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The Effect of Institutional Expenditures on Employment Outcomes and Wages

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Abstract

In recent decades college expenditures and costs have risen dramatically, drawing much public attention. Unfortunately, little is known about the connection between institutional spending and labor market outcomes of graduates. This study uses the National Longitudinal Survey of Youth: 1997 to investigate how different categories of spending impact graduates' salaries, employment outcomes, and pursuit of advanced degrees. Our findings indicate that spending on instruction primarily benefits disadvantaged students, while the benefits of spending on student services and research accrue mostly to more advantaged students. These results have implications for how institutions can adjust their spending habits in order to get the biggest bang for their buck, in an era where there is increased scrutiny of colleges' value, and the success of their graduates.

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I. Introduction

Over the last decade or two there has been a large increase in spending for both educational and non-educational purposes by colleges and universities in the United States. Which areas of spending have increased has been dependent on the type of institution. Research-focused institutions, both public and private, have seen 10-22% increases in instructional spending, and on the private side, this has been accompanied by significant increases of roughly 30% in research, over 40% increases in academic support, and over 35% increases in student services spending. Master's and bachelor's focused institutions have also seen significant increases of roughly 30% in student services expenditures, but very little increase, and often decreases, in research spending (Delta Cost Project, 2008).

Hardly surprisingly, the last decade has also seen a rise in public concern over the ever-increasing cost of four-year colleges. This concern has manifested in many magazine and newspaper articles, news headlines, and public discussion. In August of this year, President Obama announced a plan to develop a rating system for colleges based on their cost, characteristics, and value as measured by outcomes such as graduation rates and earnings of graduates. The administration then plans to link these ratings to financial aid provided through the government, such as Pell grants[1]. Throughout these discussions, a focus on identifying how to keep college costs down, while also maintaining or increasing student outcomes has been a common thread.

Ultimately, for both institutions and students, the interest is in providing or receiving the highest quality post-secondary education, such that the returns post-graduation are maximized, at the lowest price. Students may also be concerned with the consumption value of their college education, which they may be willing to pay more for without any returns post-graduation. Therefore, students want to receive the best value, and institutions have an incentive to provide it in order to attract the right students. As such, institutions need to know how best to spend their money; what type of spending has the biggest bang for its buck? Spending more money may result in higher quality, but knowing how to spend the dollars to maximize quality can keep costs down while still attracting the best students.

Unfortunately, there is very little information about what the payoff is for institutional expenditures, particularly by category. Should institutions spend more on instruction, and therefore be able to capture and keep more high-quality faculty, or would this money be better spent on student services by providing opportunities for students to network and receive assistance during their time in

[1] See for example "Obama's Plan aims to Lower Cost of College." Tamar Lewin. NY Times, August 22, 2013.

college? Without understanding how different types of institutional expenditures may impact student outcomes in different ways, we are unable to answer these questions.

This study uses a nationally representative data set of college graduates to examine how institutional expenditures by category impact labor market success, as measured by salaries, employment, and pursuit of advanced degrees. The results indicate that the student's own characteristics and the characteristics of the institution attended are very important in determining how each category of expenditures impacts these outcomes. Overall, it appears that expenditures on research and student services have the most consistent positive impact on labor market outcomes.

This paper continues as follows: Section II discusses the literature on returns to college quality and spending. Section III introduces the data and model, followed by the results in Section IV. In Section V, we conclude.

II. Literature Review

The literature on returns to college quality is extensive and varied. Much of the focus on college quality has thus far been on the quality of peers, as measured by median SAT scores. Original papers found a positive return to attending institutions with better peers (see for example: Kane, 1998). One main concern of examining returns to college quality has been the selection of high-ability students into high quality institutions. Studies controlling for this selection have found mixed but mostly positive results (Behrman et al., 1996; Behrman, Rosenzweig, & Taubman, 1996; Brewer & Ehrenberg, 1996). Dale & Krueger used the quality of college application choices to control for selection on unobserved ability, finding no return to higher peer quality, except for minority students, or those with less educated parents (2002; 2011). Hoekstra in 2009 used a regression discontinuity design to examine students just barely admitted and those that just barely missed out on admission to a public institution. The results showed a significant positive impact of making the cut-off and attending the more selective public institution. Other studies have focused on other college characteristics such as type or control. Monks, in a 2000 paper, found that students graduating from private, or doctoral institutions earn higher salaries, and that there is a return to college quality as measured by Barron's rankings of college competitiveness.

Fewer studies have examined the relationship between schooling and non-salary labor market outcomes. While some studies have found that increased schooling decreases the probability of unemployment, there is little examining the link between college quality and employment outcomes. Bewer,Eide, & Ehrenberg do examine the link between college quality and the probability of graduate

school attendance, using Barron's rankings of college quality (1999). Their results indicate that students attending more selective colleges are more likely to go on to graduate school.

Although peer quality is only one measure of college quality, it is the one that has received most of the focus so far. An alternative way to look at returns to school quality would be to examine how institutional spending habits may benefit students in the labor market. While Dale & Krueger's 2002 study did not find a link between median SAT scores and salaries for the average student, they did find that students graduating from schools with higher levels of institutional spending earned higher salaries. This begs the question of what type of institutional expenditure has a return in the labor market, or does it only matter that total expenditures be high. Webber & Ehrenberg (2010) and Webber (2012) have found that the purpose of the institutional spending is important in determining institution graduation rates.

In their 2010 paper, Webber and Ehrenberg use a panel dataset of four year colleges and universities to estimate how the four main categories of educational expenditures – instruction, academic support, student services, and research – impact an institution's graduation rate. Their findings indicate that expenditures on student services have the largest positive impact on graduation rates, particularly at institutions with low-test scores and a high percentage of low-income students. Increases in instructional and academic support expenditures also have a small positive impact, while research expenditures appear to be negatively related to graduation rates. In a similar 2004 study, Ryan finds a link between increased instructional and academic support expenditures and graduation rates. Webber conducts an analysis of graduation probabilities at the individual level using data from the public university system in Ohio in a 2012 study. The findings are similar; student services expenditures benefit low test-score students, while instructional expenditures benefit high test-score students[2].

Research has also found that the category of institutional expenditure is important in the matriculation decision, indicating that students sort into colleges based on how they spend their funds. Just as with outcomes, students of different backgrounds react differently to institutional spending (Griffith & Rask, 2013; Jacob, McCall, & Stange, 2013). Consistent with the findings on the impacts of institutional expenditures, low test-score students are more likely to matriculate at institutions with high levels of student services expenditures (Griffith & Rask, 2013).

[2] Institutional expenditures have also been linked to student engagement, but the results are mixed, as the relationship depends on the category of spending and the individual's own characteristics (Pike, Smart, Kuh, & Hayek, 2006).

Despite the growing literature on the importance of *how* the institutional expenditures are spent, there are no studies that disaggregate the effect of expenditures on labor market outcomes. It seems clear that the relationship between institutional spending and student outcomes is complicated and depends on the background of the student, and possibly on the institutional setting. This study takes the research one step further, into the labor market. We examine how the four main categories of institutional spending impact on salaries, employment outcomes, and graduate school attendance. Our results will help build this growing literature, as well as provide policy implications for institutions concerned with the labor market success of their graduates. Finally, the results will help lend insight into the inner workings of institutional expenditures and student outcomes.

III. Data & Methods

III.A Description of Data

To answer these questions of how college spending decisions affect labor market outcomes, we use the National Longitudinal Survey of Youth 1997 (NLSY97). The NLSY97 is a nationally representative data set. Roughly 9,000 youths who were 12-16 years old in 1996 were surveyed annually from 1997 through 2010[3]. In each year, respondents are asked to report their current employment or enrollment status, as well as their highest degree earned by that date. Using these data, we identified the sub-sample of students that attended a four-year college or university immediately following graduation from high school, so as to capture the traditional college-going population.

Information on respondent's SAT scores, high school GPA, and ASVAB scores were taken from the NLSY97 surveys, and linked with parental income and education levels from the original survey given to respondents' parents in 1997. Labor market outcomes, including annual salary (in 2012 dollars), and weeks employed, unemployed or not in the labor force, were collected for all survey years following the respondent's graduation from a four-year college or university. Additionally, an indicator of whether a student was pursuing a graduate degree of any kind in any year following college graduation was created using the responses to enrollment questions in each survey-year.

These data were linked to college spending characteristics obtained from the *Integrated Post-Secondary Education Data System* (IPEDS) in the following way. Data were collected from IPEDS on four-year colleges' spending on instruction, academic support, student services, and research. Each of these spending measures was converted to 2012 dollars, and measured per full-time student equivalencies. Four-year averages of each of these spending measures were then computed to smooth out the

[3] The NLSY97 has continued to survey respondents since 2010, but this is the last year of data used in this study.

spending measures and to reflect the average level of spending in each category during a student's time in college. These measures are linked to the student's graduation year such that the level of spending in each category (instruction, academic support, student services, and research) reflects the average spending in these categories in the four years prior to and including the student's year of graduation. Indicators for college control and type (doctoral, master's or baccalaureate) were derived from IPEDS data as well. Median SAT scores for incoming classes were calculated as the middle of the interquartile range, and were obtained from IPEDS from 2000 on and from the College Board's Annual Survey of College for years prior to 2000. For colleges that only reported ACT scores, the median was converted to the equivalent SAT score.

The resultant data set is a panel data set following 1680 NLSY97 four-year college graduates from their year of college graduation through 2010, for a total of 7470 complete observations. There are 390 respondents (2178 respondent-years) for which there is either not a valid college code (IPEDS unitid) available, or for which college spending data are not available. In our main estimations this sub-sample is dropped. However, to check for robust estimates we include this sub-sample, utilizing indicator variables to flag for missing spending values, and these results are reported later in the paper.

III.B Description of Model

Our empirical model is based on a basic human capital framework. We assume that earnings are a function of individual characteristics such as gender, race, and ability, as well as characteristics of the college attended, and years of labor market experience. Colleges and universities are assumed to contribute to a worker's human capital and their opportunities in the labor market through institutional expenditures. Our model separates total institutional expenditures by type - instruction, academic support, student services, and research - to test how each category of spending may impact on labor market outcomes separately. We also assume, based on the literature, that different types of institutions – private, public, doctoral, master's, or baccalaureate, may have different effects on the accumulation of human capital, and therefore on labor market outcomes.

It is reasonable to hypothesize that institutional spending devoted to different purposes may impact graduates' labor market outcomes differently. Spending on instruction may have a direct impact on human capital formation, and therefore help to build skills that will be rewarded in the labor market. Academic support expenditures, on things such as libraries, museums, and support of curricular activities, may have less of a direct impact on human capital formation. Research expenditures could potentially impact labor market outcomes in two ways. First, students attending colleges that devote a lot of resources to research may provide more opportunities to develop skills with high rewards in the

labor market. Additionally, institutions with high research expenditures likely also have high-profile researchers on faculty that may provide connections and networking opportunities for graduates, therefore enhancing their labor market opportunities. Lastly, the other major category of student-related expenditures is student services. These expenditures go to on-campus offices such admissions, and career offices, as well as to support student organizations and student health services. While these expenditures may not have as direct a link to human capital formation as we might think instructional expenditures should, they very well may have impacts on labor market outcomes. Students attending schools that devote significant resources to student services may also have more labor market opportunities available to them. For example, colleges with many student organizations may have created a network of alumni that provides more opportunities for current graduates than a school with very little emphasis on student services. Student services expenditures may work to build non-cognitive skills that enhance human capital and improve labor market outcomes.

Given this theoretical framework, our goal is to estimate a model as in equation (1):

$$(1)\ Y_{its} = \alpha_0 + X_{it}\beta + Z_s\gamma + \varepsilon_{its}$$

Where Y_{its} represents a labor market outcome of respondent i in time period t that graduated from school s from the following list: log of salary, number of weeks employed, unemployed, not in labor force, or an indicator for whether the respondent is currently enrolled in a graduate program. The vector X contains individual characteristics for respondent i in time period t, including gender, race/ethnicity, and ability as measured by SAT score, high school GPA, and ASVAB score. We also control for family background through parents' highest level of education and the log of parental income. Additionally, this vector includes a measure of years of potential labor market experience calculated as the number of years since the respondent graduated from a four-year college or university. The vector Z contains the school specific variables measuring instructional, academic support, research, and student services expenditures per FTE student for the school from which the student received their four-year degree. Finally, this vector includes indicators of school control and type (doctoral, master's, or baccalaureate).

Under this framework, assuming that there are benefits of institutional spending and following the literature, it seems reasonable to assume that students will sort into institutions accordingly. Therefore, we should expect that students with unobservable characteristics that allow them to benefit highly from a particular type of expenditure should enroll at higher rates in institutions with higher spending in that category, and also graduate at higher rate from those schools. If it is the case that these unobservable characteristics are complementary to institutional spending, then the coefficients in

gamma will likely exhibit upward bias, indicating a more positive benefit of institutional spending. In contrast, it may be that some categories of institutional spending are substitutes for low levels of unobservable characteristics. In this case, students with lower levels of positive unobservables will be more likely to enroll in institutions with high level of spending in these categories, and any effect of spending will be biased towards zero. Therefore, it is important to control for any unobservable characteristics that may influence both school choice and labor market outcomes.

To do this, we use two methods. Both are based on the theory developed in the 2002 work of Dale & Krueger. First, we assume that college admissions decisions are made as a function of an individual's characteristics. These come in two types, observable and unobservable. The admissions officer sees the ability level of applicants as measured by high school GPA and other test scores. They also obtain information on characteristics unobservable to the econometrician, such as motivation and tenacity, through such instruments as application essays and letters of recommendation from teachers. It is these unobservable characteristics that will affect which college each student attends that may also have an impact on their future wages.

We assume that colleges accept students for which some function of their characteristics, both observable and unobservable, exceeds a college-specific threshold. Therefore, given a student's observable characteristics, being accepted to or attending a higher quality college should reflect a higher level of unobservable characteristics. Under this assumption, a measure of college quality, separate of college spending, can be used to capture any unobservable characteristics that may affect labor market outcomes. In contrast to Dale & Krueger (2002), we are not concerned with identifying a causal impact of the median SAT score of an institution on labor market outcomes, so we use this measure to control for selection on unobservables. The coefficient on median SAT may be biased, as it is picking up the effect of higher quality peers, spending held constant, as well as any unobservable characteristics that sort students into higher quality colleges. That is not of concern given our question of interest.

To provide a second check of whether this method truly controls for any selection on unobervables into colleges with differing expenditures, we also estimate models similar to the "self-revelation" models developed by Dale & Krueger (2002). Youths in the NLSY97 that were born in either 1983 or 1984 were asked to report the colleges to which they applied, in addition to the college they ultimately attended. We use this information to construct average spending levels in each category for the schools to which the student applied, and we then control for these measures, along with the total number of applications reported. This then means that labor market outcomes are compared for respondents who applied to institutions with similar spending habits, and therefore revealed themselves

to have similar unobservable preferences or characteristics with regards to institutional spending. The effect of college spending is then identified off of variation in spending at the colleges actually attended. These models are as in (2):

$$(2)\ Y_{its} = \alpha_0 + X_{it}\beta + Z_s\gamma + S_s\lambda + \varepsilon_{its}$$

Where S is a vector containing the average instructional, academic support, student services, and research spending at the institutions to which the student applied. S also contains indicator variables for the number of applications reported. If these measures control for any selection on unobservables, as assumed, the coefficients in gamma should reflect causal estimates of the effect of institutional spending on labor market outcomes.

III.C. Descriptive Statistics

Descriptive statistics for the NLSY97 sample are shown in Table 1, for both the whole sample and the restricted sample for which college application data are available. The samples look very similar, as they are selected only on the year in which the applicant was born. The NLSY97 is meant to be nationally representative, and that is reflected in these descriptive statistics for the college-going population. In Panel A, statistics are calculated for each individual in the sample. Both samples are roughly 58% female, with about 15% and 11% of the sample identifying as Black or Hispanic respectively. There is quite a bit of variation in ability in the sample, with a mean of 1059 on the SAT and an almost 200 point standard deviation, as well as high school GPA averaging around a B+ on a 4.3 scale. On average, individuals that attended college immediately following graduation had parents with roughly a college education or slightly less. Incomes are also higher than national median incomes at 10.95 log points, or roughly $57,000. On average, each individual has roughly 4 years of data available. This is of course lower for the application sub-sample, as these individuals were born in later years, and therefore graduated from college later.

In Panel B of Table 1, labor market outcomes are shown, averaged over all observations in the sample for each individual. Salaries are on average just below $40,000, again lower for the application sample as they have had fewer years of experience to grow these salaries. Individuals appear to be mostly fully employed on average, with 43 weeks of employment annually, but there is a lot of variation in time spent out of the labor force, or unemployed. Roughly 16% of the time an individual was enrolled in a graduate program.

Finally, Panel C of Table 1 displays the characteristics of the institutions attended by the individuals in the sample, weighted by individual. On average, the median SAT score of institutions

attended looks very similar to the average student SAT score in the sample. The largest category of expenditures is instructional, with the four-year average instructional expenditures per full-time equivalent (FTE) student coming in at $13,592. Academic support expenditures are roughly a quarter of this at $3470, with student services expenditures just slightly below this. For all cases, it is apparent that there is a significant amount of variation in institutional expenditures. This is probably most evident for research expenditures. Because many institutions attended by individuals in the sample report zeros, the average research expenditures per FTE are only $6000. However, the standard deviation is just over $20,000, reflecting the large research programs at some of the institutions attended by students in the sample. These differences are also reflected in the type of institution attended. Roughly 28% of the individuals attended private institutions which tend to be smaller and less research focused. Students attending institutions with a doctoral focus, which are often much larger, comprise 48% of the sample. Primarily master's granting institutions, which also often have large student enrollments, comprise 37% of the sample, with the rest attending institutions with a baccalaureate focus.

One of the advantages of the using the NLSY97 data set to examine how institutional expenditures affect labor market outcomes is the diversity in both the student population and the universities attended. These descriptive statistics reflect the significant variation in both student characteristics and institutional characteristics.

IV. Results

Results of OLS estimations of equation (1), for five labor market outcomes - natural log of salary, number of weeks employed, unemployed, or not in the labor force, and whether the student is currently enrolled in graduate school – are shown in Table 2. In the odd columns the Median SAT score of the college attended is used to control for selection on unobservables. In the even columns, the average spending levels of schools to which the student applied are added as an additional selection control. For all models, standard errors are clustered by person, to account for any within-person correlation of errors across observations[4]. The results in column (1), for how personal and college characteristics affect salaries, show very little effect of institutional spending on salaries, with the exception of research spending. Increasing average research expenditures by 1 percent has a small and marginally significant impact of increasing salaries by 0.018%. To put this in dollars, a $1000 increase for the mean institution (currently spending $6000 on research) would be a 16% increase in spending, leading to a .29% increase in salaries. This may reflect the opportunities available at institutions that have large research budgets,

[4] Models of salary are estimated for the sub-sample of workers reporting an income of $5,000 or more. The results are not sensitive to this cut-off.

and therefore likely notable researchers. This combination may provide boosts in the labor market that come in the form of higher-paying jobs.

Although there is no impact of the other categories of expenditures on salaries, they do impact other labor market outcomes such as employment. Increasing expenditures on student services by 1% is associated with a 1.53 week increase in annual weeks employed, on average, and decreases the number of weeks not in the labor force by a similar amount. Student service expenditures on things such as student organizations may give students the networks and group skills that are needed to successfully find and keep jobs following graduation. In contrast, increased expenditures on academic support or instruction lead to a roughly 2 week decrease in the number of weeks employed. For instructional expenditures this is nearly balanced by a similar increase in weeks out of the labor force. Although not significant, the results for the smaller application sample are very similar in sign and magnitude. The only exception is a significant positive impact of research expenditures on weeks spent out of the labor force. As the results are very similar with the smaller application sample, the remaining models are shown only for the larger sample with median SATs serving as the selection control. However, all models were estimated on the smaller sample as well and any notable differences will be discussed.

Overall, despite findings in the literature that total expenditures significantly improve labor market outcomes such as salaries, when disaggregated it does not appear that there is much of an impact of institutional spending for the sample as a whole. However, it may be the case that certain types of students may benefit more from certain types of institutional expenditures. To investigate this question, we estimate a set of models for the same outcomes with interactions between spending categories and parent's education, race, and ability. The results of these models are shown in Tables 3 through 5. Also, it is quite possible that certain types of expenditures may impact students differently, depending on the institution at which the spending is occurring. To examine this question further we estimate our set of models separately for each type of institution, as shown in Tables 6 and 7.

Results in Table 3 indicate that students with less-educated parents have more to gain from institutional expenditures. For both student services expenditures and research expenditures, there is a positive impact on spending that is decreasing in the level of parental education. For a student with high school educated parents, the net effect of increasing both student service and research expenditures is positive, with very little total impact of increasing student service expenditures for any level of parental education past this. However, while these expenditure categories have an increasing positive impact on salaries as parental education levels fall, they have a negative impact on number of

weeks employed. Students with high school educated parents experience little effect on weeks employed as research and student services expenditures increase. However, for all students with parental education levels above high school, the effect of increasing either category of expenditures has a net positive impact on weeks employed. Students with fewer parental resources and experience with education appear to be having more trouble utilizing the resources available from high levels of student services and research spending and therefore having difficulty landing jobs and are more likely to be unemployed. However, for the students that are able to take advantage of these higher levels of spending, perhaps because their parents have more resources or experience doing so themselves, they are more likely to land jobs, and they are earning higher salaries.

We also see some differences in the effect of spending by race, as shown in Table 4. Increasing instructional expenditures decreases weeks employed and weeks unemployed for minority students and increases the probability that a minority student will be enrolled in graduate school. The negative negative impact of academic support expenditures on weeks employed appears to be reversed for minority students. These students also benefit from student services expenditures, earning salaries that are significantly higher as expenditures in this category increase. However, while student services expenditures have a significant negative impact on weeks unemployed for non-minority students, this effect is positive for minority students. Again, as we saw with parental education levels, it appears that students that may have fewer family resources are less able to capitalize on the opportunities in the job market that are provided by institutions with high levels of student expenditures. This also manifests in graduate school attendance; non-minority students are significantly more likely to be enrolled in graduate school as student services expenditures increases, but the net effect is zero for minority students.

If institutional expenditures contribute to human capital accumulation, as well as labor market opportunities, then it is likely that the ability level of the student could be key in this relationship. If college spending is complementary to ability, then high-ability students have the most to gain from increasing expenditures. However, if spending is a substitute for ability, then low-ability students may gain the most. Table 5 examines this question by interacting the expenditure categories with ability, as measured by high school GPA. Student services expenditures increase weeks spent unemployed for lower ability students, but this effect reverses for higher ability students, serving as a complement to ability. For high ability students, B- average or better in high school, increasing student expenditures works to decrease weeks unemployed. However, for lower-ability students, the opposite relationship

holds. These results follow nicely with those from the last two tables; students of high ability and more resources are able to gain from increased student expenditures.

The results thus far indicate that an individual's background can impact how institutional expenditures affect their labor market outcomes. It is also possible that the effect of instructional expenditures is specific to the school characteristics. To test this, models were estimated separately on sub-samples defined by the control and type of institution from which the individual graduated. Table 5 shows results of each model estimated separately for those who graduated from public and private institutions respectively. The positive impact on salary of increasing research expenditures only holds for individuals that graduated from private institutions. There are also differences in the effect of student services expenditures by institutional control. While student service expenditures have a positive impact on number of weeks employed for all students, the effect is twice as large at private institutions than at public institutions, and only significant for private institutions. Similarly, at private institutions, student service expenditures act to decrease weeks unemployed and not in the labor force, but have no impact at public institutions. The only significant impact of student services expenditures at public institutions is a positive impact on the probability of enrolling in graduate school.

The negative impact of academic support expenditures on weeks employed, occurs at both public and private institutions. However, for public institutions this is accompanied by an increase in weeks unemployed, but for private institutions there is a similar increase in weeks out of the labor force. Similarly, increased instructional expenditures at private institutions decreases weeks employed.

There are also differences in the effects of institutional spending across institution type – doctoral, master's, baccalaureate - as shown in Table 6. It is students graduating from baccalaureate institutions that reap the salary and employment benefits of increased research spending. Increased student services expenditures have a positive impact on number of weeks employed at doctoral institutions and decrease weeks spent out of the labor force for graduates of doctoral and baccalaureate institutions. For individuals graduating from master's institutions, increased academic expenditures have a mostly negative impact, decreasing weeks employed and increasing weeks unemployed and out of the labor force. However, there is an increase in the probability of graduate school enrollment as academic support expenditures increase at master's institutions. Instructional expenditures also have mixed impacts, depending on institutional setting. At master's institutions, instructional expenditures have a positive impact on salaries. For baccalaureate institutions, the results are slightly different. Increased instructional expenditures at baccalaureate institutions are associated with fewer weeks

employed and more spent out of the labor force. For doctoral institutions there is very little overall impact of instructional expenditures.

Altogether, these results suggest that students with fewer resources benefit from instructional expenditures, while students at the other end of the spectrum are better able to benefit from student service and research expenditures. Academic expenditures have a much less consistent effect, regardless of student background. Similarly, students attending smaller, baccalaureate institutions and larger research-focused doctoral institutions, benefit the most from increased student services and research expenditures, while students at master's institutions benefit more from increased instructional expenditures. It is likely that some of the differences we see by institution type are a result of student sorting. Doctoral and baccalaureate institutions tend to be more expensive and higher ranked, and therefore likely attract higher-ability students with more family resources, while master's institutions on average may attract more students at the other end of the spectrum.

V. Conclusions

Given the recent focus on college spending, costs, and students' success post-graduation, we need to better understand the link between institutional spending and student outcomes. This paper has used a nationally representative dataset, NLSY97, to shed light on this issue. Our models examine how each category of educational spending – instruction, research, academic support, and student services – impacts on students' post-graduation employment, salaries, and enrollment in graduate school, controlling for the selection of students into institutions.

Our findings have revealed some patterns. Increasing instructional expenditures can have benefits for minority students, by decreasing unemployment and increasing the probability of enrolling in a graduate program, which will likely increase salaries once the student has re-entered the labor market. These results suggest that instructional expenditures, which are in practice primarily on faculty salaries, are substitutes for other inputs in the education production function. Hiring high-quality, yet expensive, faculty members likely provides a high-level of instruction that can benefit students that may need additional resources in order to succeed post-graduation.

In contrast, expenditures on student services such as student organizations or health services, primarily benefit more advantaged students. Non-minority students, and those with highly-educated parents or of higher ability themselves, are more likely to be employed, and less likely to be unemployed, as student services expenditures increase. The effects of this type of spending are muted, or absent for students from more disadvantaged backgrounds, and those of lower-ability. These results indicate that this type of expenditure may be a complement to higher ability or resources. Therefore,

students from more advantaged settings are best able to take advantage of the resources provided by student services spending, and translate them into better labor market outcomes. High-ability students may be more likely to go to health services, therefore keeping them healthier and allowing them to be more productive in class, building more human capital. It may also be the case that students from this type of background are more likely to get involved in student organizations that may provide important networking opportunities that spillover into the post-graduation labor market. These organizations may also build human capital directly by providing important skills in team-work and interacting with different types of people, that could lead to better skills in job interviews or on the job. Given our results, it appears that students from disadvantaged backgrounds are either less likely to take advantage of these types of opportunities and therefore do not see the return to the skills they could provide, or do not have the same gain in skills from these types of services.

Research spending, which reflects mostly external funding for faculty-conducted research, can significantly increase salaries, particularly for students with less-educated parents. More spending on research could mean more opportunities for students to become involved in research themselves. The skills and connections made in this setting appears to translate into higher-paying jobs. Alternatively, it may be that institutions that have more research spending are also producing graduates that are getting jobs in higher-paying fields. Therefore the research spending itself is not causing higher salaries, but rather there is sorting into different majors and fields which are associated with higher salaries.

One category of spending that does not appear to have a consistent positive impact on labor market outcomes is academic support – spending on curriculum support, museums, etc. In some cases the effects are actually negative, while in many cases there is no impact at all. Therefore, institutions interested in improving students' post-graduation outcomes should not focus on academic support expenditures as a tool to accomplish this goal, and may in fact want to divert resources away from academic support and into one of the other categories.

Overall, our findings indicate that there are areas of spending on which institutions can try to focus, depending on the student population that they serve, as well as the type of institution, and the goal. Although instructional expenditures are theoretically most closely related to human capital formation, increasing spending on student services can also provide labor market benefits. Institutions interested in improving post-graduation outcomes for disadvantaged and minority students should focus on research and instructional expenditures. Institutions that want to maximize outcomes for higher-ability students from more advantaged backgrounds should instead turn to student services and research spending.

VI. References

Behrman, J. R., Constantine, J., Kletzer, L., McPherson, M., and Morton O. Schapiro. (1996). "The impact of college quality on wages: are there differences among demographics groups?" Working paper No. DP-38, Williams College.

Behrman, J.R., Rosenzweig, M.R., and Paul Taubman. (1996). "College choice and wages: Estimates using data on female twins." *Review of Economics and Statistics.* 77. Pp. 672-685.

Brewer, D., and Ronald G. Ehrenberg. (1996). "Does it pay to attend an elite private college? Evidence from the senior high school class of 1980." *Research in Labor Economics*. 15(2). Pp. 239-271.

Brewer, D., Eide, E., and Ronald G. Ehrenberg. (1999). "Does it pay to attend an elite college? Cross cohort evidence on the effects of college type on earnings." *Journal of Human Resources*. 34(1). Pp. 104-123.

Dale, Stacy Berg., and Krueger, Alan B. (2002). "Estimating the Payoff to Attending a More Selective College: An application of selection on observables and unobservables." *The Quarterly Journal of Economics*. 117(4). Pp 1491-1527.

Delta Cost Project (2008). "Trends in College Spending 1998-2008." Delta Cost Project report.

Griffith, A.L., and Kevin N. Rask. (2013). "The Cost-quality trade-off in the matriculation decision of high-ability students." Working paper.

Hoekstra, Mark. (2009). "The effect of attending the flagship state university on earnings: A discontinuity-based approach." *Review of Economics and Statistics*. 91(4). Pp 717-24.

Jacob, B., McCall, B., and Kevin Stange. (2013). "College as country club: Do colleges cater to students' preferences for consumption?" NBER Working paper #18745.

Kane, Thomas. (1998). "Racial and ethnic preferences in college admissions." In C. Jencks and M. Phillips, eds., *The Black-White Test Score Gap* (Washington, DC: The Brookings Institution).

Monks, James. (2000). "The returns to individual and college characteristics. Evidence from the National Longitudinal Survey of Youth." *Economics of Education Review*, 19(2). Pp 279-289.

Webber, D., and Ronald G. Ehrenberg. (2010). "Do expenditures other than instructional expenditures affect graduation and persistence rates in American higher education." *Economics of Education Review.* 29(6). Pp. 947-958.

Webber, D. (2012) "Expenditures and Post-secondary graduation: An investigation using individual level data from the state of Ohio." *Economics of Education Review.* 31(5). Pp. 615-18.

Table 1: Descriptive statistics for NLSY97

Panel A: Individual characteristics

	Full Sample	App. Info
Female	0.581	0.57
Black	0.156	0.144
Hispanic	0.115	0.112
Other Race	0.011	0.011
SAT	1059	1079
	(194)	(184)
High School GPA	3.31	3.347
	(0.432)	(0.408)
ASVAB	70	71
	(23.1)	(22.3)
Parent's Education	15.1	15.3
	(2.85)	(2.86)
log(parent income)	10.95	10.97
	(0.788)	(0.782)
Total years in Data	3.631	2.47
	(1.68)	(0.961)
Observations	1778	654

Panel C: College Characteristics

	Full Sample	App. Info
Median SAT	1099	1108
	(1.22)	(1.25)
Instructional Expenditures/FTE	13592	13971
	(20557)	(19268)
Academic Support Exp./FTE	3470	3686
	(5312)	(5732)
Student Services Exp./FTE	2381	2439
	(2461)	(1851)
Research Exp./FTE	6008	6598
	(20542)	(23060)
Doctoral	0.484	0.502
Masters	0.365	0.34
Private	0.276	0.268
Observations	1671	624

Note: Means shown with standard deviations in parentheses. All means are for individuals in their first year of labor market experience

Panel B: Outcomes

	Full Sample	App Info.
Salary	39367	35797.41
	(25163)	(23174)
Weeks Employed	43.05	42.24
	(15.69)	(16.02)
Weeks Unemployed	1.77	2.01
	(5.65)	(6)
Weeks not in Labor Force	4.78	5.13
	(11.17)	(11.39)
Enrolled in Graduate Program	0.161	0.18
Observations	6197	2201

Note: Means are for all observations for each individual

Table 2: Estimations of salaries, employment outcomes, and enrollment in advanced study, for the college-going sample of NLSY97.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Log(Salary)		**Weeks Employed**		**Weeks Unemployed**		**Weeks Not in Labor Force**		**Enrolled in Grad.**	
	Full	**App.**	**Full**	**App.**	**Full**	**App.**	**Full**	**App.**	**Full**	**App.**
Log(Instructional Expenditures)	0.0193	-0.00182	-2.304*	-0.165	0.0598	-0.354	1.480*	0.322	-0.00290	-0.0229
	[0.0572]	[0.0832]	[1.362]	[1.350]	[0.324]	[0.478]	[0.845]	[1.070]	[0.0272]	[0.0406]
Log(Academic Support)	-0.0289	-0.0582	-1.833**	-0.738	0.268	0.195	0.941	-0.280	0.0273	0.00740
	[0.0341]	[0.0384]	[0.912]	[0.873]	[0.216]	[0.307]	[0.602]	[0.609]	[0.0179]	[0.0197]
Log(Student Services)	0.00172	0.109	1.528*	0.968	-0.0691	0.316	-1.210*	-0.191	0.0283	-0.00226
	[0.0361]	[0.0776]	[0.917]	[1.417]	[0.218]	[0.457]	[0.691]	[1.053]	[0.0172]	[0.0398]
Log(Research)	0.0185**	0.00875	0.161	-0.471	0.0203	-0.0678	-0.0764	0.465**	0.00213	0.00542
	[0.00799]	[0.0142]	[0.191]	[0.329]	[0.0544]	[0.0977]	[0.144]	[0.183]	[0.00397]	[0.00773]
Private	-0.0168	-0.0854	-1.847	-3.388	0.532	-0.0504	1.231	1.354	-0.00124	-0.0336
	[0.0545]	[0.103]	[1.493]	[2.134]	[0.372]	[0.741]	[1.055]	[1.351]	[0.0263]	[0.0542]
Doctoral	0.0249	0.135	0.397	0.655	-0.0175	-0.0996	-0.608	-2.079	0.0282	-0.0153
	[0.0596]	[0.121]	[1.423]	[2.410]	[0.359]	[0.824]	[0.958]	[1.587]	[0.0296]	[0.0641]
Master's	0.0277	0.0577	0.0132	-2.477	0.407	0.473	-0.677	0.0753	0.0230	-0.0344
	[0.0487]	[0.0998]	[1.290]	[1.924]	[0.353]	[0.727]	[0.870]	[1.274]	[0.0249]	[0.0527]
Observations	4502	1060	5900	1382	5900	1382	5900	1382	5900	1382
R-squared	0.138	0.125	0.029	0.071	0.020	0.035	0.040	0.111	0.031	0.104

Note: Robust standard errors in brackets clustered by individual. *** p<0.01, ** p<0.05, * p<0.1. All models also control for gender, race, years of labor market experience, parent's education, log of parent's income, high school GPA, SAT score, ASVAB score, and Median SAT score of college attended. Flags for missing parental income and education, and ability measures included. In even-numbered columns number of applications and average expenditures by category for applied schools are also included.

Table 3: Estimations of salaries, employment outcomes, and enrollment in advanced study by parent's education level, for the college-going sample of NLSY97.

	(1)	(2)	(3)	(4)	(5)
	Log(Salary)	Weeks Employed	Weeks Unemployed	Weeks Not in Labor Force	Enrolled in Grad.
Log(Instructional Expenditures)	-0.151	3.010	-0.374	1.422	0.00695
	[0.166]	[5.025]	[0.941]	[2.892]	[0.0720]
Parent's Education	0.0122	-0.371	0.0299	0.00663	-0.000646
x log(instruction)	[0.0112]	[0.332]	[0.0632]	[0.206]	[0.00493]
Log(Academic Support)	-0.189	-1.120	0.0407	-0.105	-0.0270
	[0.132]	[4.167]	[1.012]	[2.428]	[0.0662]
Parent's Education	0.0107	-0.0517	0.0144	0.0708	0.00367
x log(academic support)	[0.00879]	[0.269]	[0.0646]	[0.165]	[0.00433]
Log(Student Services)	0.282***	-5.467**	0.248	0.682	0.0451
	[0.107]	[2.679]	[0.594]	[2.302]	[0.0572]
Parent's Education	-0.0191***	0.467**	-0.0225	-0.126	-0.00116
x log(Student Services)	[0.00715]	[0.182]	[0.0364]	[0.156]	[0.00368]
Log(Research)	0.0576***	-1.033*	-0.00405	0.153	0.00898
	[0.0219]	[0.611]	[0.122]	[0.451]	[0.0105]
Parent's Education	-0.00272*	0.0818*	0.00171	-0.0155	-0.000486
x Log(Research)	[0.00149]	[0.0423]	[0.00737]	[0.0317]	[0.000730]
Observations	4502	5900	5900	5900	5900
R-squared	0.142	0.033	0.020	0.041	0.031

Note: Robust standard errors in brackets clustered by individual. *** p<0.01, ** p<0.05, * p<0.1. All models also control for gender, race, years of labor market experience, parent's education, log of parent's income, high school GPA, SAT score, ASVAB score, and Median SAT score, type, and control of college attended. Flags for missing parental income and education, and ability measures included.

Table 4: Estimations of salaries, employment outcomes, and enrollment in advanced study by race, for the college-going sample of NLSY97.

	(1)	(2)	(3)	(4)	(5)
	Log(Salary)	Weeks Employed	Weeks Unemployed	Weeks Not in Labor Force	Enrolled in Grad.
Log(Instructional Expenditures)	0.0281	-1.084	0.537	0.736	-0.0333
	[0.0659]	[1.477]	[0.347]	[0.969]	[0.0288]
Minority	-0.0625	-4.496*	-2.110***	2.871	0.126**
x log(instruction)	[0.113]	[2.573]	[0.666]	[1.857]	[0.0580]
Log(Academic Support)	-0.00264	-2.914***	0.129	1.283*	0.0622***
	[0.0421]	[1.048]	[0.241]	[0.717]	[0.0193]
Minority	-0.0799	3.769*	0.671	-1.301	-0.127***
x log(academic support)	[0.0680]	[1.969]	[0.481]	[1.285]	[0.0391]
Log(Student Services)	-0.0334	2.115*	-0.454*	-1.059	0.0323*
	[0.0414]	[1.088]	[0.247]	[0.833]	[0.0180]
Minority	0.127*	-2.094	1.611***	-0.637	-0.0336
x log(Student Services)	[0.0670]	[1.538]	[0.442]	[1.012]	[0.0370]
Log(Research)	0.0180*	0.0959	-0.00816	0.00445	0.00136
	[0.00918]	[0.226]	[0.0638]	[0.171]	[0.00457]
Minority	-0.00302	0.215	0.0531	-0.245	0.00393
x Log(Research)	[0.0132]	[0.312]	[0.100]	[0.223]	[0.00668]
Observations	4502	5900	5900	5900	5900
R-squared	0.142	0.033	0.024	0.042	0.035

Note: Robust standard errors in brackets clustered by individual. *** p<0.01, ** p<0.05, * p<0.1. All models also control for gender, race, years of labor market experience, parent's education, log of parent's income, high school GPA, SAT score, ASVAB score, and Median SAT score, type, and control of college attended. Flags for missing parental income and education, and ability measures included.

Table 5: Estimations of salaries, employment outcomes, and enrollment in advanced study by ability, for the college-going sample of NLSY97.

	(1)	(2)	(3)	(4)	(5)
	Log(Salary)	Weeks Employed	Weeks Unemployed	Weeks Not in Labor Force	Enrolled in Grad.
Log(Instructional Expenditures)	-0.0514	-2.357	-0.347	2.913	-0.00472
	[0.123]	[2.637]	[0.597]	[1.978]	[0.0492]
HS GPA	0.0254	0.0207	0.149	-0.524	0.000624
x log(instruction)	[0.0403]	[0.842]	[0.196]	[0.647]	[0.0162]
Log(Academic Support)	-0.00688	0.506	0.199	-1.546	-0.00829
	[0.0757]	[1.870]	[0.417]	[1.333]	[0.0349]
HS GPA	-0.00838	-0.900	0.0288	0.950**	0.0136
x log(academic support)	[0.0263]	[0.643]	[0.138]	[0.472]	[0.0124]
Log(Student Services)	-0.00501	0.271	0.688*	0.448	0.0665*
	[0.0731]	[1.802]	[0.378]	[1.024]	[0.0348]
HS GPA	0.00306	0.506	-0.273**	-0.639*	-0.0143
x log(Student Services)	[0.0237]	[0.562]	[0.119]	[0.350]	[0.0114]
Log(Research)	0.0149	-0.344	0.0277	0.264	0.00454
	[0.0146]	[0.304]	[0.0896]	[0.209]	[0.00725]
HS GPA	0.00133	0.190*	-0.00276	-0.127	-0.000872
x Log(Research)	[0.00475]	[0.107]	[0.0265]	[0.0812]	[0.00230]
Observations	4502	5900	5900	5900	5900
R-squared	0.139	0.031	0.021	0.044	0.032

Note: Robust standard errors in brackets clustered by individual. *** p<0.01, ** p<0.05, * p<0.1. All models also control for gender, race, years of labor market experience, parent's education, log of parent's income, high school GPA, SAT score, ASVAB score, and Median SAT score, type, and control of college attended. Flags for missing parental income and education, and ability measures included.

Table 6: Estimations of salaries, employment outcomes, and enrollment in advanced study by ability, for the college-going sample of NLSY97.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Log(Salary)		Weeks Employed		Weeks Unemployed		Weeks Not in Labor Force		Enrolled in Grad.	
	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public
Log(Instructional Expenditures)	-0.0149	0.0470	-3.032	-1.935	1.078*	-0.518	1.897	1.534	-0.00535	0.00534
	[0.100]	[0.0719]	[2.326]	[1.675]	[0.615]	[0.382]	[1.714]	[0.933]	[0.0469]	[0.0334]
Log(Academic Support)	-0.0146	-0.0573	-2.409*	-1.987*	0.00422	0.638**	1.791*	0.356	0.0359	0.0207
	[0.0553]	[0.0449]	[1.388]	[1.139]	[0.360]	[0.282]	[1.048]	[0.619]	[0.0271]	[0.0225]
Log(Student Services)	0.0333	-0.0141	3.693**	1.068	-0.887**	0.147	-3.714**	-0.369	0.00208	0.0376*
	[0.0739]	[0.0422]	[1.777]	[0.988]	[0.411]	[0.259]	[1.703]	[0.583]	[0.0342]	[0.0199]
Log(Research)	0.0244*	0.0104	0.397	-0.0351	0.0677	-0.0269	-0.196	0.00680	0.00103	0.00404
	[0.0131]	[0.0104]	[0.314]	[0.242]	[0.0803]	[0.0824]	[0.255]	[0.191]	[0.00657]	[0.00521]
Observations	1181	3321	1661	4239	1661	4239	1661	4239	1661	4239
R-squared	0.194	0.130	0.067	0.030	0.046	0.021	0.072	0.039	0.048	0.029

Note: Robust standard errors in brackets clustered by individual. *** p<0.01, ** p<0.05, * p<0.1. All models also control for gender, race, years of labor market experience, parent's education, log of parent's income, high school GPA, SAT score, ASVAB score, and Median SAT score, and type of college attended. Flags for missing parental income and education, and ability measures included.

Table 7: Estimations of salaries, employment outcomes, and enrollment in advanced study by ability, for the college-going sample of NLSY97.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Log(Salary)			Weeks Employed			Weeks Unemployed	
	Doctoral	Master's	Bacc.	Doctoral	Master's	Bacc.	Doctoral	Master's	Bacc.
Log(Instructional Expenditures)	-0.0243	0.257**	-0.108	-0.890	-0.970	-13.30***	-0.0801	0.294	-0.00761
	[0.0807]	[0.100]	[0.156]	[1.631]	[2.560]	[4.876]	[0.402]	[0.746]	[0.858]
Log(Academic Support)	-0.0552	-0.0817	0.0614	-1.563	-3.203**	-0.460	-0.0813	0.843*	0.424
	[0.0554]	[0.0529]	[0.0741]	[1.192]	[1.566]	[2.138]	[0.255]	[0.452]	[0.499]
Log(Student Services)	-0.00289	-0.0708	0.107	2.759**	-0.336	-0.520	-0.284	0.558	-0.295
	[0.0531]	[0.0611]	[0.0819]	[1.253]	[1.514]	[2.227]	[0.245]	[0.554]	[0.486]
Log(Research)	0.0245	0.000620	0.0363**	0.423	-0.279	1.207**	0.0908	0.0339	-0.143
	[0.0249]	[0.0104]	[0.0162]	[0.401]	[0.265]	[0.480]	[0.115]	[0.0736]	[0.104]
Observations	2255	1653	594	2933	2162	805	2933	2162	805
R-squared	0.129	0.141	0.278	0.048	0.039	0.153	0.028	0.034	0.039

	(10)	(11)	(12)	(13)	(14)	(15)
	Weeks Not in Labor Force			Enrolled in Grad.		
	Doctoral	Master's	Bacc.	Doctoral	Master's	Bacc.
Log(Instructional Expenditures)	1.505	-0.511	5.920*	-0.00914	-0.0382	0.0918
	[1.107]	[1.734]	[3.247]	[0.0373]	[0.0513]	[0.0700]
Log(Academic Support)	-0.0720	1.253*	2.342	0.0246	0.0470*	0.00558
	[0.910]	[0.725]	[1.418]	[0.0271]	[0.0285]	[0.0419]
Log(Student Services)	-1.738*	0.708	-2.582*	0.0257	0.0447	0.000948
	[1.054]	[0.940]	[1.393]	[0.0243]	[0.0311]	[0.0513]
Log(Research)	-0.264	0.172	-0.394	0.00384	0.00543	-0.00343
	[0.252]	[0.199]	[0.366]	[0.00892]	[0.00561]	[0.00854]
Observations	2933	2162	805	2933	2162	805
R-squared	0.057	0.035	0.107	0.036	0.029	0.058

Note: Robust standard errors in brackets clustered by individual. *** p<0.01, ** p<0.05, * p<0.1. All models also control for gender, race, years of labor market experience, parent's education, log of parent's income, high school GPA, SAT score, ASVAB score, and Median SAT score, and control of college attended. Flags for missing parental income and education, and ability measures included.