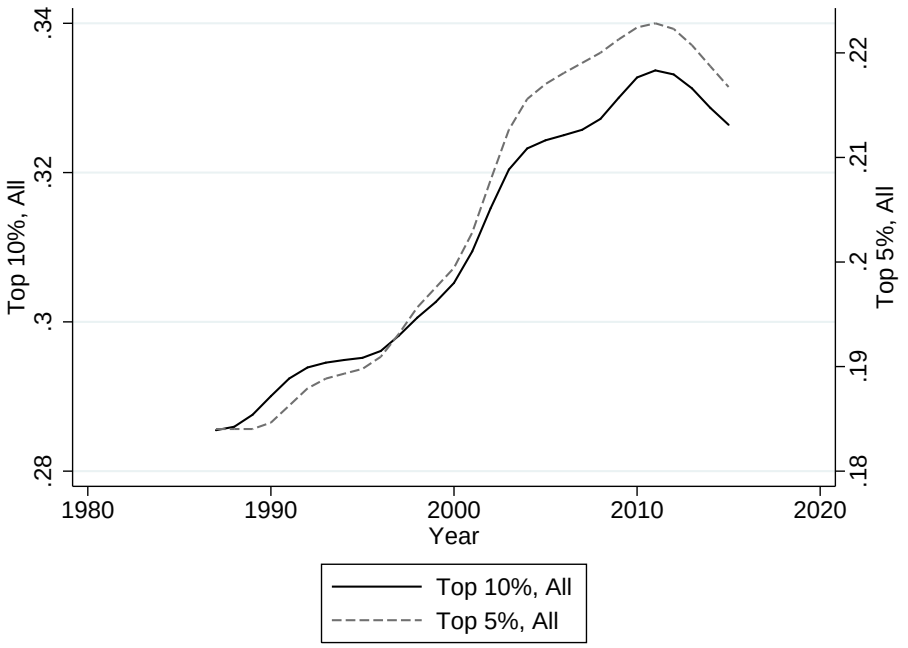
the end of the period, the top 10% of students—all measures of inequality are weighted by FTE enrollment—enjoys a third of all spending in higher education.

For comparison, the market income and the after tax and transfers Gini coefficients in the U.S. reported in appendix on figure A3 have increased from .47 to .6 and from .35 to .44 respectively over the period 1979-2015. The top 10% and 5% shares of income have increased from 33% to 47% and from 21% to 33% respectively over the same period. In levels, inequality among expenditures per student are slightly lower but comparable to the level of inequality in the after tax and transfers income distribution. Regarding trends, *the increase in inequality among expenditures per student has been about half as large as the the increase in income inequality.*

Figure 1: Inequality in Educational and Research Expenditures



(a) Gini and Theil Indexes



(b) Top 10 and 5 shares

3.2 Revenue and Faculty per FTE Students

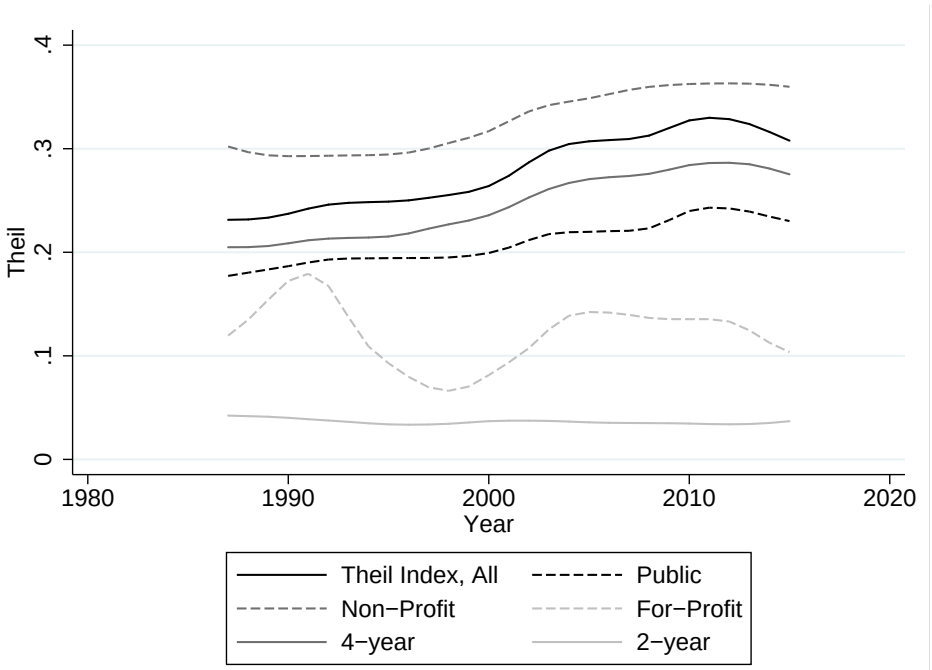
Although more noisy, figure A1 shows that the increase in inequality in revenues has been similar to the one documented for educational spending.

Has the increase in inequality in educational expenditures and total revenues per student translated into inequality in the number of faculty per student? Figure A2 shows that it indeed has. The 10 percent students with the highest faculty-student ratio have seen their shares of the total stock of faculty going from 20% to 23% percent from 1987 to 2015. One should however be careful with those measures given that the data are of lesser quality than the measures of expenditures per student—number of faculty were not as systematically reported by colleges in the early years.

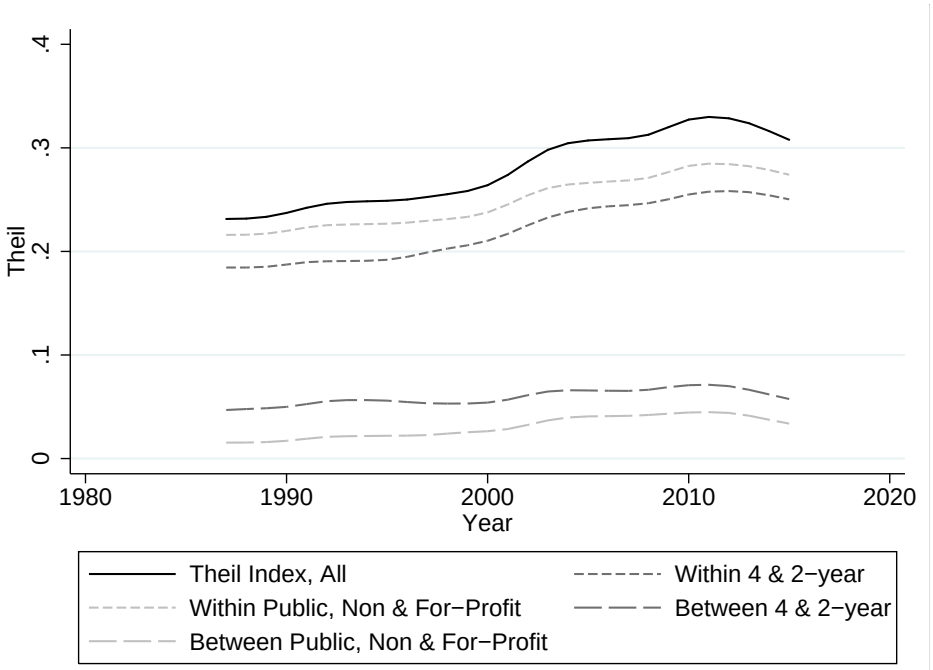
3.3 Decomposing the Trends in Inequality

What part of the higher education system is driving the overall increase in inequality among colleges? The decomposability of the Theil T index allows us to separate the trend in inequality into a within and a between group components. I consider two different grouping: 2-year *vs* 4-year colleges on the one hand and public, private non-profit and private for-profit on the other hand. The first graph of figure 2 reports the Theil Index for the five different subsamples while the second reports the within and between Theil measures for both decompositions.

Figure 2: Theil T Index and Subgroup Decompositions



(a) By Type of Control and Length of Study



(b) Within/Between Decomposition

The decomposition in the two/four-year dimension suggests that the increase in inequality is driven neither by an increase in inequality within 2 year colleges nor by an increase between 2-year and 4-year colleges, but that *it is mainly due to an increase in inequality within 4-year colleges.* The decomposition by type of control shows that the increase in inequality happened within public and within non-profit private colleges to a similar extent and that *the between public-private colleges component of inequality seems to have also contributed to the general trend.* Finally the within for-profit series doesn't display any clear trend.

3.4 Total-Enrollment Adjusted Gini

Not every individual of a given cohort goes to college. What are the implications for the measure of inequality if one takes into account the total enrollment margin into account by assigning a value of 0 to the share of individuals who do not go to college? I focus on the Gini coefficient because there exists a simple mapping between the enrollment rate e, the share of people who do go to college, and $\text{Gini}_{\text{Goers}}$, the Gini coefficient of the individuals going to college. The Gini index for the entire population can be written as:

$$\text{Gini} = e \times \text{Gini}_{\text{Goers}} + (1 - e)$$

The adjusted Gini—reported in figure A6—declined from the middle of the 1980s to the year 2000 because the enrollment rate was increasing faster than the Gini within the set of goers but has stabilized since then as the enrollment rate, e, has been growing at a slower rate.

4 The Rise in Income Inequality and Decline in Government Transfers to Colleges

What are the roots of this increase in the dispersion of educational spending across colleges? I present here two hypotheses: increase in household income inequality and decrease in the progressivity of government funding.

Increase in Income Inequality. Income inequality across households have dramatically increased in the U.S. since 1980 as reported in figure A3, [Piketty and Saez, 2003]. In Capelle [2019a], I show that an increase in the market returns to human capital, a well-documented fact, is very likely to lead to an increase in a) household income inequalities, b) in college tuition and importantly c) in the dispersion of resources across colleges. The underlying model features overlapping generations of heterogeneous households subject to a borrowing constraint who choose which college to send their kids to and in which heterogeneous colleges maximize the quality they deliver. The mechanism at play in the model is akin to the revenue theory of cost by Bowen [1980],

but applied to a framework with a ladder of colleges, whereby revenue and spending are dictated by how much tuition each college can raise, and ultimately by the households' willingness to pay. Bowen summarizes his theory:

> ...at any given time, the unit cost of education is determined by the amount of revenues currently available for education relative to enrollment. The statement is more than a tautology, as it expresses the fundamental fact that unit cost [i.e., the cost of education] is determined by hard dollars of revenue and only indirectly and distantly by considerations of need, technology, efficiency, and market wages and prices. (p. 19)

In the model, the production technology of education quality is constant returns to scale, hence the equilibrium level of quality in each college is demand-determined. When household income inequality increases, the amount of resources going to top colleges increases relatively to lower quality colleges because the former draw—in equilibrium—from a richer pool of students than the latter.

Decline in Government Transfers to Colleges. It is well-known that states' transfers to public institutions of higher education have declined, especially at four-year colleges. Figure 3a plots the ratio of the sum of government transfers at all institutions over the sum of total revenue at all institutions:

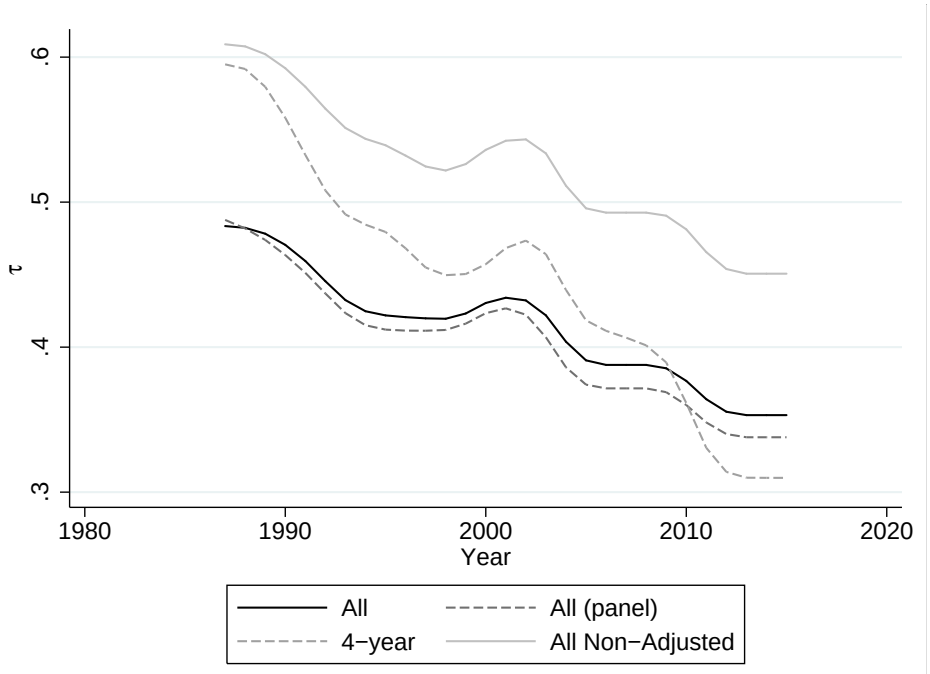
$$a_u = \frac{\sum_{j \in \mathscr{J}} T_j}{\sum_{j \in \mathscr{J}} R_j}$$

where T_j is the sum of items 2,3 and 4 in table 2 and R_j is defined as in the previous section, as the sum of items 1 to 7[4]. The downward trend is very striking: while 60% of all revenues in higher education was government funded in the middle of the 1980s, it has declined to 38% in 2015. The light dashed line plots the same series for 4-year colleges only and shows that the overall decline is really led by 4-year colleges. The dark dashed line reports the same series for a restricted sample where we observe every college every year, in case one would be worried about college entering or exiting the sample.

[4]Although Pell-Grants are usually channeled from the federal budget to students through colleges and do appear in the balance-sheet of colleges, I exclude them from the measure of revenues and government transfers since they are ultimately student financial aid.

Figure 3: Decline in Average and Progressivity of Government Subsidies

(a) Government Subsidies in % of Total Revenues



(b) Progressivity of Government Subsidies

But what really matters for the inequality of resources across colleges is the progressivity of transfers, as I show in [Capelle, 2019a]. The decrease in state subsidies to public colleges leads to an increase in inequality among colleges if it implies a decrease in the progressivity of the government transfers schedule. Figure 3b plots a measure of the progressivity of goverment transfers. If we define $\tilde{R}_j$ the total revenues net of government transfers at college j

$$\tilde{R}_j = R_j - T_j$$

and n_j FTE enrollment at college j, the progressivity is given by the coefficient τ_u estimated by running the following regression[5]

$$\log\left(\frac{x_j R_j}{n_j}\right) = \alpha + (1-\tau_u)\log\left(\frac{x_j \tilde{R}_j}{n_j}\right)$$

where x_j is an adjustment factor equal to 4 (2 and 1 resp.) for four (two and less than two resp.)-year colleges. This adjustment aims at taking into account the fact that individuals at four-year institutions are expected to spend twice as much time in the institution than individuals at 2 year colleges, and four times as much time as those at 1-year colleges. The gray solid line shows the same estimated coefficient with $x_j = 1$ for all colleges.

Three observations stem from figure 3b. First of all, the decline in the progressivity of the transfer schedule is very large, from .5 in the middle of the 1980s to .35 after 2010. For comparison, the progressivity of the income tax schedule has been estimated to be around .2 and has remained fairly stable [Heathcote et al., 2017][6]. Secondly, the decline has been particularly dramatic at four-year institutions, in line with the earlier finding that the increase in inequality across colleges is concentrated in this sector of the higher education system. Finally, looking at the non-adjusted line reveals that adjusting for the expected time spent in the institution significantly lower the measured degree of progressivity of government transfers.

5 Conclusion

The paper presents series on dispersion of expenditures per student, revenues and faculty per student across colleges from 1980 to 2016 in the United States using IPEDS data. Inequality across students have been slowly and steadily increasing over the period. All measures of inequality suggest that the increase is half as large as the increase in annual income inequality. The trend are entirely driven by four-year colleges, with an increase in inequality within-public, within non-profit

[5] This functional form is used and explained in Capelle [2019a] and is inspired by the progressive income tax schedule introduced by Benabou [2002]. Notice that a progressive transfer schedule requires $\tau_u \in [0, 1]$ and $\tau_u = 1$ means complete redistribution and full equality of resources.

[6] Piketty and Saez [2003] show however that the progressivity of the income tax schedule has sharply declined for very top income.

private institutions and between non-profit private and public colleges.

The paper also shows that the average and the progressivity of government transfers to higher education institutions have sharply declined over the period, especially at four-year institutions. This, together with the rise of household income inequality, may explain the rising inequality across colleges, as I have argued in a companion paper Capelle [2019a].

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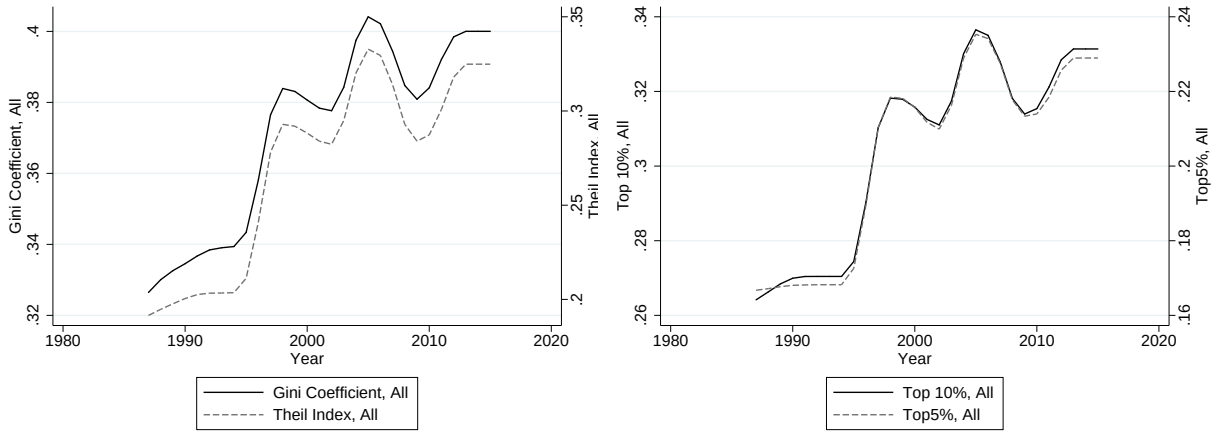
A Additional Figures

A.1 Revenue per Student

Figure A1: Inequality in Total Revenues

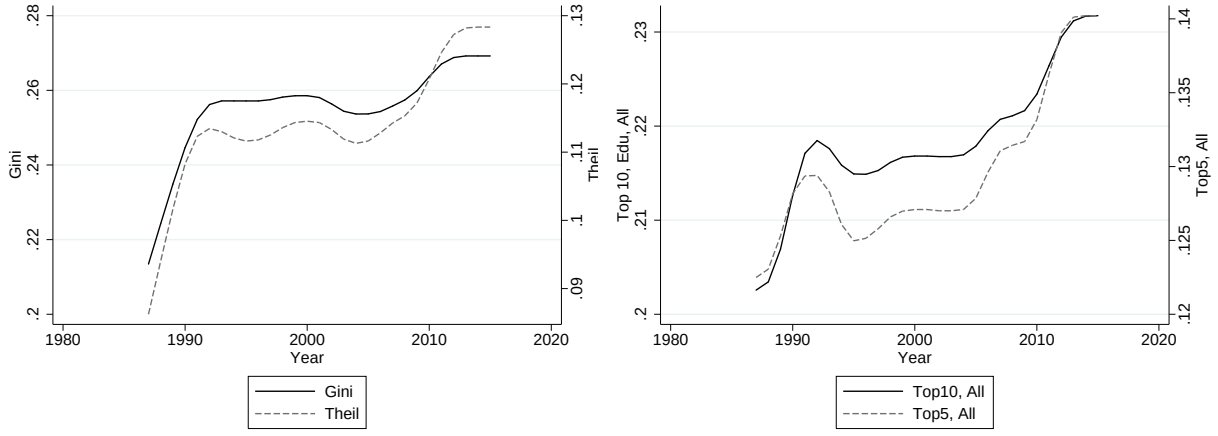


(a) Gini and Theil Indexes

(b) Top 10 and 5 shares

A.2 Faculty per Student

Figure A2: Inequality in Faculty per FTE Students



(a) Gini and Theil Indexes

(b) Top 10 and 5 shares

A.3 Income Inequality

The data for the Gini coefficient are from the The Distribution of Household Income, 2015 released by the CBO and available here. The CBO reports four different measures of Gini, from the one

based on pure market-income to the one based on after tax and transfers income. I do not report the two intermediary measures. The data for the top income shares are from the updated excel file available here originally published in Piketty and Saez [2003]. All series have been smoothed.

Figure A3: Income Inequality

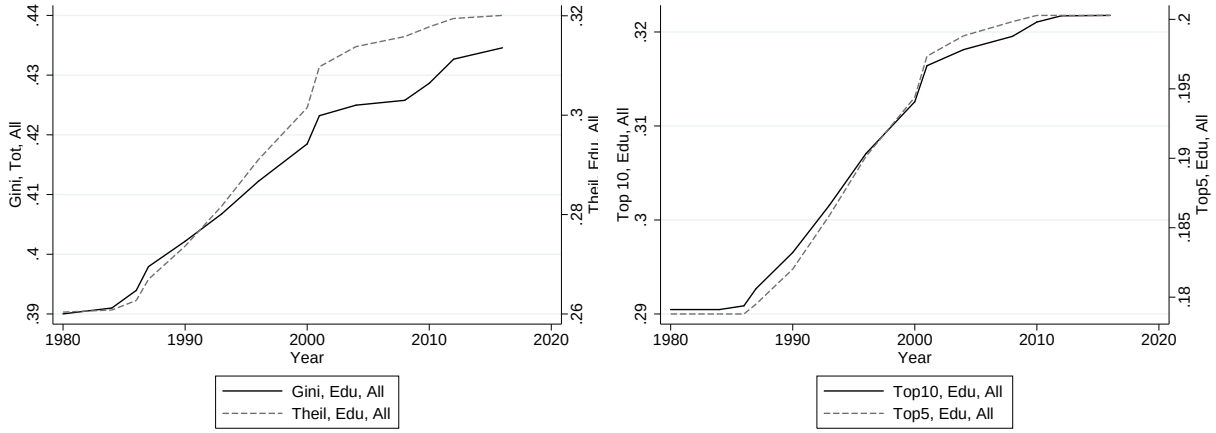
(a) Gini Index

(b) Top 10 and 5 shares

A.4 IPEDS *vs* Delta Cost Project

In this appendix are displayed the Gini and Theil Indexes as well as the top 10 and top 5% share computed in the original IPEDS dataset instead of the Delta Cost Project dataset. The data extended before 1987 confirms the results found with the Delta Cost Project Data.

Figure A4: Inequality in Educational and Research Expenditures in Original IPEDS



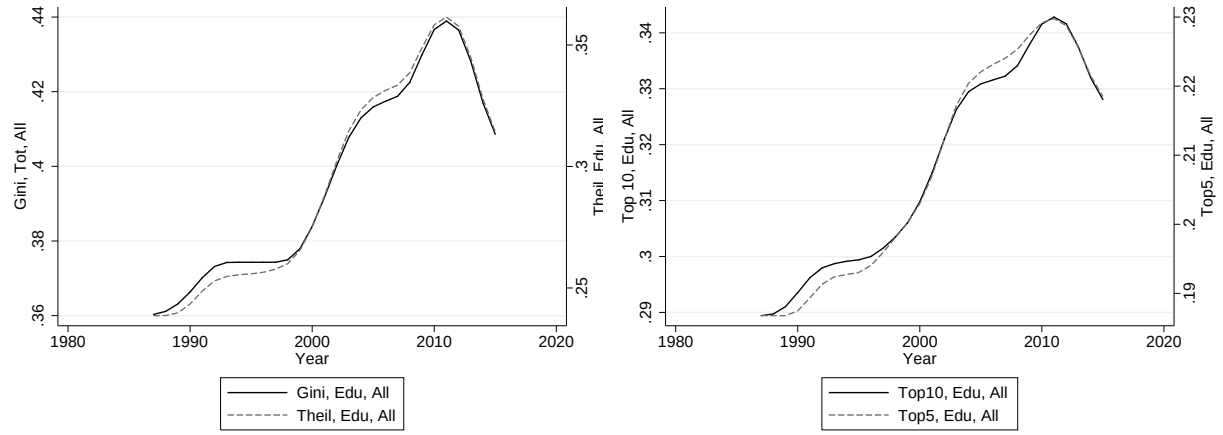
(a) Gini and Theil Indexes

(b) Top 10 and 5 shares

A.5 Quasi-Panel *vs* Full Sample

In this appendix are displayed the Gini and Theil Indexes as well as the top 10 and top 5% share computed over the full sample instead of the restricted quasi-panel. Our previous results remain almost unaffected when considered the unrestricted sample. The only noticeable difference is the sharper increase in all measure of inequality.

Figure A5: Inequality in Educational and Research Expenditures, Full Sample

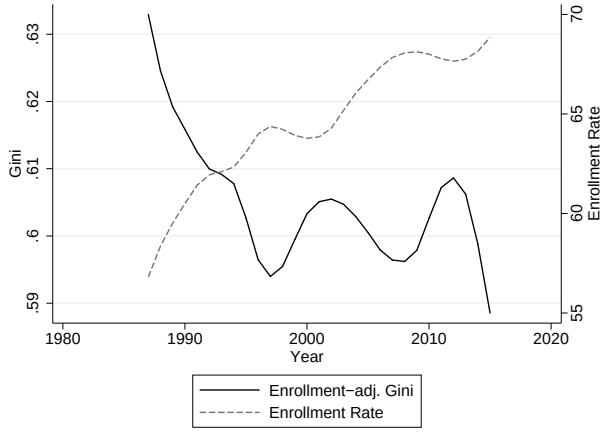


(a) Gini and Theil Indexes

(b) Top 10 and 5 shares

A.6 Total-Enrollment-Adjusted Gini

Figure A6: Enrollment-Adjusted Gini



Note: The enrollment rate is the immediate enrollment rate, provided by the NCES