



Postsecondary Equity & Economics Research Project

A joint initiative of
George Washington University,
Columbia University and Student Defense

The Economic Value of Master's Degrees *Evidence from a large, urban public university system*

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JUNE 2024

The views expressed in this report are solely those of the authors.

More college graduates in the U.S. are going on to earn master's, professional and doctoral degrees, even as overall college enrollments are falling. Since 2000, the number of people ages 25 and over whose highest degree was a master's has doubled to 23.9 million (U.S. Census Bureau, 2023). This surge in graduate enrollment coincides with a growing proportion of graduate students among loan recipients (Meyer, 2022),¹ spurring debates about the value of graduate school and the role of the federal government in protecting student consumers from programs that may be poor investments (Cooper, October 19, 2022). Though the number of students seeking graduate education suggests they expect some return in the labor market, only a small number of studies have estimated the economic return to obtaining a master's degree.

In this study we use administrative data from a large, urban public university system to estimate the effect of earning a master's degree on students' average quarterly wages. This study contributes to a growing body of literature estimating the economic value of graduate education and informs current policy debates around the use of earnings for accountability in higher education. In addition to estimating the average effect of earning a master's degree on wages, we also explore variation in earnings premia across field areas (e.g., Education compared to Business).

STUDY CONTEXT

Our data comes from a large, urban public university system (henceforth referred to as the system). The system is comprised of 25 campuses, 15 of which offer graduate programs. Master's and doctoral programs are offered at 15 of the schools. As of fall 2022, graduate enrollment totaled approximately 30,000 students. In the 2022-23 academic year, students in the system's graduate programs completed nearly 9,200 master's degrees, 1,300 advanced certificates, 270 first professional/law degrees, and 520 doctoral degrees (System Fast Facts, n.d.). Our study focuses on master's degrees and excludes advanced certificates, doctoral degrees, and first-professional degrees, such as those in law and medicine.² For state residents pursuing graduate studies full-time, tuition ranges from \$1,235 per semester to \$8,340 per semester, depending on the field of study (System Cost & Paying for Grad School, n.d.).

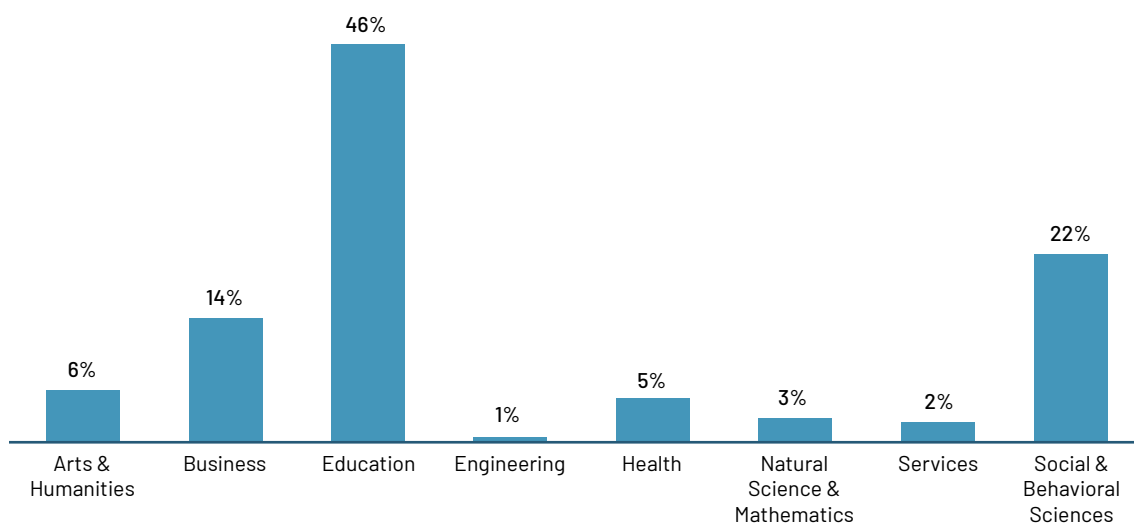
Table 1 displays descriptive statistics for our analysis sample. Approximately 70% of the students in our sample are women and 56% are White. Black and Hispanic or Latino students are overrepresented in our study context compared to national estimates. In our sample, 21% of master's degree holders are Black and 15% are Hispanic/Latino, compared to 16% (Black) and 9% (Hispanic/Latino) nationally. The average age at entry into graduate school is 30, and the average student completes their degree in approximately 2 years.

Table 1. Summary Statistics

Summary Statistics	ALL	A&H	Business	Education	Engineering	Health	Natural Sciences & Math	Services	Social & Behavioral Sciences
Gender									
Male	30.5%	35.7%	55.3%	21.5%	83.1%	16.6%	66.4%	38.0%	27.5%
Female	69.5%	64.3%	44.7%	78.5%	16.9%	83.4%	33.6%	62.0%	72.5%
Race/Ethnicity									
White	55.7%	66.5%	57.7%	60.3%	45.1%	49.4%	48.8%	53.6%	45.2%
Black	20.8%	14.7%	12.1%	18.6%	21.1%	26.6%	13.6%	28.0%	31.0%
Hispanic/Latino	14.9%	12.7%	7.4%	16.3%	15.5%	15.1%	8.8%	15.2%	18.1%
Asian	8.5%	6.0%	22.8%	4.7%	18.3%	8.9%	28.5%	3.2%	5.6%
Age									
MA Enrollment	30	31	30	30	33	32	30	29	31
MA Degree	33	33	32	32	35	35	32	31	33
MA Full-time Enrollment	20%	23%	30%	11%	27%	28%	17%	17%	29%
MA Quarterly Earnings									
Pre-Enrollment	\$13,897	\$12,636	\$18,322	\$12,383	\$12,874	\$17,912	\$16,506	\$13,973	\$13,294
Post-Degree	\$20,513	\$16,876	\$28,242	\$19,283	\$19,539	\$23,599	\$25,158	\$18,836	\$17,922
Sample Size (N)	10,715	638	1,549	4,971	71	549	295	250	2,353

Note: Sample includes Master's degree holders who first enrolled in graduate school and obtained a Master's degree from Fall 2001 to Fall 2008. Exclusions include individuals over 50 at the time of master's degree graduation and those younger than 22 at first enrollment. The sample further excludes individuals who do not have at least four quarters of earnings above the state minimum wage within six quarters before graduate enrollment, and at least one quarter of earnings above the minimum wage within ten years after earning the master's degree. 'A&H' to refer to Arts & Humanities majors.

Figure 1. Master's Degree Awarded, by Field Area



Note: Field areas were defined using the first two digits of the 2010 CIP code.

Figure 1 shows the distribution of master's degrees awarded across field areas. The most prevalent fields of study in the sample are Education, with a notable focus on elementary education and teaching; Business, predominantly finance, business administration and management, and accounting; and Social & Behavioral Sciences, primarily comprised of social work, public administration, and urban studies/affairs.³ Relative to the overall racial/ethnic distribution of master's degree fields, Black and Hispanic students are overrepresented in Education and Social & Behavioral Sciences, while they are underrepresented in Business, which is predominantly pursued by White and Asian students. Only 20% of students enroll full-time in graduate school, suggesting that most are actively engaged in the labor market. For master's students in Education fields, only 11% are enrolled full-time in their first semester.

DATA & METHODS

We examine the labor market returns to the Master's degrees in a large urban public university system. We use student transcript and quarterly earnings records provided by two state agencies. With this data, we are able to observe students' term-over-term earnings while enrolled as well as their quarterly earnings before enrollment in graduate school and after degree completion. We can also observe how employment, in terms of number of jobs, industry of employment, and total quarterly earnings vary over time.

We estimate the effect of earning a master's degree on students' quarterly wages after graduation (i.e., the economic return to master's degrees) using an individual fixed effects model that compares an individual's wages before and after they complete a master's degree. The individual fixed effects model allows us to estimate measures of earnings gains that control for fixed student characteristics (such as race, gender, family background, and motivation) as well as natural wage growth over time. The results are estimates of earnings gains that come close to the causal impact of master's degree programs on earnings.

Because these models effectively compare an individual's earnings after they complete a master's degree with their earnings before entering the program, our sample includes only individuals who have at least four quarters (or one year) of earnings higher than the state minimum wage before their first semester of enrollment in graduate school. Thus, our sample excludes individuals with weak labor market attachment prior to graduate enrollment, including those who enrolled in a master's program immediately after completing their bachelor's degree (about 30% of all master's completers in our sample). We estimate both average returns and returns by field area. More detail on our methodology can be found in Appendix A.

RESULTS

In order to explore the economic value of earning a master's degree for the students in our sample, we began by plotting wage trajectories. Figure 2 shows earnings trajectories by field area. Specifically, the figure depicts average quarterly earnings for six quarters before graduate enrollment, shown as negative relative quarters, and ten years after graduate degree completion, shown as positive relative quarters.⁴

On average, students who earn master's degrees appear to have consistently positive earnings trajectories over the approximately ten years (40 quarters) in which we are able to observe them. This figure demonstrates that, while, on average, students who earn a master's degree experience growth in their quarterly wages post-graduation, there is variation across field areas with the average Business major (dark red line) far out-pacing the average Arts & Humanities major (dark blue line) or Education major (dark green line).

Table 2 shows estimates of the effect of earning a master's degree on quarterly wages. Our estimates suggest that, on average, and conditional on being employed in the state, an individual who completes a master's degree experiences an 18% increase in quarterly wages. When we disaggregate credential completion by field areas, we find that individuals earning master's degrees in Business, Education, Health and Natural Sciences & Math experience statistically significant increases in their average quarterly wages. Students earning master's degrees in Education gain the largest increases in average quarterly wages, among the fields of study in our sample. Students graduating with master's degrees in Education experience a 28% increase in average quarterly wages, compared to about a 16% return for individuals completing master's degrees in Business. We do not find a

Table 2. Earnings Premia for Master's Degrees

OUTCOME: Log Real Quarterly Earnings			Number of Observations	Number of Students	Baseline Quarterly Earning
Any Master's Degree	0.183***	(0.012)	405,549	10,715	\$ 11,662
Arts & Humanities	0.020	(0.062)	23,534	638	\$ 10,757
Business	0.160***	(0.030)	54,914	1,549	\$ 15,873
Education	0.278***	(0.017)	196,181	4,971	\$ 10,441
Engineering	-0.061	(0.215)	2,419	71	\$ 10,698
Health	0.203***	(0.050)	20,506	549	\$ 14,398
Natural Sciences & Math	0.156**	(0.068)	10,513	295	\$ 13,221
Services	0.069	(0.093)	8,843	250	\$ 11,480
Social & Behavioral Sciences	0.078***	(0.023)	87,225	2,353	\$ 11,591

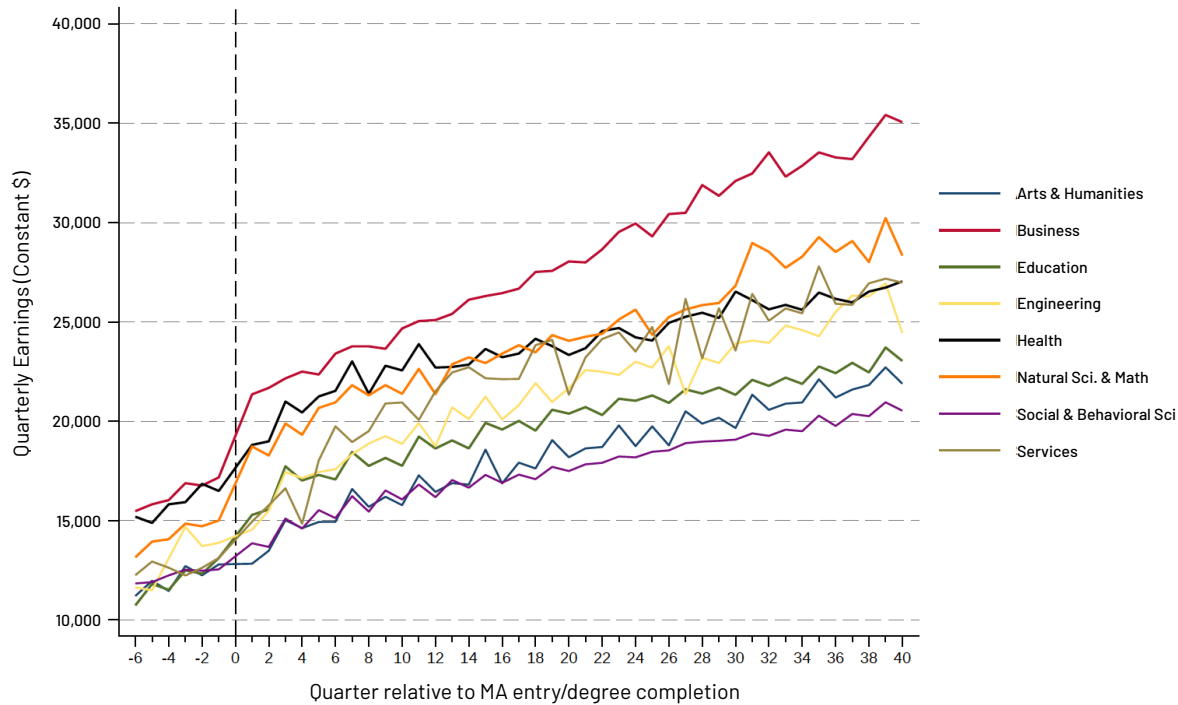
Note: Standard errors in parentheses. Sample includes Master's degree holders who first enrolled in graduate school and obtained a Master's degree from Fall 2001 to Fall 2008. Exclusions include individuals over 50 at the time of master's degree graduation and those younger than 22 at first enrollment. The sample further requires at least four quarters of earnings above the state minimum wage within six quarters before graduate enrollment, and at least one quarter of earnings above the minimum wage within ten years after earning the master's degree. Earnings are adjusted to 2019Q4 dollars using the Consumer Price Index for All Urban Consumers, U.S. City Average (CPI-U), and top-coding applies to the highest 1% wages. Earnings earned before age 22 are excluded from the analysis. Regressions control for: (i) individual's age at each quarter and age squared; (ii) a dummy that is equal to one for the time period one quarter before first enrollment at graduate school, and another dummy that is equal to one for the time period one quarter after obtaining the Master's degree; (iii) individual fixed effects and individual specific time trends. Baseline quarterly earnings show geometric mean of earnings before graduate enrollment.

statistically significant effect on wages for students earning master's degrees in Engineering, Arts & Humanities or Services (i.e., programs in criminal justice and law enforcement).

It is important to keep in mind that these estimates indicate that students graduating with master's degrees in Education experience the greatest difference between their pre- and post-graduation earnings, not the highest overall earnings. Students enrolling in MBA programs in our sample tend to come from backgrounds in finance and insurance, information, and professional and legal services, that may already be highly compensated. Conversely, individuals entering master's programs in Education in our sample previously held positions in elementary and secondary schools, as well as in health care and social assistance. These students may be transitioning from low-wage jobs in service or already working in a classroom, and receive a substantial boost in earnings from obtaining the master's degree. However, it's unclear whether this boost is primarily due to securing a teaching position or if it is a salary increase for existing teachers. In the context of our study, state regulations require educators to obtain a master's degree to remain in their jobs, creating a strong incentive for pursuing this qualification. This requirement not only helps them secure and maintain teaching positions but also places them on a higher salary schedule. As Figure 2 shows, students with master's degrees in Business have the highest overall earnings, on average, particularly as they gain experience. Appendix B contains estimates from additional statistical model specifications.

It may be surprising that we do not find a statistically significant return to master's degrees in Engineering. This could be because individuals who enroll in master's of Engineering programs hold bachelor's degrees in STEM fields which made them relatively high earners even before entering graduate school. It is also possible that in some fields, in order to experience a jump in one's wage trajectory, a student needs to earn a PhD rather than a master's degree. Similarly, in Services field areas like criminal justice and law enforcement, the main wage increase may come after completing training at the police academy. Earning a master's degree may be mainly a strategy for those seeking promotion and may not come with a large pay bump. We also only have a relatively small number of students completing credentials in these fields in our sample, so we could be underpowered to detect effects.

Figure 2. Quarterly Earning Trajectories for Master’s Degree Holders

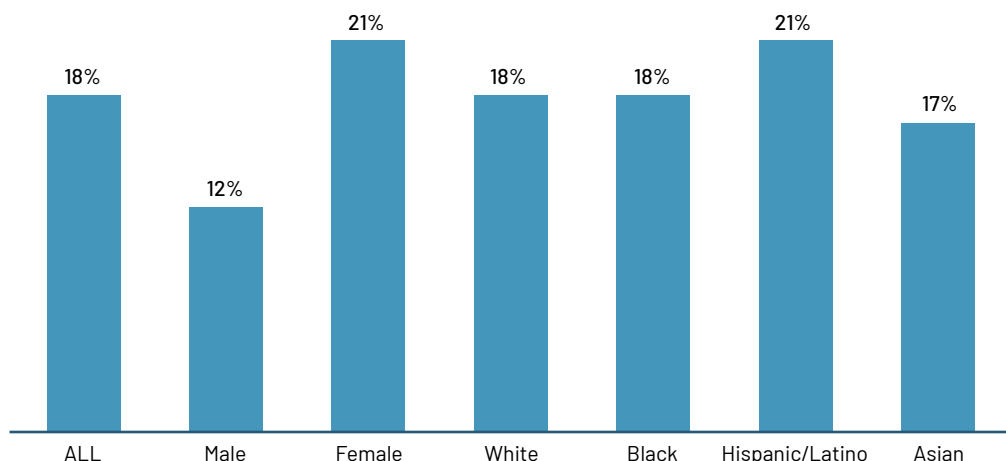


Note: This figure illustrates the unadjusted average quarterly earnings six quarters before graduate enrollment (depicted as negative relative quarters) and ten years after attaining a graduate degree (represented as positive relative quarters). Sample includes Master’s degree holders who first enrolled in graduate school and obtained a Master’s degree from Fall 2001 to Fall 2008. Exclusions include individuals over 50 at master’s degree graduation and younger than 22 at first enrollment. The sample further excludes individuals who do not have at least four quarters of earnings above the state minimum wage within six quarters before graduate enrollment, and at least one quarter of earnings above the minimum wage within ten years after earning the master’s degree. Earnings are adjusted to 2019Q4 dollars using the Consumer Price Index for All Urban Consumers, U.S. City Average (CPI-U), and top-coding applies to the highest 1% wages. Earnings earned before age 22 are excluded from the analysis.

Finally, for some programs the main return may be non-monetary or unobservable. For example, a Master of Fine Arts (MFA) program may allow students to develop their creativity, explore a new passion, or access mentors and networks that do not necessarily translate to higher earnings. Some programs may also generate income that is not reflected in quarterly earnings records. For example, writers, painters, and other artists may earn money from selling their work that we cannot observe in our earnings data. We return to the idea of unobservable and non-pecuniary benefits below.

Figure 3 displays estimates of the average return to a master’s degree disaggregated by gender and race/ethnicity. The estimates in Figure 3 suggest that women experience a statistically significant 21% increase in average quarterly wages after earning a master’s degree, whereas men experience a 12% increase. This difference in the return to master’s degrees between genders can be explained by differences in returns across field areas. The largest number of master’s degrees in our sample are earned in Education, and students earning a master’s in Education experience the largest economic return. Women earn 79% of these credentials. On the other hand, men earn the majority of master’s degrees awarded in Engineering and Natural Sciences & Math. We find no statistically significant return to master’s degrees in Engineering, and an approximately 16% return to degrees in Natural Sciences & Math, but this is much smaller than the approximately 28% return to Education degrees. When we disaggregate our estimates by race/ethnicity we find that all groups experience statistically significant increases in their average quarterly wages after earning master’s degrees, and there are not large differences in the increase across groups. It follows that we do not find evidence of differential selection into either high or low-return field areas by student race/ethnicity. However, further research is needed to assess disparities within specific field areas, especially those requiring master’s degrees for professional licensure, which could pose a burden for traditionally underrepresented groups in graduate education.

Figure 3. Earnings Premia for Master's Degrees, by Gender and Race/Ethnicity



Note: This figure shows the average return to a master's degree by gender and race/ethnicity. Each bar represents a separate regression showing individual fixed effects estimates. Log real quarterly earnings gains roughly correspond to percentage earnings gains. Sample includes Master's degree holders who first enrolled in graduate school and obtained a Master's degree from Fall 2001 to Fall 2008. Exclusions include individuals over 50 at the time of master's degree graduation and those younger than 22 at first enrollment. The sample further excludes individuals who do not have at least four quarters of earnings above the state minimum wage within six quarters before graduate enrollment, and at least one quarter of earnings above the minimum wage within ten years after earning the master's degree. Earnings are adjusted to 2019Q4 dollars using the Consumer Price Index for All Urban Consumers, U.S. City Average (CPI-U), and top-coding applies to the highest 1% wages. Earnings earned before age 22 are excluded from the analysis. Regressions control for: (i) individual's age at each quarter and age squared; (ii) a dummy that is equal to one for the time period one quarter before first enrollment at graduate school, and another dummy that is equal to one for the time period one quarter after obtaining the Master's degree; (iii) individual fixed effects and individual specific time trends.

DISCUSSION AND CONCLUSION

Using administrative data from a large, urban public university system we estimate the economic value of earning a master's degree, both on average and by field area. In general, our findings demonstrate that there is an economic return to earning a master's degree, though the return varies across field areas. We use an individual fixed effects approach to compare an individual's wages before and after earning a master's degree in order to get at the causal effect of completing this degree. Our findings demonstrate that the economic value of earning a master's degree (i.e., the difference in pre- and post-degree earnings) can be high, even when average wages may seem low. This is clearly demonstrated by our estimates of the return to Education degrees in Table 2 compared to the average wage trajectories displayed in Figure 2. This approach highlights the importance of comparing post-degree wages to some baseline when trying to understand the value of a given credential.

An important limitation of our study is that it makes use of data from a single context. Though the type of rich administrative data that is available from a single state or system has many benefits, the drawback is that our findings may not generalize to other contexts. As mentioned above, wages for teachers are particularly high in our context, where the state mandates a master's degree to fulfill professional licensure requirements. Our large, urban context is also characterized by a robust labor market that has many opportunities for new graduates, perhaps unlike some small or mid-size cities or rural areas.

This paper contributes to a small literature exploring the economic value of graduate education. Our findings are in line with those of Minaya et al. (2023) who explore the economic return to graduate education in Ohio. We need more research in different contexts that explores the value of master's degrees both to add evidence to debates about the value of graduate school and also to inform students who often take out loans in order to pay for this type of program. More studies describing individuals' patterns of work (e.g., what types of jobs do students have before entering a master's of Education program) could help us better understand the mechanisms underlying ours and similar studies. We also need studies of potential non-pecuniary benefits of graduate education including greater civic engagement and possible generational effects. Though wages may be one of the easiest outcomes to measure, earning a master's degree--even one that does not result in an increase

in wages--could have many other potential benefits. It could allow an individual to move from unpredictable shift work, for example in retail, to a set schedule, which has demonstrated benefits on an individual's health and economic stability (Harknett et al., 2021). It could also help an individual get a promotion and move from an hourly wage position to a salaried position with health insurance and other benefits. Moving into a better job with regular hours and health insurance could have an impact on an individual's entire family, well beyond any increase in their wages.

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APPENDIX A. EMPIRICAL METHODOLOGY

Sample

We limit the sample to Master's degree holders who enrolled in graduate school and completed a master's degree from fall 2001 to spring 2008. This restriction allows us to track and compare each individual's quarterly earnings from six quarters before graduate school enrollment to ten years after completion. Since our fixed effects approach compares an individual's earnings before and after obtaining the graduate degree, we would ideally like to focus on Bachelor's degree holders who actively participated in the labor market before graduate school enrollment. Because our estimation strategy is based on comparing an individual's wages before and after they complete a master's degree, we limit the sample to individuals who had at least four quarters of earnings higher than the state minimum wage within six quarters before their first graduate enrollment. To ensure individuals are at least minimally connected to the state labor market, we also exclude graduates who did not have at least one quarter of earnings above the state minimum wage within ten years of completion. This will exclude individuals who moved out of the state and job types that may not appear in the quarterly earnings records. Finally, we exclude individuals pursuing doctoral programs, advanced certificates and first professional degrees after completing their master's degrees since our goal is to isolate and measure specifically the economic return to a master's degree. An important limitation of our earnings data is that we are unable to distinguish between quarters when an individual was unemployed, not in the labor force, worked in another state or under employers not covered by unemployment insurance in the anonymized state. We therefore exclude quarters of missing earnings from the analysis. All the earnings are converted to 2019, 4th quarter dollars using the Consumer Price Index for All Urban Consumers, U.S. City Average (CPI-U), and the highest 1% are top-coded.

Estimation

To estimate the labor market returns to Master's degrees, we employ an individual fixed effects approach comparing pre- and post-graduate education earnings within the same individual among Master's degree holders in our analysis sample. For each individual, we use quarters of earnings within six quarters before the first graduate enrollment as pre-earnings, and quarters of earnings within ten years after the completion of the Master's degree as post-earnings. Specifically, we estimate:

$$L\text{earn}_{it} = \alpha + \beta \text{Masters}_{it} + \theta_1 \text{Age}_{it} + \theta_2 \text{Age}_{it}^2 + \gamma \text{Prern}_{it} + \sigma \text{Postern}_{it} + \text{Indtrend}_{it} + \eta_i + \varepsilon_{it}$$

The dependent variable $L\text{earn}_{it}$ is the log-transformed real quarterly earnings for individual i at quarter t . Masters_{it} is a dummy variable indicating if individual i has obtained a Master's degree in quarter t . That is, quarters of pre-earnings have a value of zero for this variable and quarters of post-earnings have a value of one. Prern_{it} is a dichotomous variable, which is equal to one for the time period one quarter before first graduate enrollment to control for possible pre-enrollment dips in earnings (Ashenfelter's dip before first graduate enrollment). Postern_{it} is a post-degree dummy that controls for potential work start delays after obtaining a Master's degree. We also control for individual's age at each quarter and age squared. Indtrend_{it} controls for linear time trends specific to individual characteristics, and η_i controls for individual fixed effects.

APPENDIX B. ADDITIONAL SPECIFICATIONS

Table B1. Earnings Premia for Master's Degrees, Without Individual Time Trends

OUTCOME: Log Real Quarterly Earnings			Number of Observations	Number of Students	Baseline Quarterly Earning
Any Master's Degree	0.091***	(0.009)	405,549	10,715	\$ 11,662
Arts & Humanities	-0.112**	(0.047)	23,534	638	\$ 10,757
Business	0.055**	(0.024)	54,914	1,549	\$ 15,873
Education	0.219***	(0.012)	196,181	4,971	\$ 10,441
Engineering	-0.161	(0.141)	2,419	71	\$ 10,698
Health	0.039	(0.038)	20,506	549	\$ 14,398
Natural Sciences & Math	0.098*	(0.051)	10,513	295	\$ 13,221
Services	-0.185***	(0.069)	8,843	250	\$ 11,480
Social & Behavioral Sciences	-0.0548***	(0.017)	87,225	2,353	\$ 11,591

Note: Standard errors in parentheses. Sample includes Master's degree holders who first enrolled in graduate school and obtained a Master's degree from Fall 2001 to Fall 2008. Exclusions include individuals over 50 at the time of master's degree graduation and those younger than 22 at first enrollment. The sample further requires at least four quarters of earnings above the state minimum wage within six quarters before graduate enrollment, and at least one quarter of earnings above the minimum wage within ten years after earning the master's degree. Earnings are adjusted to 2019Q4 dollars using the Consumer Price Index for All Urban Consumers, U.S. City Average (CPI-U), and top-coding applies to the highest 1% wages. Earnings earned before age 22 are excluded from the analysis. Regressions control for: (i) individual's age at each quarter and age squared; (ii) a dummy that is equal to one for the time period one quarter before first enrollment at graduate school, and another dummy that is equal to one for the time period one quarter after obtaining the Master's degree; (iii) a time trend interacted with age at first graduate enrollment to control for linear trends; (iv) individual fixed effects. Baseline quarterly earnings show geometric mean of earnings before graduate enrollment.

Table B2. Individual Fixed Effects Estimates of Real Quarterly Earnings

Real Quarterly Earnings	Any Master's Degree	MASTER'S DEGREE FIELD							
		A&H	Business	Education	Eng	Health	Natural Sciences & Math	Services	Social & Behavioral Sciences
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Master's Degree	1,882*** (163)	259 (669)	2,268*** (704)	2,856*** (188)	-1,545 (2,032)	791 (801)	3,091** (1,410)	-420 (1,082)	802*** (286)
Number of Observations	491,707	29,330	71,093	228,198	3,262	25,159	13,509	11,397	107,965
Number of Students	10,715	638	1,549	4,971	71	549	295	250	2,353

Note: Standard errors in parentheses. Quarters with missing earnings were replaced by zeros.

ENDNOTES

- 1 It is important to note that Meyer's (2022) finding is driven by students attending private, non-profit institutions.
- 2 The system offers both in-person and online master's degrees but our data does not allow us to distinguish between the two.
- 3 The most prevalent programs in the field of Arts & Humanities are liberal arts and sciences, language and literature, creative writing, drama and theatre arts, studio arts, film studies, and journalism. In Services, the predominant programs are criminal justice and law enforcement.
- 4 The figure shows a slight earning dip one quarter before the first enrollment term in graduate school, known as "Ashenfelter's dip" (Ashenfelter, 1978). Our estimation strategy controls for this dip with an indicator variable for the quarter immediately prior to enrollment.