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More Money for Less Time? Examining the Relative and Heterogenous Financial Returns to Non-Degree Credentials and Degree Programs

Jason Jabbari
Washington University in St. Louis

Yung Chun
Washington University in St. Louis

Xueying Mei
Washington University in St. Louis

Stephen Roll
Washington University in St. Louis

There is a large and growing number of non-degree credential offerings between a high school diploma and a bachelor's degree, as well as degree programs beyond a bachelor's degree. Nevertheless, research on the financial returns to non-degree credentials and degree-granting programs is often narrow and siloed. To fill this gap, we leverage a national sample of individuals across nine MSAs and four industries to examine the relative financial returns to a variety of non-degree credentials and degree programs. Leveraging two-way fixed-effect models, we explore the relationship between completing a credential or degree and earnings premiums. We find that an associate's, bachelor's, master's and doctorate degree follows a similar model of returns in which the number of schooling years is linearly related to proportional earnings premiums. However, students completing sub-baccalaureate certificates and earning non-school credentials appear to get larger financial returns for less time. Additionally, while we noticed subtle differences across degree programs, we noticed substantial differences in non-school credentials: only women experienced a significant earnings premium from a non-degree credential. Finally, in terms of race/ethnicity, students of color often experienced larger economic returns to undergraduate certificates and degree programs.

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More Money for Less Time?

Examining the Relative and Heterogenous Financial Returns to Non-Degree Credentials and Degree Programs

Jason Jabbari, PhD (Jabbari.jason@wustl.edu)

(corresponding author)

Yung Chun, PhD

(Yungchun@wustl.edu)

Xueying Mei, MS

(Evelyn.m@wustl.edu)

Stephen Roll, PhD

(Stephen.roll@wustl.edu)

Washington University in St. Louis

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Abstract. There is a large and growing number of non-degree credential offerings between a high school diploma and a bachelor's degree, as well as degree programs beyond a bachelor's degree. Nevertheless, research on the financial returns to non-degree credentials and degree-granting programs is often narrow and siloed. To fill this gap, we leverage a national sample of individuals across nine MSAs and four industries to examine the relative financial returns to a variety of non-degree credentials and degree programs. Leveraging two-way fixed-effect models, we explore the relationship between completing a credential or degree and earnings premiums. We find that an associate's, bachelor's, master's and doctorate degree follows a similar model of returns in which the number of schooling years is linearly related to proportional earnings premiums. However, students completing sub-baccalaureate certificates and earning non-school credentials appear to get larger financial returns for less time. Additionally, while we noticed subtle differences across degree programs, we noticed substantial differences in non-school credentials: only women experienced a significant earnings premium from a non-degree credential. Finally, in terms of race/ethnicity, students of color often experienced larger economic returns to undergraduate certificates and degree programs.

Keywords. Education economics; financial returns; non-degree credentials

More Money for Less Time?

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INTRODUCTION

Post-secondary education has been historically and causally linked to higher incomes (Card, 1999). In 2021, the median annual income for a year-round worker aged 25-34 with a high school diploma was $39,700, while a worker of the same age with a bachelor's degree earned $61,600 (National Center for Education Statistics, 2023). Indeed, having a bachelor's degree is often a good investment when compared to having no post-secondary education or training—especially over the life course (Deming, 2023). Unsurprisingly, large public investments, such as federal and state funding, have been made in educational institutions that offer bachelor's degrees. However, having a bachelor's degree does not necessarily guarantee getting a job that benefits from the earnings premium commonly associated with the degree. Although the unemployment rate for bachelor's degree holders is only one-third that of non-bachelor's degree holders, a significant portion of graduates still face *under*employment. One analysis found that 52 percent of bachelor's degree holders were underemployed one year after graduation, and even after 10 years, 45 percent remained in jobs that did not fully utilize their degrees (Burning Glass Institute and Strada Institute for the Future of Work, 2024). Furthermore, there are large opportunity costs associated with earning a bachelor's degree—both in terms of time (e.g., most bachelor's degree programs take 4 years) and money (e.g., the average cost of attendance for a student living on campus at a public 4-year in-state institution is $104,108; Hanson, 2024). For instance, in a recent survey of high school students, nearly half of them believed they could achieve professional success with education programs that lasted under 4 years (ECMC Group, 2022).

As a result, policymakers and researchers have continued to examine the economic returns of bachelor's degrees. Nevertheless, the perennial question of "Is college still worth it?" is limited in that it implies only a partially true counterfactual assumption; it relies on a comparison between having a bachelor's degree and having no post-secondary education and training whatsoever. However, there is a large and growing number of post-secondary education and training opportunities *between* a high school diploma and a bachelor's degree. Indeed, while Carnevale and his colleagues (2023) estimate that 72 percent of jobs will require some form of post-secondary education or training by 2031, not all these jobs will require a bachelor's degree. Even managerial and professional occupations (e.g., occupations in science, technology, engineering, and mathematics, social sciences, education, and healthcare), of which the vast majority—95 percent—require at least some form of post-secondary education and/or training, many of these jobs do not require a bachelor's degree (Carnevale et al., 2023). Rather, there is a substantial proportion of "middle-skill" jobs in the managerial and professional economy—that can be obtained with post-secondary education and training opportunities *between* high school diploma to bachelor's degree, such as associate's degrees and non-degree credentialing programs that provide, for example, job- or industry-specific certifications. For instance, 23% of healthcare professional and technical occupations are projected to represent middle-skill jobs by 2031 (Carnevale et al., 2023).

At the same time, there is a large and growing number of jobs that require advanced skills, and subsequently, a large and growing number graduate degree programs. For example, when compared to the 7-percent average growth projection for employment in all occupations, employment in master's-level occupations was projected to grow by roughly 17 percent from 2016 to 2026, while employment in doctoral- and professional-level occupations was projected to grow by roughly 13 percent (BLS).

When considering the importance of post-secondary education and training *between* a high school diploma and a bachelor's degree, as well as *beyond* a bachelor's degree, a more comprehensive research approach is needed. Therefore, instead of interrogating whether college is still worth it, we examine the relative economic returns of a variety of non-degree credential programs and degree-granting programs. Furthermore, given changing labor market dynamics across industries, we explore the heterogenous returns across industries. Moreover, given the potential for non-degree credential programs to close gender and racial/ethnic equity gaps, we explore the heterogenous returns across various aspects of identity as well. To that end, we ask the following research questions:

1. What are the earnings premiums associated with earning a non-degree credential and completing a degree program?
2. To what extent does earning multiple credentials or degrees impact earnings premiums?
3. How do the earnings premiums associated with degree completion and non-degree credentials differ across industries?
4. How do the earnings premiums associated with degree completion and non-degree credentials differ by the recipients' gender and race/ethnicity?

In doing so, our analysis reflects the complexity of the educational choices, and their relative costs and benefits, faced by individuals, who are not just prospective students deciding between a high school diploma and a bachelor's degree, but are, instead, considering a range of post-secondary education and training opportunities over their life course. Although the evidence remains strong that bachelor's degree programs are associated with improved economic outcomes, it is essential to examine the returns of bachelor's program *relative* to the full array of education and training opportunities available.

BACKGROUND

As described by Deming (2022) education, training, and experience—often referred to as human capital—explain a substantial share of the variation in earnings both within and across countries. While novel methods have been used to estimate earnings (e.g., instrumental variable approaches, regression discontinuity designs, etc.), Deming notes that these estimates match those produced by foundational methods (*ibid*). For example, the "Mincer Equation" (Mincer, 1976) specified an additive function for annual earnings that was linear in years of education and quadratic in years of work experience (Deming, 2022). Here, an additional year of schooling is estimated to produce a 6-18 percent increase in earnings, which has been largely replicated in more recent studies leveraging novel methods (*ibid*). Unsurprisingly, the earnings returns of associate's, bachelor's, master's, and doctoral degrees—which are incremental in the number of years to complete—demonstrate incremental earnings returns that follow the Mincer Equation. Indeed, Deming demonstrates these incremental returns with the 1979 National Longitudinal Survey of Youth (Bureau of Labor Statistics, 2019): when controlling for ability, each additional year of schooling is associated with a 7 percent increase in earnings. Similarly, relative to not graduating high school, graduating high school is associated with a 13 percent increase in earnings; having some college (e.g., associate's degree) is associated with a 25 percent increase in earnings; having a bachelor's degree is associated with a 48 percent increase in earnings; and having a graduate degree is associated with a 54 percent increase in earnings (*ibid*).

Given the prevalence of degree-granting programs in the U.S., primarily consisting of associate's, bachelor's, master's, and doctoral degrees, it is unsurprising that the research on the economic returns to education often focuses on these programs. However, there is an increasing number of non-degree credentials offered by various school- and non-school-providers. In 2023, Credential Engine, a non-profit organization that maps the terrain of credentials in the United Sates, estimated that there are roughly 1.076 million credentials offered by roughly 59,690 providers (Credential Engine, 2023). Non-Degree Credentials have been operationalized by National Skills Coalition (Duke-Benfield et al., 2019) as including (a) sub-baccalaureate credit bearing certificates that are earned from education institutions, (b) non-credit bearing certificates that are earned from community organizations (e.g., coding boot camps), (c) apprenticeship certifications that are earned through work-based learning opportunities and typically apply to industry trades and professions, (d) industry-recognized certifications that are earned from an industry certification body and typically demonstrate the ability to perform a specific job, and (e), licenses earned from a government agency based on a set of criteria that typically include some combination of degree attainment, certification, and assessment (Duke-Benfield et al., 2019, p. 6).

It is possible that non-degree credentials, which often entail one year (or less) of schooling, produce economic returns somewhere between a high school diploma and an associate's degree, and thus follow the Mincer Equation. However, many of these credentials are structured differently than traditional degree-granting programs. For example, Coding Bootcamps attempt to condense the most applicable computer science skills into a 3-month credential program and often provide direct connections to employment (e.g., through an apprenticeship). Recent research demonstrates that these non-degree credentials produce earnings returns that far exceed the estimates that we might expect from a Mincerian distribution. For example, Jabbari et al. (2023) found that a Coding Bootcamp produced a roughly 70 percent increase in earnings. Moreover, while degree programs are often sequential (e.g., in order to have a master's degree, one must first have a bachelor's degree) and onetime (e.g., it is rare for someone to earn two bachelor's degrees at two different time-points), non-degree credentials are often non-sequential and stackable. Indeed, both sub- and post-baccalaureate certificates are offered at many educational institutions, and non-degree credentials can be "stacked" on top of each other to demonstrate multiple domains of expertise.

In addition to the unique structure of non-degree credentials, the underlying mechanisms and subsequent populations are also distinctive. For example, because non-degree credentials are shorter than degree programs, they can often be more responsive to labor markets demands. In fact, many non-degree credentials are not offered by traditional education institutions and are instead offered by non-profit organizations and industry certification bodies. Moreover, as the opportunity costs—both in terms of time and money—are often lower in non-degree credentials, these credentials tend to serve a broader population of students. Indeed, many individuals who earn non-degree credentials are adults working full-time.

Given these dynamics, it is possible that the economic returns to non-degree credentials—relative to degree-granting programs—do not follow a Mincerian distribution. For instance, Jepsen, Troske, and Coomes (2014) leveraged fixed effects models with a sample of roughly 25,000 students from technical and community colleges in Kentucky, finding that non-degree certificates were associated within increased earnings; yet, the relative returns of non-degree certificates were substantially lower than the returns of an associate's degree. Men experienced a quarterly increase of $297 for earning a certificate compared to $1,484 for earning an associate's degree and women experienced a quarterly increase of $299 for earning a certificate compared to $2,363 for an associate's degree. Here, while earning a certificate represented a roughly 6 percent increase for men, earning an associate's degree represented a 29 percent increase; similarly, while earning a certificate represented roughly an 8 percent increase for women, earning an associate's degree represented a 65 percent increase. If a certificate, in theory, took half the time to complete as an associate's degree, then we would expect the percent increases for earning a certificate to be half of the percent increases for earning an associate's degree.

Additionally, Xu and Trimble (2016) leveraged fixed-effects models with a sample of roughly 230,000 students from 81 community colleges in Virginia and North Carolina to estimate the impact of sub-baccalaureate certificates, finding positive impacts on earnings. Following a Mincerian distribution, quarterly earnings increased from $278 for earning a short-term certificate (i.e., a certificate lasting less than 1 year) to $953 for earning a long-term certificate (i.e., a certificate lasting 1-2 years) to $1,256 for earning an associate's degree in North Carolina. However, in Virginia, the economic returns to long-term certificates ($200) were considerably less than an associate's degree ($773) and only slightly more than a short-term certificate ($153).

Similarly, Bettinger and Soliz (2016) leveraged fixed-effects models with a sample of roughly 51,000 students from both technical and community colleges in Ohio, finding mostly positive impacts on earnings across multiple industries. However, while long-term certificates were associated with economic returns that were slightly less than associate's degrees—and thus loosely followed a Mincerian distribution, this was not the case for men or short-term certificates. Rather, men did not experience any significant economic returns for earning a long-term certificate, yet experienced economic returns for short-term certificates that were nearly twice the economic returns of an associate's degree. Further analyses demonstrated that the returns of short-term certificates were largely a byproduct of being offered by technical, rather than community, colleges.

Finally, Darolia, Guo, and Kim (2023) add nuance to the literature on economic returns of non-degree credentials by focusing on *very* short-term credentials. Leveraging fixed-effects models with matched samples of 108,000 students from community colleges in Kentucky, the authors found that very short-term credentials (requiring 6 credits or less) produce initial economic returns that are similar to short-term credentials (requiring 6-36 credits). In addition to research on initial economic returns to non-degree credentials, research has also examined long-term economic trajectories associated with non-degree credentials. For example, Minaya and Scott-Clayton (2022), leveraged fixed-effects models with roughly 92,000 students from community colleges in Ohio, finding that the economic returns to a long-term certificate remained flat when compared to the economic returns to an associate's degree, which grew over time.

The recent research on non-degree credentials provides three additional insights on human capital:

(1) The relative economic returns to non-degree credentials do not necessarily follow a Mincerian distribution: the economic returns to non-degree credentials are not proportional to the time it takes to complete them.

(2) The relative economic returns to non-degree credentials are context specific: the economic returns to non-degree credentials are informed by the industry and the geography in which they are used.

(3) The relative economic returns to non-degree credentials are moderated by gender, meaning they are different for males and females.

As a result, it is important to consider the economic returns of non-degree credentials relative to a range of degree-granting programs, to take into account contexts relating to industry and geography, and to consider heterogeneous treatment effects across different dimensions of identity.

In this regard, we consider the relative returns of non-degree credentials compared to a wide range of degree-granting programs. We also consider differences between non-degree credentials offered by educational institutions and industries. Additionally, we include a population of individuals across four unique industries and nine unique Metropolitan Statistical Areas (MSAs), and we consider differences by gender and race. Finally, given the ability to stack non-degree credentials, as well as on top of other degree granting programs, we explore the cumulative effects of earning multiple non-degree credentials. In doing so, we provide one of the first studies that (a) includes a range of degree granting programs and non-degree credentials from both educational institutions and industries, (b) includes a sample from a diverse array of U.S. cities, (c) examines heterogeneities across multiple dimensions of identity, and (d) examines cumulative effects from earning multiple non-degree credentials.

METHODS

Data

Our research focuses on individuals who obtained a non-degree credential or completed a degree program between 2017 and 2024. To obtain data for our analyses, we utilize two main sources: the National Student Clearinghouse (NSC) and a large credit bureau. The NSC provides comprehensive information on various credentials (i.e., undergraduate certificates and non-school-based certificates), in addition to earned degrees (e.g., associate's degree, bachelor's degree, master's degree, and doctoral/professional degrees), along with the month and year it was earned. While undergraduate certificates extend from education institutions that are nearly universally represented in NSC's database, this is not the case for non-school-based certificates, which are growing, but nevertheless, are relatively moderate in size within NSC's database. Currently, the most common non-school-based certificates within NSC's database were: Certified Pharmacy Technicians, Certified Safety Professionals, and Certified Welding Inspectors.

Through their online platform, the partnering credit bureau receives observed income—total gross annual earned income (calculated monthly)—directly from over 2.8mm businesses. In addition to income, the partnering credit bureau contains detailed employer information, including their North American Industry Classification System (NAICS) code. Due to data sharing arrangements across both the partnering credit bureau and NSC, our study sample originated on the credit bureau side; NSC data was then merged with the credit bureau data using individuals' personally identifiable information (PII); finally, the merged data was anonymized and shared with the research team through the credit bureau's online platform. Our sample had three main selection requirements:

- To ensure that earnings data was collected by the partnering credit bureau, individuals had to have observed income during the study period (i.e., 2017-2024);
- To ensure a variety of industries with adequate matches with credentials and degree programs, individuals had to have worked in one of the following industries in 2024: education, manufacturing, STEM, and healthcare;
- To ensure our sample was reflective of a broad array of geographic and economic contexts, individuals had to be working in one of nine metropolitan areas across the U.S. in 2024: San Francisco, CA; Denver, CO; Austin, TX; St. Louis, MO; Chicago, IL; Nashville, TN; Boston, MA; Philadelphia, PA; and New York City, NY.

For those that meet the three requirements, our analytic models focus on two groups of individuals as follows:

- *Treatment sample*: Those who earned any certificate(s) and/or degree(s) collected by the NSC between 2017-2024 (i.e., those whose certificates/degrees status has changed during the study period)
- *Comparison sample*: Those who never earned either a certificate or a degree collected by the NSC as of 2024 (i.e., those who are "unmatched" in the NSC sample[1]).

For the individuals in question, we gathered total gross annual earned income (calculated monthly) from the partnering credit bureau. To construct the earnings income variable, we winsorized the annual earned income at $11,600 (lower limit) and $609,351 (upper limit), based on the bottom and top U.S. tax brackets in 2024 (Rev. Proc. 2023-34, 2023), to minimize the impact of extreme outliers. Additionally, due to the asymmetric and right-skewed income

[1] Given NSC's near complete reach of post-secondary students, non-matched persons most likely hold a high school diploma or less.

distribution even after winsorization, we transformed our outcomes into logged income. Our data from the partnering credit bureau and NSC also includes basic demographic information such as gender and race/ethnicity. After removing incomplete cases, our analytical sample consists of 1,291,392 yearly observations from 161,424 individuals. For a summary of the statistics of the variables used in our analytical model, please refer to Table 1 below.

** **Table 1 is about here** **

Degree and credential analysis

In our analysis, we consider two types of non-degree credentials (undergraduate certificates and non-school-based certificates)[2] and four types of degree programs (associate's degree, bachelor's degree, master's degree, and doctoral/professional degree) as independent but not mutually exclusive, such that an individual could earn multiple types of certificates and degrees at the same time. We also treat them as cumulative, such that an individual could earn multiple of the same types of certificates and degrees at different times. For instance, we allow for John, in Table 2 below, to earn both a non-school-based credential and an associate's degree in 2019, disregarding the association between these credentials and degrees, and instead allowing for earnings premiums to be estimated for both. Additionally, we assume that the impact of each earned credential/degree on income does not diminish over time but continues to extend beyond 2019. Finally, for individuals who achieve multiple credentials/degrees of the same type we assign a distinct code to each certificate—0 for credentials/degrees not earned, 1 for earning

[2] Post-Graduate certificate holders are also in our sample, but results were not reported due to small sample sizes.

one/first certificate/degree, and 2 for earning multiple certificates; here, John earns a second non-school-based credential in 2022.

** **Table 2 is about here** **

Empirical model design

For empirical analysis of the economic returns of education, we employ a two-way fixed effects (TWFE) model. The TWFE approach addresses potential biases due to the two types of unobservable characteristics: unit-specific and time-specific unobservable characteristics. It is particularly useful to capture the income impacts of credentials and degrees, while adjusting for potential macro-economic impacts, including inflation and labor market dynamics.

First, we assumed that income is a function of earning various types of credentials/degrees, in addition to individual characteristics and time components. In mathematical representation,

$$y_{it} = \alpha_i + \beta_t + \sum_{c=1}^{2} \sum_{n=1}^{2} \gamma^{cn} x_{it}^{c} + \sum_{d=1}^{4} \sum_{n=1}^{2} \delta^{dn} x_{it}^{d} + \varepsilon_{it}$$

where an individual i's annualized income (logged) in year t, y_{it}, is a function of two types of earned credentials(s) and four types of degree(s) as of the start of the year, x_{it}^{c}, and x_{it}^{d}, respectively, in addition to individual fixed effects α_i, and year fixed effects β_t. To clarify the coding of the credential and degree variables, we assign the value $n = 0$ to indicate credentials/degrees not earned, $n = 1$ to indicate earning one/first credential/degree, and $n = 2$ to indicate earning multiple credentials/degrees. Therefore, the coefficient estimates for each earned certificate/degree captures the average income changes associated with earning that specific certificate/degree, while accounting for both time-varying and fixed attributes of each individual and year. For example, the estimate δ^{41} represents the average income changes before and after earning a PhD degree. Similarly, the estimate δ^{42} represents the average income changes after earning two or more PhD degrees, compared to before earning a single PhD degree.

Second, we anticipate that the income effects of credentials/degree(s) vary across industry, and demographic characteristics. Therefore, we conduct three sets of subsample analyses to estimate heterogeneous income effects of certificates/degrees across four industries as of 2024 (manufacturing, STEM, education, healthcare); gender (male and female/other); and race/ethnicity (non-Hispanic white, non-Hispanic Black, non-Hispanic Asian, and Hispanic). Lastly, we conduct a subsample analysis primarily focused on those without any degrees (i.e., AA, BA, MA/PhD).

The data analysis in this study was conducted using R version 4.3.3 (R Core Team, 2023) and we used a threshold of $p < 0.05$, 0.01, and 0.001 to assess statistical significance.

EMPIRICAL FINDINGS

Interpretation Considerations

However, it is important to note that the magnitude of the coefficient estimates cannot be *directly* equated across different types of degrees or certificates due to the potential for different within-group comparisons. While all groups share high school diploma holders as the main comparison group, fixed effect models also entail within-group pre-treatment comparisons as well, which are different for all treatment groups. For example, one might observe that the coefficient estimate for holding a bachelor's degree (beta=0.301, p<0.01) is not substantially greater than the estimate for holding a master’s degree (beta=0.317, $p<0.01$) or a doctoral degree (beta=0.344 $p<0.001$). Nevertheless, we cannot conclude that the actual monetary benefit of a doctoral degree is simply 4.3 percentage points greater than that of a bachelor's degree based solely on this observation. This is because the reference period for the coefficient of a bachelor's degree includes the average pre-bachelor's degree annual income, which includes the time when individuals held an associate’s degree, or a high school diploma. In contrast, the reference period for the coefficient of a PhD degree includes the average pre-PhD degree annual income, which includes the time when individuals held a master’s or bachelor's degree. Let’s consider Jane in Table 2 above: having earned a bachelor’s degree in 2018, her reference period includes 2017 where she held an associate’s degree; however, having earned a doctorate degree in 2022, her reference period includes 2017-2021 where she held an associate’s degree (in 2017), a bachelor’s degree (in 2018), and a master’s degree (in 2020). Here, the annual income during the reference period for earning a PhD degree is likely to be considerably higher than the reference period for earning a bachelor's degree.

Nevertheless, our use of logged income examines the *proportion* of earnings increases. Thus, even with different pre-treatment time periods, we can compare the relative proportional earnings premiums resulting from a credential or degree. Moreover, since most educational attainment is cumulative, our interpretations can be understood—in many cases—as additive. For example, we can consider the *relative* advantage of earning an additional certificate or degree (e.g., the impacts of moving from a bachelor's degree to a master’s degree relative to the impacts of moving from a master’s degree to a PhD degree) with an understanding that the reference periods will be different. As the Mincer model includes both years of education years and years of work experience, we can infer general alignments to and misalignments from the

Mincerian distribution of incomes in relationship to years of schooling, but we cannot fully approximate the Mincer model, as we cannot account for years of work experience, which may be further complicated by the potential for different pre-treatment time periods.

On the other hand, when comparing different levels of degree attainment within the same degree type (e.g., earning one bachelor's degree vs. earning two or more bachelor's degrees), the coefficient estimates can be directly equated because they share the same reference category, namely the period without a bachelor's degree. For instance, John’s first non-degree credential (earned in 2019) and his second non-degree credential (earned in 2022) both share the same reference periods—2017-2018—where John had no non-degree credentials.

Income effects

The first column in Table 3 presents the results from the Two-Way Fixed Effects (TWFE) model, which leverages both between- and within-individual changes in post-secondary education on earned income. Overall, we observe significant impacts of most of credentials on earnings: an undergraduate certificate (beta=0.309, $p<0.01$) and a non-degree credential (beta=0.233; $p<0.01$). That is, holding an undergraduate certificate and a non-degree credential is associated with an increase in income by 30.9 percent and 23.3 percent, respectively, compared to those without a certificate/credential. Similarly, earning a traditional degree also relates to a significant increase in income: an associate’s degree (beta=0.261, $p<0.01$); a bachelor's degree (beta=0.301, $p<0.01$); a master’s degree (beta=0.317, $p<0.01$), and a doctoral degree (beta=0.344, $p<0.01$). Also, we observe additive effects of holding multiple certificates/degrees ranging from 118 to 206 percent of their original certificate/degree effect. Here, it is notable that holding a single vs. multiple non-degree credential(s) are comparable: while holding a non-degree credential is associated with a 23.3 percent increase in income compared to those without credentials, holding multiple credentials is associated with a 39.5 percent increase in income compared to the same reference individuals.

**** Table 3 is about here ****

Heterogeneous income effects by industry

Columns 2 to 5 in Table 3 display the varied impact of different types of credentials and degrees across various industries. Here, it is important to note that the income effect of a non-degree credential is exceptionally high and statistically significant in the manufacturing and STEM industry, resulting in an increase by 39.6 and 42.0 percent, respectively ($p<0.01$). Furthermore, while the returns on degree completions are largely similar across various industries, we observe that the additional effects of holding multiple degrees of the same type are quite significant in certain industries. For example, individuals with multiple associate's degrees show a substantial increase in income within STEM and healthcare by 98.2 and 71.6 percent ($p<0.01$) respectively. Meanwhile, although it is relatively rare, possessing multiple doctorate degrees can lead to a considerable salary increase, except for the education industry.

Heterogeneous income effects by demographic characteristics

Table 4 reports the diverse income effects based on gender (Columns 1-2) and race/ethnicity (Columns 3-6). When examining gender-based differences in economic returns, we observe some gender disparity in income effects of obtaining a traditional degree. For example, while obtaining a master's degree is linked with a 29.2 percent increase in annual income for male participants ($p<0.01$), the income effect for their female counterparts is 33.4 percent ($p<0.01$).

Notably, for doctorate degrees, the income effects of holding multiple degrees are higher among males than females. The effects of non-degree credentials are particularly noteworthy. For men, obtaining a non-degree credential(s) does not lead to a significant salary increase (beta=0.120, not significant). However, for female employees, obtaining a non-degree credential is associated with a 31.4 percent increase in their income. In summary, the income effects of post-secondary education are more substantial among female employees compared to their male counterparts in many cases.

There are also observed heterogeneous income effects of credentials and degrees across race and ethnicity. Initially, non-degree credentials have significant income effects only among Black (one credential: beta=0.467, $p<0.05$; multiple credentials: beta=1.180, $p<0.01$) and Asian (one credential: beta=0.929, $p<0.01$) individuals. Also, a greater impact of multiple undergraduate certificates is observed among Black (beta=1.119, $p<0.01$) and Hispanic (beta=0.614, $p<0.01$) individuals than the other two race/ethnic groups.

Regarding traditional degree attainment, the income effects of obtaining a graduate degree are greater among people of color compared with their white counterparts. For instance, for Black, Hispanic and Asian individuals, obtaining a master's degree can be expected to result in 34.2 percent ($p<0.01$), 40.1 percent ($p<0.01$), and 34.1 percent ($p<0.01$) increases in their annual salary, respectively, which are greater than salary increases for white (beta=0.294; $p<0.01$) and Asian ($26,719; $p<0.01$) individuals. Similarly, for people of color, the returns of a doctoral degree (Black—44.3 percent, Hispanic—39.7 percent, Asian—40.8 percent; $p<0.01$) are substantially greater than that for white individual (31.3 percent, $p<0.01$).

Economic returns of credentials as alternatives to the formal degrees

Table 5 presents the economic returns of non-degree credentials for the general population (column 1) and a subsample of individuals whose highest education level—prior to earning non-degree credential—was a high school diploma or less (column 2). Across all certificates and credentials, the economic returns were larger for individuals whose highest education level was a high school diploma or less. For instance, earning an undergraduate certificate was associated with a 36.0 percent increase in earnings for those with a high school diploma or less ($p<0.01$) but was associated with a 28.0 percent increase in earnings among the entire population ($p<0.01$). Similarly, earning an non-degree credential was associated with a 31.4 percent increase in earnings for those with a high school diploma or less ($p<0.01$) but was associated with a 21.7 percent increase in earnings among the entire population ($p<0.01$).

DISCUSSION

In addition to low-skill jobs (e.g., that are typically filled with high school diploma holders) and high-skill jobs (e.g., that are typically filled with bachelor degree holders), there is a large and growing number of jobs that require “middle”, as well as “advanced”, skills. In response to these jobs, there is a large and growing number of non-degree credential offerings *between* a high school diploma and a bachelor's degree, as well as degree programs *beyond* a bachelor’s degree. Moreover, even though non-degree credentials—from a skills perspective—often lie between a high school diploma and a bachelor’s degree, they tend to operate uniquely. These credentials are not always sequential. For example, one doesn’t need a high school diploma to earn a non-degree credential, and non-degree credentials can be earned by individuals with more advanced degrees. Moreover, non-degree credentials tend to be stacked (i.e., different credentials are earned at different time points) more often than more traditional degrees programs. Nevertheless, research on the financial returns to non-degree credentials and degree-granting programs is often narrow and siloed. As a result, it is difficult to ascertain the relative returns to a variety of post-secondary educational options. We, therefore, leverage a national sample of individuals across nine MSAs and four industries to examine the relative financial returns to a variety of non-degree credentials and degree programs.

Summary of findings

First, leveraging two-way fixed-effect models, we explore the relationship between earning a single degree or credential. We observe large earnings premiums associated with post-secondary education. In essence, earning any certificate or credential was associated with an increase between 23.0 percent (a single non-degree credential) and 63.7 percent (multiple undergraduate certificates), while earning any degree was associated with an increase between 26.1 percent (a single associate's degree) and 55.5 percent (multiple associate's degrees). While it is difficult to replicate a Mincer model of financial returns to education based on our data and methods, we find that an associate's, bachelor's, master's and doctorate degree follows a similar model of returns in which the number of schooling years is linearly related to proportional earnings premiums—especially if we conceptualize each successive degree as taking a similar amount of additional time if a student is enrolled full time (e.g., a bachelor's degree taking two more years than an associate's degree, a master's degree taking two more years than a bachelor's degree, and a doctorate/professional degree taking two more years than a master's degree[3]). However,

[3] Here, it is important to note that there are a variety of factors that can influence time-to-degree completion for students pursuing master's and doctorate/professional degrees, including type of degree, area of study, student status (e.g., full-/part-time), etc. For example, completing a law degree typically takes three years; completing a medical degree typically takes four years, and completing a PhD degree typically takes six years.

undergraduate certificates (30.9 percent) and non-school credentials (23.3 percent) appear to actually resemble the earnings increases of a two-year degree-granting program (26.1 percent). In other words, students completing sub-baccalaureate certificates and earning non-school credentials appear to earn more money (proportionally) for less time—relative to other degree granting programs and certificates. Nevertheless, time-to-completion is difficult to verify for sub-baccalaureate certificates and non-school credentials in our sample. While the literature would suggest that these certificates and credentials tend to require between 6 and 18 months to complete, the range of potential completion times is large.

In all degree programs and credential categories, we observed cumulative effects that were substantially larger than the effects of earning a single certificate/credential or completing a single program in their respective categories. While sample constraints limit our ability to break down these cumulative effects into ones that correspond to each additional program completed or credential earned, this finding demonstrates the importance of additional educational attainment—not only from advancing to *another* education "level", but also from completing an additional program or credential *within* a given level.

While returns of degree completions were often higher in Manufacturing and STEM industries, these returns were still significant in Education and Healthcare industries. Nevertheless, the returns to non-school credentials were only significant in manufacturing and STEM, potentially representing the importance of these credentials for career advancement in these industries. Concerning differences in financial returns according to gender, while we noticed subtle differences across degree programs, we noticed substantial differences in non-school credentials: only women experienced a significant earnings premium from a non-degree credential. Finally, in terms of race/ethnicity, while students of color often experienced larger financial returns to undergraduate certificates and degree programs—representing the power of post-secondary education to increase racial equity in labor markets, it is important to note that individuals from these groups tend to have more room to grow due to initially low earnings levels.

Implications

These findings have significant implications for education finance and policy. Concerning education finance, our findings suggest a significant departure from a linear distribution of income according to years of schooling (e.g., like those based on the Mincer model) for non-degree credentials. Undergraduate certificates and non-school credentials appear to demonstrate similar earnings increases as two-year degree programs despite often taking one year to complete, suggesting higher proportional earning premiums relative to the time it typically takes to complete these programs. Moreover, the returns for undergraduate certificates and non-school credentials were significantly larger for Black individuals and women, respectively, suggesting an opportunity to increase gender and racial equity in the labor market. As a result, policymakers should consider making public investments across a range of certificate, credential, and degree programs, as opposed to a narrow focus on 2- and 4-year programs. Finally, our findings demonstrate the potential of leveraging and merging large sources of administrative data from credit agencies with administrative education data to demonstrate financial returns. While many studies rely on records from state unemployment insurance and individual education institutions, these data are often confined to particular states and schools, which can limit generalizability.

Limitations

While our study offers one of the first nation-wide reports on the relative returns of both degree programs and non-degree credentials across multiple industries, it is not without limitations. Concerning internal validity, it is likely that students "select" certain degree programs and non-degree credentials based on a variety of observed and unobserved characteristics. While our two-way fixed effects models account for both person-specific and time-specific confounders, we cannot rule out the possibility of other, unobserved confounders that may bias our results. Future research should consider leveraging pre-treatment information relating to interest and ability, such as academic course-taking and performance in high school. It is also important to note that fixed effects models are less prone to bias when reliable outcome data is observed *prior to* the treatment, which may be problematic for individuals in some of our treatment groups—particularly those that enter into their respective educational program or start earning their respective credential shortly after high school, often with briefer—and thus potentially less reliable—income histories. Furthermore, it is important to note that we cannot identify the length of time it takes for each individual to complete their respective degree or earn their respective credential in our data, which limits our ability to factor in exact opportunity costs related to time. Future research should consider ways to capture length of credential/degree completion to better understand these costs. Moreover, it is possible that individuals in our reference group have earned non-degree credentials from other credentialing bodies that are not identified by the NSC, which may bias our results—especially our results pertaining non-degree credentials. While the data on sub- and post-baccalaureate certificates, as well as degree granting programs, is near-exhaustive in the NSC database, the data on non-degree credentials is not. Future research should consider leveraging additional sources of data for non-degree credentials.

Concerning external validity, our sample originated from a large credit bureau, and although it is extensive, it is not exhaustive. It is also important to note that our sample consisted of individuals with observed income in 2024, which does not include individuals who were unemployed throughout the year, and thus does not represent the entire adult population. In addition, we only consider individuals working in four specific industries; thus, it is possible that the economic returns to both degree programs and non-degree credentials are different in other industries. Another limitation is the use of NAICS codes, which are employer-specific, to identify employee industries. Indeed, one can work for an employer in a specific industry, yet not perform a core industry duty (and vice-versa). Lastly, regarding construct validity, our earned income measure, which is winsorized at both ends and then log-transformed, does not account for minimal employment effects for those earning less than the lower limit. Rather, our winsorization strategy focuses on capturing improvements in job quality.

CONCLUSION

In 2021, only 37.9 percent of adults aged 25 and older had a bachelor's degree (Schaeffer, 2022), and nearly 40 percent of all students that started a bachelor's degree program failed to graduate (National Center for Education Statistics, 2021). Given the growing economic opportunities for middle-skill workers and the deleterious effects of student debt—especially for individuals who fail to earn a degree (Jabbari et al., 2023), research on non-degree credentials is particularly important for increasing social mobility. In addition to increasing social mobility, research on non-degree credentials is also important for increasing racial equity. As only 28.1 percent of Black adults and only 20.6 percent of Hispanic adults have a bachelor's degree (Schaeffer, 2022), post-secondary education and training *between* a high school diploma and a bachelor's degree may represent a viable and desirable educational opportunity for groups that have been historically excluded. Finally, broader educational attainment can also increase community prosperity, as research demonstrates that employers tend to locate to areas with large pools of skilled labor (Takatsuka, 2011) and local sectors tend to attract new firms when training costs are borne by workers (Almazan et al., 2007).

REFERENCES

Almazan, A., De Motta, A., & Titman, S. (2007). Firm location and the creation and utilization of human capital. *The Review of Economic Studies*, *74*(4), 1305–1327.

Bettinger, E., & Soliz, A. (2016). Returns to Vocational Credentials: Evidence from Ohio's Community and Technical Colleges. A CAPSEE Working Paper. *Center for Analysis of Postsecondary Education and Employment*.

Bureau of Labor Statistics. (2019). *National Longitudinal Survey of Youth 1979 cohort*. U.S. Department of Labor.

Card, D. (1999). The causal effect of education on earnings. *Handbook of Labor Economics*, *3*, 1801–1863.

Carnevale, A. P., Smith, N., Van Der Werf, M., & Quinn, M. C. (2023). After Everything: Projections of Jobs, Education, and Training Requirements through 2031. National Report. *Georgetown University Center on Education and the Workforce*.

Credential Engine. (2023). *Counting U.S. Postsecondary and Secondary Credentials*. https://credentialengine.org/resources/counting-u-s-secondary-and-postsecondary-credentials-report/

Darolia, R., Guo, C., & Kim, Y. (2023). *The Labor Market Returns to Very Short Postsecondary Certificates*. IZA Discussion Paper.

Deming, D. J. (2022). Four facts about human capital. *Journal of Economic Perspectives*, *36*(3), 75–102.

Deming, D. J. (2023). *Why Do Wages Grow Faster for Educated Workers?* National Bureau of Economic Research.

Duke-Benfield, A. E., Wilson, B., Kaleba, K., & Leventoff, J. (2019). Expanding Opportunities: Defining Quality Non-Degree Credentials for States. *National Skills Coalition*.

Hanson, M. (2024). *Average Cost of College & Tuition*. EducationData.Org. https://educationdata.org/average-cost-of-college

Jabbari, J., Chun, Y., Huang, W., & Roll, S. (2023). Disaggregating the effects of STEM education and apprenticeships on economic mobility: Evidence from the LaunchCode program. *Educational Evaluation and Policy Analysis*, 01623737231199985.

Jabbari, J., Despard, M., Kondratjeva, O., Gupta, B., & Grinstein-Weiss, M. (2023). Nothing to show for it: Financial Distress and Re-Enrollment Aspirations for those with non-degreed debt. *Research in Higher Education*, *64*(1), 1-32.

Jepsen, C., Troske, K., & Coomes, P. (2014). The labor-market returns to community college degrees, diplomas, and certificates. *Journal of Labor Economics*, *32*(1), 95–121.

Minaya, V., & Scott-Clayton, J. (2022). Labor market trajectories for community college graduates: How returns to certificates and associate's degrees evolve over time. *Education Finance and Policy*, *17*(1), 53–80.

Mincer, J. (1976). Unemployment effects of minimum wages. *Journal of Political Economy*, *84*(4, Part 2), S87–S104.

National Center for Education Statistics. (2021). *The Condition of Education 2021 (NCES 2021-144)*.

National Center for Education Statistics. (2023). *Annual Earnings by Educational Attainment.* https://nces.ed.gov/programs/coe/indicator/cba.

R Core Team. (2023). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. https://www.R-project.org/

Rev. Proc. 2023-34, Internal Revenue Service (2023).

Schaeffer, K. (2022). *10 facts about today's college graduates*. Pew Research Center. https://www.pewresearch.org/short-reads/2022/04/12/10-facts-about-todays-college-graduates/

Takatsuka, H. (2011). Economic geography of firms and skilled labor. *Journal of Regional Science*, *51*(4), 784–803.

Xu, D., & Trimble, M. (2016). What about certificates? Evidence on the labor market returns to nondegree community college awards in two states. *Educational Evaluation and Policy Analysis*, *38*(2), 272–292.

TABLES

Table 1. Summary statistics of the variables in use

	All (n=182,048)		Manufacture (n=40,873)		STEM (n=19,875)		Education (n=40,217)		Health care (n=81,083)	
	2017	2024	2017	2024	2017	2024	2017	2024	2017	2024
Credentials (mean of certificates/credentials)										
Undergraduate Certificate	0.016	0.061	0.015	0.058	0.015	0.061	0.015	0.058	0.018	0.065
	(0.134)	(0.256)	(0.129)	(0.248)	(0.130)	(0.257)	(0.127)	(0.248)	(0.140)	(0.264)
Postgraduate Certificate	0.0000	0.0003	0.0000	0.0004	0.0000	0.0002	0.0000	0.0002	0.000	0.0004
	(0.002)	(0.018)	(0.000)	(0.019)	(0.000)	(0.015)	(0.000)	(0.014)	(0.004)	(0.019)
Non-School Credential	0.001	0.056	0.001	0.057	0.001	0.091	0.001	0.048	0.001	0.050
	(0.027)	(2.167)	(0.026)	(2.182)	(0.033)	(2.771)	(0.024)	(2.012)	(0.026)	(2.060)
Degrees (mean of degrees)										
Associate's Degree	0.012	0.045	0.012	0.044	0.012	0.044	0.012	0.042	0.013	0.047
	(0.115)	(0.218)	(0.112)	(0.215)	(0.112)	(0.215)	(0.110)	(0.209)	(0.120)	(0.224)
Bachelor's Degree	0.048	0.252	0.045	0.243	0.049	0.251	0.042	0.241	0.053	0.262
	(0.254)	(0.546)	(0.243)	(0.536)	(0.258)	(0.544)	(0.229)	(0.522)	(0.271)	(0.562)
Master's Degree	0.014	0.069	0.013	0.067	0.012	0.068	0.013	0.067	0.015	0.071
	(0.122)	(0.269)	(0.122)	(0.265)	(0.113)	(0.265)	(0.117)	(0.264)	(0.126)	(0.274)
Doctoral Degree	0.005	0.026	0.005	0.025	0.006	0.026	0.005	0.026	0.006	0.027
	(0.073)	(0.164)	(0.069)	(0.160)	(0.076)	(0.162)	(0.070)	(0.162)	(0.075)	(0.168)
Income										
Annual Income (top-coded at $609,351)	67,579.8	96,393.9	80,647.3	109,630.8	71,590.9	110,325.4	54,393.8	80,420.5	66,509.2	94,149.4
	(89,703.6)	(94,817.7)	(93,151.2)	(95,709.5)	(91,404.9)	(96,437.0)	(83,689.8)	(91,287.0)	(89,391.8)	(94,259.2)
Gender										
Female/other	0.601		0.379		0.451		0.623		0.742	
	(0.490)		(0.485)		(0.498)		(0.485)		(0.438)	
Race										
White	0.662		0.698		0.692		0.691		0.621	
	(0.473)		(0.459)		(0.462)		(0.462)		(0.485)	
Black	0.092		0.058		0.052		0.082		0.125	
	(0.289)		(0.234)		(0.222)		(0.274)		(0.330)	
Hispanic	0.131		0.132		0.102		0.102		0.153	
	(0.338)		(0.339)		(0.303)		(0.303)		(0.360)	
Asian	0.012		0.010		0.010		0.013		0.014	
	(0.110)		(0.098)		(0.100)		(0.112)		(0.118)	

Table 2. Data Structure for Identifying Treatment Status

Name	Year	Undergraduate Certificate	Non-School-Based Credential	Associate's Degree	Bachelor's Degree	Master's Degree	Doctorate/ Professional Degree
John	2017	0	0	0	0	0	0
John	2018	0	0	0	0	0	0
John	2019	0	1	1	0	0	0
John	2020	0	1	1	0	0	0
John	2021	0	1	1	0	0	0
John	2022	0	2	1	0	0	0
John	2023	0	2	1	0	0	0
Jane	2017	0	0	1	0	0	0
Jane	2018	0	0	1	1	0	0
Jane	2019	0	0	1	1	0	0
Jane	2020	0	0	1	1	1	0
Jane	2021	0	0	1	1	1	0
Jane	2022	0	0	1	1	1	1
Jane	2023	0	0	1	1	1	1

Table 3. Income impacts of certificates and degrees (TWFE model; by industry, logged income)

	All	By Industry			
		Manufacture	STEM	Education	Health Care
	(1)	(2)	(3)	(4)	(5)
Certificates and Credentials					
Undergraduate Certificate	0.309***	0.300***	0.336***	0.262***	0.385***
	(0.006)	(0.009)	(0.013)	(0.013)	(0.019)
Undergraduate Certificates M	0.637***	0.704***	0.795***	0.440***	0.438***
	(0.024)	(0.034)	(0.055)	(0.054)	(0.076)
Non-Degree Credential	0.233***	0.396***	0.420***	-0.043	0.019
	(0.062)	(0.106)	(0.121)	(0.117)	(0.185)
Non-Degree Credentials M	0.393***	0.541***	0.694***	(0.085)	0.290
	-0.088	-0.145	-0.185	-0.176	-0.244
Degrees					
Associate's Degree	0.261***	0.237***	0.343***	0.208***	0.312***
	(0.007)	(0.010)	(0.015)	(0.015)	(0.023)
Associate's Degrees M	0.555***	0.372***	0.982***	0.530***	0.716***
	-0.031	-0.044	-0.073	-0.067	-0.098
Bachelor's Degree	0.301***	0.305***	0.356***	0.230***	0.321***
	(0.003)	(0.005)	(0.006)	(0.007)	(0.010)
Bachelor's Degrees M	0.552***	0.585***	0.669***	0.426***	0.436***
	-0.008	-0.012	-0.017	-0.017	-0.026
Master's Degree	0.317***	0.312***	0.401***	0.255***	0.295***
	(0.005)	(0.008)	(0.011)	(0.012)	(0.017)
Master's Degrees M	0.515***	0.632***	0.520***	0.344***	0.294***
	-0.023	-0.033	-0.049	-0.051	-0.087
Doctoral Degree	0.344***	0.340***	0.414***	0.257***	0.409***
	(0.009)	(0.013)	(0.018)	(0.018)	(0.029)
Doctoral Degrees M	0.409***	0.208**	0.920***	0.115	0.857***
	(0.056)	(0.076)	(0.114)	(0.149)	(0.187)
Individual fixed effect	Y	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y	Y
Observations	1,291,392	571,752	285,576	291,136	142,928
(individuals)	(161,424)	(36,392)	(17,866)	(35,697)	(71,469)
R2	0.211	0.207	0.19	0.218	0.264
Adjusted R2	0.098	0.094	0.074	0.106	0.158
F Statistic	15,083.450***	6,526.213***	2,930.143***	3,550.988***	2,239.259***
	(df = 20;	(df = 20;	(df = 20;	(df = 20;	(df = 20;
	1129948)	500263)	249859)	254724)	125042)

Note: *p<0.05; **p<0.01; ***p<0.001
M: Multiple degrees/certificates/credentials;
Post-Graduate certificate holders are also in our sample, but results were not reported due to small sample sizes.

Table 4. Income impacts of certificates and degrees (TWFE model, by demography)

	By Gender		By Race			
	Male	**Female/other**	**White**	**Black**	**Hispanic**	**Asian**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Certificates and Credentials						
Undergraduate Certificate	0.313***	0.307***	0.292***	0.301***	0.349***	0.386***
	(0.010)	(0.008)	(0.007)	(0.018)	(0.017)	(0.021)
Undergraduate Certificates M	0.647***	0.630***	0.519***	1.119***	0.614***	1.002***
	(0.039)	(0.031)	(0.028)	(0.077)	(0.082)	(0.093)
Non-Degree Credential	0.12	0.314***	0.08	0.467**	0.00	0.929***
	(0.099)	(0.080)	(0.078)	(0.144)	(0.195)	(0.209)
Non-Degree Credentials M	0.346*	0.421***	0.220*	1.180***	0.36	0.484
	(0.139)	(0.114)	(0.108)	(0.281)	(0.258)	(0.336)
Degrees						
Associate's Degree	0.263***	0.260***	0.251***	0.269***	0.322***	0.218***
	(0.011)	(0.009)	(0.008)	(0.021)	(0.019)	(0.024)
Associate's Degrees M	0.584***	0.537***	0.571***	0.764***	0.318***	0.513***
	(0.051)	(0.039)	(0.039)	(0.081)	(0.094)	(0.101)
Bachelor's Degree	0.283***	0.313***	0.286***	0.306***	0.331***	0.354***
	(0.005)	(0.004)	(0.004)	(0.009)	(0.008)	(0.011)
Bachelor's Degrees M	0.508***	0.581***	0.533***	0.526***	0.568***	0.667***
	(0.013)	(0.010)	(0.010)	(0.024)	(0.022)	(0.028)
Master's Degree	0.292***	0.334***	0.294***	0.342***	0.401***	0.341***
	(0.009)	(0.007)	(0.007)	(0.017)	(0.015)	(0.019)
Master's Degrees M	0.509***	0.519***	0.435***	0.682***	0.786***	0.573***
	(0.039)	(0.029)	(0.029)	(0.065)	(0.069)	(0.077)
Doctoral Degree	0.359***	0.335***	0.313***	0.443***	0.397***	0.408***
	(0.014)	(0.011)	(0.011)	(0.027)	(0.022)	(0.029)
Doctoral Degrees M	0.565***	0.305***	0.351***	0.724***	0.732***	0.341*
	(0.091)	(0.071)	(0.069)	(0.193)	(0.163)	(0.168)
Individual fixed effect	Y	Y	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y	Y	Y
Observations	514,672	776,720	854,520	119,032	169,696	132,264
(Individuals)	(64,334)	(97,090)	(106,815)	(14,879)	(21,212)	(16,533)
R2	0.211	0.211	0.203	0.212	0.223	0.25
Adjusted R2	0.099	0.098	0.089	0.099	0.112	0.143
F Statistic	6,031.733***	9,067.339***	9,520.681***	1,397.522***	2,135.190***	1,933.328***
	(df = 20;	(df = 20;	(df = 20;	(df = 20;	(df = 20;	(df = 20;
	450318)	679610)	747685)	104133)	148464)	115711)

Note: *p<0.05; **p<0.01; ***p<0.001
M: Multiple degrees/certificates/credentials;
Post-Graduate certificate holders are also in our sample, but results were not reported due to small sample sizes.

Table 5. Educational Attainment Subsample

	All (1)	HS or less only (2)
Certificates and Credentials		
Undergraduate Certificate	0.280***	0.360***
	(0.006)	(0.006)
Undergraduate Certificates [M]	0.611***	0.774***
	(0.025)	(0.028)
Non-Degree Credential	0.217***	0.314***
	(0.063)	(0.059)
Non-Degree Credentials [M]	0.325***	0.490***
	(0.089)	(0.079)
Individual fixed effect	Y	Y
Year fixed effect	Y	Y
Observations	1,291,392	1,058,847
(individuals)	(161,424)	(151,628)
R2	0.199	0.221
Adjusted R2	0.085	0.091
F Statistic	23,438.410*** (df = 12; 1129956)	21,465.650*** (df = 12; 907207)

Note: *p<0.05; **p<0.01; ***p<0.001
M: Multiple degrees/certificates/credentials;
Post-Graduate certificate holders are also in our sample, but results were not reported due to small sample sizes.