Community College Occupational Degrees: Are They Worth It?

Thomas Bailey
TBailey@tc.edu
Teachers College, Columbia University
Box 174, 525 W.120th Street
New York, NY 10027

Clive R. Belfield
Clive.Belfield@qc.cuny.edu
Queens College, City University of New York
Flushing, NY 11367

May 2011

This paper was presented May 25, 2011, at a conference titled "Preparing Today's Students for Tomorrow's Jobs in Metropolitan America: The Policy, Practice, and Research Issues," University of Pennsylvania, Graduate School of Education.

The paper is also forthcoming in Perna, L. (Ed.), *Preparing today's students for tomorrow's jobs in metropolitan America.* Philadelphia, PA: University of Pennsylvania Press.

Abstract

While more than 60% of associate degrees and 98% of higher education certificates are classified as “career education,” the value of these programs has been repeatedly questioned. In this paper, we review and develop the evidence base on occupational higher education in the community college sector. We begin by describing the extent and recent growth of occupational credentials, including diplomas and certificates, both in the community college system and the for-profit sector. We then review the evidence on the labor market returns to occupational programs, focusing particularly on whether patterns vary between metropolitan and non-metropolitan residents and by gender. Using SIPP data from 2008, we observe the returns across vocational certificates and associate degrees by field of study. Finally, we draw policy lessons and consider the implications of the Great Recession on changes in the labor market.

Table of Contents

1. Introduction

This paper provides a broad overview of the economic consequences of occupational higher education in the United States, with a particular focus on community colleges. The apparent contrast between employment-focused occupational or career education on the one hand and academic or liberal arts education on the other has been the basis of a long standing controversy about the role of higher education and what it should be and do to serve society most effectively. This tension has taken on more urgency as U.S. higher education has increasingly come under criticism from policy makers, researchers, and the public. U.S. colleges and universities, which until only 10 or 15 years ago were acclaimed as the best in the world, are now widely criticized and seen as falling behind postsecondary systems in many other countries.

In their 2008 book, Goldin and Katz describe an almost century-long "race" between education and technology: wages and economic growth depend on how well workers can keep up with changes in the complexity of job tasks. In earlier eras, the workforce kept up by near-universal high school graduation and subsequently by large-scale college enrollment. This not only promoted economic growth but spread the benefits of that growth widely throughout society. But this focus on promoting education has faded in recent decades, potentially leading to faltering growth and innovation and a reversal of the post-World War II trend toward educational equality. And while the international comparisons have focused on the percentage of the population with a college credential, recent research by Arum and Roksa (2011) suggests that even those American college students who persist do not learn very much. The growing criticism of American higher education is accompanied by a consensus that new technology and work organization actually require a deeper and more flexible education system. This system will need to keep up not only with technological change but also with the changing nature of work organization and labor contracts.

Higher education also takes on the responsibility of retraining adults who either failed to acquire skills in high school or in earlier rounds of higher education or whose skills have become obsolete. Many working adults need new skills but are unable to take time out from employment. Job loss during the Great Recession has further highlighted

the need for adaptability and retraining, as older workers who lost their jobs in the Great Recession need new skills. The college student population, or potential population, also includes those persons who acquired little human capital during high school and need vocational training, remediation, or even a high school diploma. This last group is particularly clustered in urban areas, where demographic changes—in population ages and immigrant status—are interacting with low quality schooling and high dropout rates to create cohorts of persons who are under-prepared for the world of work (Tienda & Alon, 2007).

In seeking to design an education system that can prepare students for the changing demands of the labor market and can strengthen the skills and human capital of low-income and first-generation college students, education reform is often conceptualized as a tension between a higher education system focused on specific preparation for particular careers and one that provides a broader, more academic education under the assumption that more specific skills can be learned on the job. Although we cannot provide a full reconciliation of this tension, we argue that a conceptualization that draws a sharp distinction between academic and occupational skills is misleading and distorts reality. In addition, we address the issue by analyzing the economic returns to occupational credentials in higher education.

Our paper is structured as follows. In Section 2, we begin with a general discussion of career-focused and academic education, arguing that the distinction between the two forms of education has been exaggerated. We then describe occupational credentials across the higher education system, with a focus on community colleges both as providers of associate degrees and as providers of a large proportion of vocational certificates. In Section 3, we review the evidence on the labor market returns to these credentials. Although this evidence is positive, there remain many unknowns and uncertainties both on the demand and supply sides. In Section 4, we present our own analysis of the returns to community college certificates and occupational and academic associate degrees. In this analysis, we use the Survey of Income and Program Participation (SIPP) data from 2008 (waves 1 and 2). This SIPP cohort has not been used previously to analyze community college outcomes. We analyze pathways and labor market returns for vocational certificates and associate degrees by field of study. In

Section 5, we consider policy issues that might help in creating an appropriate balance between academic and occupational education and that could enhance labor market opportunities for students in occupational programs. We also discuss the implications of the Great Recession for our analysis and conclusions.

2. Occupational and Academic Education

2.1 Describing the Dichotomy

American educators have argued about the balance between occupational and academic education for at least a century. Advocates of academic education argue that occupational education is too narrow to be appropriate for the dynamic nature of modern technology and workplace demands, that it fails to prepare students to adapt to changing skill demands, and that it abandons the general goal of education to prepare citizens and an educated population. According to this perspective, students learn these broader skills through a general education or liberal arts curriculum comprised primarily of science, social sciences, and the humanities. Advocates of occupational education argue that a more general academic education does not teach students usable skills of value in the labor market. Although the academic perspective seems to enjoy a great deal of intellectual support, especially among academics and other people commenting on the topic, in practice the focus on occupational education seems to have carried the day, at least in terms of numbers. As we shall see, the large majority of degrees and certificates conferred by colleges and other institutions of higher education are in what the Department of Education refers to as "career" programs or majors. Even this lopsided ratio between occupational and academic degrees understates the dominance of occupational preparation in college in the U.S.

In the past, controversy over the role of occupational education was often focused on vocational education in secondary school. High school vocational education was initially designed to prepare students who were not going to college for jobs; thus high schools had both vocational and college-prep tracks. But as a consensus grew in the late 20th century that everyone needed at least some college to have a chance to obtain a

decent job, high school programs that failed to prepare students for college lost favor. Vocational (now called technical) education in high school had now to be seen as either leading directly to postsecondary occupational programs (this was one goal of the Tech Prep program) or as an effective pedagogic strategy to teach academic skills through contextualized instruction. (This was a strong underlying theme of the 1994 School to Work Opportunity Act [see Bailey & Merritt, 1997]).

A related trend became evident in occupational education in community colleges. Many occupational programs in community colleges were designed to prepare students for work immediately. Courses in many of these programs were not transferrable to a four-year institution, so the programs were referred to as "terminal." But in some areas, educators perceived that employers began to favor bachelor's graduates even in areas in which they had previously hired associate degree holders. Colleges and state legislators responded by merging state technical college systems that granted certificates or non-transferable associate degrees and comprehensive community college systems that included many transferable programs. These mergers took place in Minnesota, Louisiana, Indiana, and other states. So-called "career pathway" programs were designed to allow students to intersperse periods of education with periods of work to allow continued opportunities for occupational mobility. The goal was to allow students to earn a two-year degree, for example, and spend some time working, but with the ability to return to college to earn a bachelor's degree without losing the credits that they had already earned. This created a design problem in that the optimal content of the first two years of a four-year degree in, say accounting, was not necessarily the same as the optimal content of a two year accounting degree designed to prepare someone for immediate work. The conflict generally involved the place of academic or general education courses in these programs.

Perhaps a similar conceptual trend can be seen at the four-year level, in which some educators are suspicious of four-year occupational degrees; although in this case, the argument is often that college should be about more than work preparation—that college should also be about citizenship and cultural growth. But even when the argument is focused on work preparation, one perspective suggests that general skills are more important than the most specific competencies taught in undergraduate career programs

such as business.[1] One of the sharpest controversies in this area concerns teacher education. The Teach for America approach suggests that a student with a strong liberal arts education and a short summer training program can be as effective a teacher as a graduate of a college teacher education program (Xu, Hannaway, & Taylor, 2007).

Moreover, the academic versus occupational argument is confused and distorted by the dual role that any given level of education has in preparing students for work immediately after that level of education and preparing them for subsequent levels of education. Focused occupational education comes under attack most often when the associated jobs tend to need additional education. High school vocational education fell out of favor when labor market information suggested that students needed at least some college to get a good job. Wood shop did not seem to be the best preparation for college. At the other end of the educational hierarchy, professional and graduate degrees provide explicit occupational preparation. No one argues that surgeons or lawyers would be most effective if graduate or professional school consisted of a general liberal arts curriculum in which they learned to "problem solve" and "work in teams," although presumably they should emerge from graduate school also with those skills. Graduate education usually combines very specific occupational preparation with some form of guided or mentored experience. Thus most academics or journalists, who look askance at undergraduate occupational programs, had their occupational education in graduate school. In general, liberal arts education is the education that students get in the levels of education that precede their highest level, at which point in most cases they get focused occupational preparation.

The discussion is further confused when academic education is in fact specific occupational preparation for some jobs. As Dewey wrote in 1917:

> Many a teacher and author writes and argues in behalf of a cultural and humane education against the encroachments of a specialized practical education, without recognizing that his own education, which he calls liberal, has been mainly training for his own particular calling. (p. 313)

[1] The argument that modern workplaces require general skills such as allocating time, working in teams, evaluating data, understanding technological systems, and others was popularized in the 1990s by the Secretary's Commission on Achieving Necessary Skills (SCANS) (1991). For contemporary examples of this perspective, see Fischer (2011) and Schneider (2011).

Over the last two decades, the argument that employers and the labor market demand general skills, not specific skills, has enjoyed a great deal of support. CEOs on the lecture circuit often argue that they want people who know how to learn; they can teach the specific skills. Generally, the concept of "skills for tomorrow's jobs" elicits a call for better general education so that students will be able to adapt to the ever-changing demands of the contemporary workplace. But there are signs of greater resistance to this perspective, or at least to the version of it that suggests that these skills can best be learned through a traditional college education with a significant component of liberal arts or academic subjects. The last two or three years has seen growing enthusiasm for very specific occupational certificates that often have minimal general education content. Indeed one of the advantages of these programs is that they often do not have academic prerequisites and therefore do not require students with weak academic skills to undergo remediation. Remediation has been shown to be a huge barrier to college persistence and completion (Bailey, Jeong, & Cho, 2010). In certificate programs, remediation is sometimes incorporated into substantive courses, but in general certificate programs get students in and out quickly with a specific job goal. Whatever these students may lose in general skills is compensated by a greater probability of completion and better access to jobs. At least for students with weak academic skills and adults returning to school to upgrade skills, certificate advocates argue that trading off the amorphous benefits of general skills for a concrete job is well worth it.

2.2 Occupational Credentials

The Classification of Instructional Programs (CIP) categorizes degrees as either "liberal arts (academic)" or "career (career and technical for sub-baccalaureate)" programs (National Center for Education Statistics [NCES], n.d., Postsecondary taxonomy). The academic programs include fine/performing arts, humanities, interdisciplinary studies, letters/English, mathematics, science, and social and behavioral sciences. Everything else is classified as a career program—most of these have occupational-sounding titles such as agriculture, business management, consumer services and so forth. By this classification, postsecondary education is already overwhelmingly occupational: 98% of certificates, 62% of associate degrees, and 60% of

bachelor's degrees are in career education (NCES, n.d., Table P84).[2] As shown in Table 1, in 2006, across all postsecondary institutions there were 2.02 million awards in career education, compared with 0.89 million awards in academic education (70% versus 30%). Approximately half of all awards in career education are bachelor's degrees, one quarter are associate degrees, and the remaining one quarter are certificates. As also shown in Table 1, award growth has been more or less uniform across each category: over the last decade, all award types have grown by approximately 30%.[3] In fact, there has even been a slight trend in which bachelor's degrees have become more vocational (with career education growing at 32%, compared with 24% for academic education) as associate degrees have become less so (growing at 23% and 36%, respectively). The trend in associate degree growth probably results from an increase in transfer students who often shift to career degrees once they are enrolled in a four-year college.

Among bachelor's degrees, associate degrees, and certificates, certificates are the fastest growing award. Between 2000 and 2009, they grew by 44% while total degrees and certificates grew by 39%. But within certificates, short-term certificates (less than one year) were by far the fastest growing segment, growing by 56% during the decade (Bailey, 2011, Table 1). At the two-year public institutions, almost half of all awards conferred are certificates (see Table 2). However, since certificates take less time than associate degrees, they account for about one quarter of total college activity (student hours) at two-year public institutions.

Table 3 shows higher education awards by field of study (career education only). Perhaps the most striking conclusion from Table 3 is the broad overlap in provision across institutional types. With the notable exceptions that we mention below, four-year institutions offer a substantial amount of instruction in fields that certificate-providing institutions also offer. It is therefore possible to imagine an integrated system where enrollees might progress from a certificate to an associate degree up to a bachelor's degree in the same field.

[2] This does not include noncredit education. Notably, four-year colleges have the same balance of career versus academic education as community colleges.

[3] Using SIPP data, Ryan (2005) reported a similar trend from 1984 to 2001, with the growth in bachelor's degrees, associate degrees, and vocational certificates increasing by similar proportions.

Table 1
Number of Undergraduate Credentials Awarded by All Title IV Postsecondary Institutions

Group	Numbers in 2006	Percentage Growth Since 1997
Total, all undergraduate credential levels	2,913,819	+29%
Career education	2,022,885	+30%
Academic education	890,934	+28%
Bachelor's degrees	1,485,242	+29%
Career education	895,248	+32%
Academic education	589,994	+24%
Sub-baccalaureate credentials	1,428,577	+30%
Associate degrees		
Career education	460,197	+23%
Academic education	283,997	+36%
Certificates		
Career education	667,440	+34%
Academic education	16,943	+14%

Source: NCES (n.d., Table P79).

Table 2
Awards Conferred by Public Two-Year Colleges (2009)

	Associate Degrees	Certificates		
		Total	< 1 year	1+ year
Awards conferred				
Total	509,615	365,637	218,476	147,161
Percentage	58%	--	25%	17%
Percentage of all such awards by Title IV eligible institutions	65%	45%	51%	39%

Source: Bailey (2011).

Table 3
Awards by Field of Study

Field of Study	Certificates			Associate Degrees			Bachelor's Degrees		
	N	%	% Change 1997–2006	*N*	%	% Change 1997–2006	*N*	%	% Change 1997–2006
Health sciences	298,480	45%	97%	145,126	32%	34%	91,973	10%	7%
Manuf., constr., repair, transport	112,812	17%	15%	31,285	7%	-16%	8,279	1%	57%
Consumer services	99,641	15%	43%	33,456	7%	130%	44,428	5%	46%
Business	51,062	8%	-38%	90,775	20%	7%	278,432	31%	39%
Protective services	27,541	4%	37%	26,539	6%	31%	35,319	4%	40%
Computer/information sciences	20,946	3%	-24%	32,081	7%	185%	47,480	5%	92%
Engineering, arch., science tech.	18,001	3%	9%	35,803	8%	-10%	91,041	10%	10%
Marketing	10,795	2%	521%	7,053	2%	305%	38,733	4%	85%
Public, legal, and social services	7,779	1%	53%	16,497	4%	15%	33,912	4%	20%
Education	6,925	1%	304%	14,528	3%	37%	107,238	12%	2%
Agriculture and natural resources	5,200	1%	4%	6,550	1%	10%	23,053	3%	57%
Communications and design	8,258	1%	22%	20,504	4%	47%	95,134	11%	70%
Total	667,440	100%	34%	460,197	100%	23%	895,248	100%	32%

Source: NCES (n.d., Table P80).

That said, Table 3 makes clear that certificates in health care dominate the certificate market. Across all institutions, they are 45% of all certificates awarded, with almost twice as many awarded in 2006 than in 1997. (Health programs also account for one third of associate degree awards).

Table 3 also shows the shifting balance within a given field across certificates, associate degrees, and bachelor's degrees. For certificates, the next largest field is manufacturing and construction-related fields (at one-fifth); although the number of these certificates has grown since 1997, the number of associate degrees in the same field has fallen. A more consistent trend is toward consumer services career education: 15% of certificates and 7% of associate degrees (and 5% of bachelor's degrees) are awarded in this field; but the numbers have grown substantially since 1997 across all award types.[4] Finally, the nature of business credentialing has changed over the period 1997 to 2006: it has shifted toward higher credential levels. Table 3 shows that business certificates fell by 38% yet associate degrees and bachelor's degrees in business rose significantly.

Although community colleges are a large part of the certificate market, they are not fully dominant. The certificates awarded by two-year public colleges as a share of the certificate market are described in Table 4. Community colleges provide 46% of all awards conferred. Their market share is greatest in agriculture and natural resources (88%); protective services (85%); business (67-69%); and engineering technologies (64%). For the largest field—health sciences—community colleges provide only 37% of all awards. Whereas non-profit colleges provide very few certificate programs, the for-profit sector is a significant competitor with the public institutions.[5] For-profit institutions provide almost 38% of short certificates and almost half of all long certificates (Bailey 2011, Table 1); About half of certificates conferred by the for-profits are awarded by institutions that do not grant either associate or bachelor's degrees (Bailey, 2011, Table 1).

[4] We emphasize that these proportions are out of the total career education provision of these institutions.
[5] In 2009, less than 5 percent of certificates were conferred by four-year colleges (calculations by the authors using IPEDS).

Table 4
Sub-Baccalaureate Awards Conferred by Field
Among Career–Technical Students at Two-Year Public Colleges (2007)

Field of Study	Number of Awards	% of All Awards in That Field
Agriculture and natural resources	4,849	88%
Protective services	24,996	85%
Business management	21,080	69%
Business support	13,136	67%
Engineering, architecture and science technologies	12,516	64%
Manufacturing, construction, repair, and transportation	77,442	58%
Education	3,720	58%
Computer and information sciences	10,321	56%
Public, legal, and social services	3,979	50%
Communication and design	4,393	47%
Marketing	4,195	43%
Health sciences	117,603	37%
Consumer services	26,561	26%
Total	324,791	46%
Number of awards conferred, total	835,070	22%

Source: NCES (n.d., Table P89).

Across the U.S. there is wide variation in the ratio of certificates to associate degrees, with the Northeast generally offering fewer certificates: whereas 18% of sub-baccalaureate credentials in Georgia are associate degrees, 75% are in South Dakota (see Appendix Table 1). Second, there is wide variation across states in the market share of for-profit institutions, with these institutions being very dominant in the Northeast. Finally, the preponderance of certificate holders are female, and this strongly reflects the provision in for-profit institutions (where three quarters of enrollees are female).

The recent review by Complete College America, *Certificates Counts*, highlights several key trends in certificate provision (Bosworth, 2010). First, certificates are getting shorter in duration. Second, for-profit provision has fluctuated dramatically as a function of regulation: provision fell after the Higher Education Amendments of 1992; it may also be altered as a result of recent attempts to re-define gainful employment of Title IV institutions under the Higher Education Act. Third, there has been a decline in provision

of certificates in STEM and computing/information sciences, despite the high demand for these skills. Fourth, there is some evidence that the link between a certificate and its labor market potential is getting tighter: the number of certificates that did not have a direct link to occupational requirements set out by professional associations fell.

Although the for-profits have been particularly important in the short-term certificates market, over the last decade, these awards grew much faster at community colleges. Whereas for-profit institutions have kept the same balance of short-term versus long-term certificates (at about one half of each), community colleges have shifted from one third of all certificates being short-term in 1987 to almost two thirds being short-term in 2007.

3. Returns to Community College Courses

3.1 Evidence on the Returns

The return to an associate degree—as measured using the human capital earnings framework—is strongly positive. In our review of 18 separate studies (Belfield & Bailey, 2011), the un-weighted average earnings premium (the additional income earned by an associate degree graduate compared to a high school graduate) is 13% for males and 22% for females (see Table 5, row 1). This is the average across all associate degrees. However, studies have found that returns differ by subject area. On average, research indicates that occupational associate degrees have higher earnings, suggesting that academic community college degrees may be most useful if students transfer and go on to earn a bachelor's degree. But there is wide variation within both academic and occupational areas, with health and quantitative fields yielding the strongest returns. Using Unemployment Insurance (UI) data from Kentucky in the 2000s, Jepsen, Troske, & Coomes (2009) found the highest gains in vocational subjects, with health degrees at the top, followed by other vocational degrees (including business), and science and social science academic degrees. They found no statistically significant earnings gains, compared to high school graduates, for students with associate degrees in humanities and

service fields such as hairdressing.[6] Other studies have reported mixed results by subject (Gill & Leigh, 2003; Jaeger & Page, 1996).[7]

Table 5
Annual Earnings Gains Over High School

Credential		Males	Females
Associate degree [a]		13%	22%
Vocational certificate			
Grubb (1997)	SIPP	7%	24%
Marcotte et al. (2005) [b]	NELS	8%	20%
Jepsen et al. (2009)	KY	9%	3%
Jepsen et al. (2009) [c]	KY	22%	41%

Source: Belfield and Bailey(2011, Table 1).
[a]Returns to an associate degree is the unweighted average across 18 studies.
[b]Marcotte (2010) found no statistically significant returns using NELS.
[c]Returns to a vocational diploma.

Also, there is consistent evidence that the gains to community college education have grown over recent decades. For example, the evidence from Marcotte, Bailey, Borkoski, and Kienzl (2005) shows higher gains using a more recent dataset (NELS over NLSY, SIPP, or NLS).[8] Thus, our un-weighted averages—based on older surveys such as the NLSY79—might actually be understatements. (We discuss the Great Recession below.)

[6] For humanities subjects, Jepsen et al. (2009) found statistically insignificant returns compared to the earnings of high school graduates. Earlier data show a similar pattern. Using SIPP data from 1984, 1987, and 1990, Grubb (1997) reported advantages by subject of study. For associate degrees, gains were highest in health and quantitative courses (business, math/science, and engineering/ computers). Unadjusted salary data show large gaps: Jacobson and Mokher (2009) reported unadjusted salaries in Florida and estimated that, relative to students with a two-year credential in the humanities, health fields pay 42% more, vocational-technical fields pay 20% more, and science-related fields pay 13% more.
[7] Using NELS, Marcotte (2010) found no difference between returns to academic and vocational credits but attributed this to the high correlation between the two as students accumulate both sets of credits prior to completion or exit from community college. For Canada, see Bourdadat (2008).
[8] This evidence is consistent with the general literature on the labor market advantages across education levels. Using Census data, Heckman et al. (2008) reported internal rates of return for White and Black males from the 1960s to the 2000s. For persons going from 12 to 14 years of schooling the rates are at least a few percentage points higher. Using CPS data from 1979-2002, Fortin (2006) identified a growing college–high school earnings premium. Similarly, also using CPS data from 1970-1997, Card and Lemieux (2001) showed a growing earnings premium over time and across age cohorts, i.e., they showed that gains for persons of a given age were higher in 1994 than they were in 1967.

While returns to occupational associate degrees may be as high or higher than those to academic degrees, the *ex ante* expected benefits of the degrees also depend on the probability of completion. Alfonso (2006) found that associate and bachelor's degree students with occupational majors had lower graduation rates (in part because of lower transfer rates). However, Bailey, Kienzl, and Marcotte (2004) suggested that the relationships vary by student characteristics, with disadvantaged students having higher graduation rates when they major in an occupational field. At the college level, associate degree graduation rates in vocational subjects are similar to graduation rates in academic subjects (as reported by Roksa, 2006, based on NELS data).

Despite the proliferation and the growing interest in occupational certificates, only four studies have estimated the returns to these awards.[9] These are listed in Table 5. They show strongly positive returns compared to high school degrees: for males, the return is 7-21%, and for females it is 3-41%. In related work, Jacobson (2011) found that certificates yield a higher boost in earnings over an equivalent number of college credits without a credential.[10] Areas of concentration make a difference, even for students who do not complete a certificate. Using UI data from Washington state in the 1990s, Jacobson, LaLonde, and Sullivan (2005) estimated returns of 10% per year for students in quantitative or technically oriented vocational courses and 3-5% for less quantitative courses.

While there appear to be good economic benefits to certificates, at least in some fields, the unadjusted probability of completion is much higher for certificates than for associate degrees. Although the National Center for Education Statistics does not publish graduation rates by degree type, it is possible to infer these rates by comparing graduation rates for colleges that predominantly confer certificates to those that focus more on associate degrees. Published graduation rates for two year institutions (those for which the two-year degree is the highest degree) range from the low single digits to 99%. But those institutions with the highest graduation rates tend to be technical colleges that confer mostly certificates and few associate degrees. Indeed, of the 50 two-year

[9] Jacobson and Mokher (2009) reported unadjusted wage differentials for vocational certificates in Florida. These too show positive gains from completing a vocational certificate.

[10] There is also some literature suggesting that career–technical education at the high school level is beneficial, both in terms of employment outcomes and—in conjunction with the appropriate academic preparation—postsecondary performance (Kemple, 2001; Maxwell, 2001).

institutions with the highest graduation rates for the 2005 cohort as reported by the Integrated Postsecondary Data System (IPEDS), only 13 granted any associate degrees. In a similar vein, public institutions classified as "less-than-two-year institutions" (the highest degrees conferred by these institutions are certificates taking less than two years) had an average graduation rate of 71% for 150 percent of normal program completion time (Bailey, 2011).

3.2 Methodological and Conceptual Issues in Estimating the Real Benefits of Career Education

Clearly, there are many questions that remain to be answered with respect to career education either in the form of an associate degree or vocational certificate.

First, to identify the causal impact of education it is important to control for personal characteristics. This is particularly important for certificate holders, who may not resemble the "typical" student. For example, they are disproportionately female and may have considerable work experience before they obtain a certificate. Students entering a specific short-term occupational program probably have more clearly defined goals than students who enter a general program in college without specific goals. Students may also be motivated to obtain a certificate because of deteriorating current work opportunities or licensing requirements. Thus differences between completion rates for certificates and associate degrees may be explained by differences in the goals and motivations of students.

Second, certificates and occupational associate degrees serve two very different roles. It is conceivable that certificates could function as a first step into higher education that would subsequently lead to higher degrees. As we have pointed out there is overlap between the substantive areas covered by certificates and associate degrees, and this suggests that it might be possible to construct sequential educational ladders that start with certificates and lead to higher-level degrees, perhaps with an intervening period of work (this model is referred to as "career ladders"). Advocates of this model call for stackable credentials or certificates that can be combined in convenient ways to add up to a degree. But although this model sounds reasonable, it has been difficult to implement, and there is no labor market evidence on the returns to "stackable" certificates. One

difficulty has to do with how to combine occupational and academic material in a career ladder or stackable credentials model. Moreover, in practice, as we shall see below, very few students move on to higher-level degrees from certificates.

Certificates in particular may also serve a labor market role that is not consistent with a conception of education as a sequence of ever-higher degrees. Students with associate or bachelor's (or even graduate) degrees may return to college for certificates seeking very specific skills. Thus in many states, certificate programs serve a similar role as continuing education, which is often not connected to any formal degree or credential. In this case, the value of the certificate may interact with degree attainment, and that interaction effect may vary across education levels: high school dropouts, for example, may gain more than college graduates from having a vocational certificate. Few studies have examined these interactive effects in detail.

Third, certificate programs are shorter and as we have seen have higher completion rates.[11] To begin with, shorter courses would yield higher net returns for a given earnings gain because they require less time out of the labor market, but if certificate students are more likely to complete, then their *ex ante* expected returns would be even higher, assuming that there is an additional value to completing a degree (the so-called sheepskin effect). Courses at community colleges are also considerably cheaper than those at four-year institutions and typically have links with local employers such that their students may secure a job offer more quickly. Certainly, the returns may be biased even more toward vocational courses if these are shorter, cheaper, offered at more convenient times outside the working day, or linked with job placements.

A fourth issue is the so-called diversion effect. While certificates or occupational associates degrees may provide short-term benefits, enrollment in these programs may limit options for future study.[12] Such enrollment might represent a barrier to transferring

[11] Many community college students never complete any award. For example, in the first decade of this century, within six years of entering community college, a cohort of students will be composed of 8.5% certificate holders, 14.4% associate degree holders, and 11.6% bachelor's degree holders; that is, only 34.5% of the cohort will have obtained a credential (Bailey, 2011, Table 2, BPS2004-2010 data). Almost two thirds of the cohort will not have obtained a credential. As a result of these low completion rates, the high certificate completions rates have attracted the attention of analysts and policymakers who believe that the spread of certificates represents a strategy to increase overall completions.

[12] This has been a dominant theme in community college research for a half a century, since Clark (1960) argued that community colleges divert students from a path to a bachelor's degree. If certificates are composed of credits that can be transferred or if multiple certificates can be "stacked," then this may

to a four-year program or—conditional on transfer—it might represent a barrier to completing a four-year program.[13] For certificates, there is also the possibility of foreclosure on attaining an associate degree. While there has been a great deal of research suggesting that starting in a community college reduces a student's chances of completing a bachelor's degree, there has not been much research analyzing the effect of enrolling in a particular program in community college.

Finally, the benefits of human capital are not restricted to the labor market. Educated persons reap a host of other benefits (e.g., enhanced health, consumption choice efficiency), and society gains in reductions in bads (e.g., crime, welfare reliance). For discussion of the array of potential private benefits and social externalities, see Belfield and Levin (2007) and Wolfe and Zuvekas (1997). Critically, these externalities are one of the motives for government subsidy of education such that fields with low externalities should receive lower subsidies. For individuals, even if the earnings gains from education are not large, the other benefits may be sufficient compensation. However, it is not known whether the benefits vary with the type of education; it seems more likely that a broad education that enhances general cognitive functioning would be more efficacious than vocational certification or even occupational degrees. The latter may convey few positive externalities—it is more akin to an indicator of competency in a particular task than to an indicator of cognitive function. As such, occupational degrees and certificates might have a lower social rate of return.

3.3 General Labor Market Issues

Demand-side issues. Occupational degrees prepare students for particular types of jobs. Certainly the value of those degrees and how they compare to academic degrees or how much academic content they should have depends on the demand for labor in those areas. In this section, we address some particular issues having to do with the nature of demand for occupational degrees and the type of information educators have available as they try to plan programs that will lead to good jobs.

---

mitigate foreclosure of progression. However, there is no labor market evidence on the returns to stackable certificates or much development in the provision of such.

[13] Transfer opportunities for certificate students are weaker in two respects. First, far fewer vocational courses transfer to other institutions, compared with liberal arts courses. Second, vocational course transfer equivalencies are negotiated in a more idiosyncratic manner.

Critically, vocational subjects often lead to licensure or certification in a trade or profession. In some cases, students must complete a specified occupational associate degree or certificate to be eligible to sit for a certification assessment. In these cases, the optimal mix of academic and occupational instruction is set by the certification requirements. Kleiner and Krueger (2010) estimated that almost one third of the workforce holds a license and that possession of a license may increase wages by 15% (independent of unionization status). But it may be that licensure drives up wages by artificially restricting the labor supply, although if the licensing or certification system is effective in protecting consumers or guaranteeing the quality of service, then these earnings gains reflect productivity rather than labor supply restriction. Notably, licensing does not reduce wage dispersion within an industry, which is suggestive that it is not a restrictive practice. However, licensing requirements do vary substantially by state (e.g., in cosmetology), so it is unlikely that these requirements always ensure optimal competencies.

Research that tries to measure directly the content of necessary skills is ambiguous with respect to the balance between general and occupational specific skills. On the one hand, predictions of the demand for labor are made in terms of occupations and the skills embodied in these occupations (e.g., nursing). See Carnevale, Smith, and Strohl (2010). It would seem that these skills can only be acquired through occupational training (e.g., learning how to draw blood) or through the content of each specific field of study (on the link between occupations and the knowledge content of fields of study, see Freeman & Hirsch, 2008). On the other hand, policy documents emphasize general skills and behaviors: as summarized in a 2009 report by the Council of Economic Advisers (CEA), "a range of behaviors that reflect 'greater student self-awareness, self-monitoring, and self-control' are key indicators that students are able to … succeed" (p.10).[14] These type of skills are not taught through specific courses such as "Self Control 101." It would

[14] A third perspective—that of dividing jobs by their routine and cognitive requirements (Autor, Levy, & Murnane, 2003)—is also insufficiently prescriptive. Occupational credentials are offered for all classifications with the possible exception of routine manual jobs (such as typing). As examples, a routine cognitive job is a machinist; a routine manual job is a firefighter; a non-routine interactive job is a teacher; and non-routine analytical job is an architect. Each of these jobs requires some occupational credential independent of a general college education.

seem that these skills can best be acquired through a general postsecondary credential such as an associate degree or bachelor's degree.[15]

Of course, one response is that workers need both general and occupational postsecondary education, presumably with the former preceding the latter. But if school quality were to improve (perhaps as a result of investments in pre-school), then it may be possible for some students to skip a postsecondary general education and just undertake occupational training after high school. Increasingly it seems unlikely that future workers will be able to do the reverse—obtain a general education perhaps up to an associate degree and skip the occupational training. Although as the CEA report suggests, contemporary changes in required skills are often thought to require more general skills, an argument can be made that they in fact will place a greater importance on occupational credentials. First, jobs are becoming more complex and specialized such that they cannot be performed without proper training. Second, for consumers many services are "experience goods" such that quality cannot be guaranteed *ex ante*: a credential (e.g., a medical diploma) is a signal of quality. Third, as highly skilled workers change jobs more frequently, prospective employers will rely on occupational credentials in making employment decisions. Finally, as government regulations increase, formal and verifiable credentials will be used more extensively. In fact, the CEA report (2009, Figure 6) predicts employment growth over the period up to 2016 to be 16% for associate degrees and vocational awards, compared with 15% for bachelor's degrees (and 8% for medium/short-term training). Thus, the need for occupational credentials is expected to grow at least at the same rate as four-year degrees.

Supply-side issues. On the supply-side, Table 3 suggests that—at least in terms of fields—students can choose from a range of program durations and institutional types. Thus, the career education market—broadly defined—appears to be reasonably competitive. Moreover, there may be more competition in terms of entry and exit of providers: given their shorter duration and indeed their lack of articulation, institutions

[15] For a typical statement of this perspective see the commentary in the *Chronicle of Higher Education* by Carol Geary Schneider (2011), president of the Association of American Colleges and Universities.

may find it easier to introduce new certificate programs (than new degree programs).[16] Such flexibility may be advantageous if there are rapid changes in the labor market.

However, the flexibility of occupational certificates may mean that it is hard to evaluate the quality of a particular certificate *ex ante*. There may be few prior graduates who can attest to the value of the certificate. There may also be fewer or weaker quality controls. Certificates might therefore be of low quality and of variable quality across providers. Plus, flexibility may mean that students accumulate an array of haphazard qualifications. By haphazard, we mean two things: students are learning cognitive skills and occupational competencies but with little integration between the two, and students are accumulating qualifications that have weak signaling power in the labor market. Hence, articulation between qualifications is critical. Articulation should include existing programs, e.g., from degrees to certificates, as well as developing a system where certificates can be added together. Hence the calls for built-for-completion certificates (Bosworth, 2010) and stackable certificates (Community Research Partners, 2008), as well as for greater clarity and simplicity in educational choices (Scott-Clayton, 2011).

Different institutional types—for profit institutions, comprehensive community colleges, technical colleges—combine academic and occupational instruction in different ways. In the two-year sector, and especially for certificates, for-profit colleges are very important in some states. The for-profits have the reputation of being very focused on specific job preparation without a strong emphasis on general or academic education. Rosenbaum, Deil-Amen, and Person (2006) argued that graduation rates for occupational students are higher at private (for-profit and not-for-profit) career colleges than at community colleges. At the institutional level, for-profit two-year colleges have higher graduation rates than community colleges, but most of the for-profits confer certificates. Public two-year technical colleges that confer only certificates also have very high graduation rates, and certificate advocates argue that this is because they also have a sharp focus on job preparation with close ties to employers and local labor market needs (Bosworth, 2010). But these higher graduation rates for both the two-year for-profits and the technical colleges may be the result of their focus on certificates rather than their institutional type. Certificate programs take much less time to complete and attract

[16] By the same token, it should also be possible to eliminate certificates that have low enrollments.

students with more focused goals than more open-ended general education or transfer programs. In recent work, Scott-Clayton and Weiss (2011) compared occupational credentials earned at technical colleges and comprehensive community colleges in Washington State. Technical colleges did have significantly higher certificate completion rates than comprehensive community colleges. But the most interesting finding of the paper was the difficulty in finding similar students in the two institutions, thus the comparison had to be made using a greatly reduced group of students who were similar, at least with respect to measureable characteristics. Thus comparisons among institutions must take account of the degree-type, the substance of the program, and the goals and characteristics of the students.

The health sector. Crucially, any discussion of vocational credentials and occupational degrees must take account of the health sector labor market. The CEA report (2009, Figure 2) estimates that, of the approximately 8 million new jobs created by 2016, at least 3.3 million will be in health-related industries.[17] As shown in Table 3, health sciences account for 45% of certificates, 32% of associate degrees, and even 10% of bachelor's degrees. Understanding the health services labor market is therefore helpful in predicting the returns to certificates and associate degrees, and in recognizing the role of the for-profit sector in the provision of occupational training.

On the demand side, the aging U.S. population means that the demand for health provision is expanding. Notably, most jobs in the health sector require some form of certification to ensure that workers can competently perform tasks. Technological change in medical procedures is also rapid, requiring workers to update their skills on a regular basis.[18] Another important consideration is the particular types of labor market regulation and professional standards that might apply in the health services sector. In nursing, for example, California imposed minimum nurse-staffing ratios in acute care hospitals in 2004; using several datasets, Mark, Harless, and Spetz (2009) estimated that this imposition increased the wages of registered nurses (RNs) in metropolitan areas by approximately 12% over RNs in other states. In the case of state requirements of

[17] Specifically, the jobs will be in nursing homes, physician offices, private hospitals, and other medical services including dentistry. On the need for workers with skills related to STEM, see Offenstein and Shulock (2009).
[18] The basic job description for registered nurses is at www.bls.gov/oco/ocos083.htm.

professional standards, the Nurse Licensure Compact allows registered and practical nurses who have a license in one state to practice in another. The goal of the Compact is to ensure standards but allow for labor market flexibility in a sector where nurses may provide health services across state lines.[19] These regulatory changes may play an important role in determining the returns to general health sciences career education and to specific certificates within occupations.

On the supply side, a substantial proportion of relatively lower-skilled nursing positions are filled by immigrants and non-citizens, many of whom were not educated in U.S. high schools. Certification may serve as an efficient way to signal competence. Another feature of the supply is that it is predominantly comprises female workers (especially in nursing). Finally, a majority of registered nurses obtain an associate degree in nursing (ADN), although nurses need a bachelor's degree (BSN) for access to supervisory specialized nursing positions. There is a controversy concerning the relative merit of ADNs versus BSNs, but it is one sector in which associate degree holders are able to return to college and complete a BSN (Karp, Jacobs, & Hughes, 2002). Thus in this highly regulated sector in which there is very close cooperation between employers and colleges, it is possible to discern a career ladder in which students can progress through degree levels while interspersing their education with work.

Metropolitan area issues. Little of the above discussion has distinguished between metropolitan or urban residency. Many of the features and trends apply across all population densities. As noted, there is significant state-level variation. But this reflects state accreditation boards and state higher education institutional features and not demographic factors. Variation across metropolitan areas may therefore be masked.

However, there are some aspects of this analysis that are especially salient for metropolitan areas. First, the returns to higher education are greater in urban areas, and this is interpreted as "human capital is more valuable in cities." This greater value may reflect greater productivity spillovers across educated workers, although the extent of

[19] The Compact was introduced in 1996, but states began participating in 2000. Currently, 24 states are members of the Compact (National Council of State Boards of Nursing, https://www.ncsbn.org/index.htm).

such spillovers is sensitive to empirical formulation.[20] Second, for-profit institutions are located primarily in areas with higher population densities such that students in these areas should have more providers to choose from. Finally, the demography of attainment is different in cities: most of the so-called "high school dropout factories" are in urban areas and in general school quality is relatively low. This suggests that these students will need considerable resources to succeed in the labor market: as well as a high school diploma and GED, and then with high probability remedial education, many will need counseling and support to complete an associate degree.

4. Current Returns to Occupational Programs

4.1 Analysis using SIPP

We update the research literature on the economic benefits of academic and occupational education by using the most recent wave of the Survey of Income and Program Participation (SIPP) data from 2008 (waves 1 and 2). The SIPP is a continuous series of national panels, with 36,000 interviewed households in the 2008 panel; the sample is a multistage-stratified sample of the U.S. civilian non-institutionalized population. The SIPP covers labor force, program participation, and income in each wave. This Survey has information on terminal education levels, including whether or not the individual has a vocational certificate. The second wave includes a topical module which asks persons with higher education qualifications what their field of study was.[21] In this wave, individuals are assigned to mutually exclusive categories of certificate, associate degree, or bachelor's degree status. We use the standard human capital approach to estimate earnings premiums.[22] The SIPP data are up-to-date with a large

[20] For example, it may depend on the proportion of high school graduates or college graduates within the metropolitan area (Abel et al., 2010).
[21] This SIPP "topical module" is only asked in the second wave and to persons in the fourth reference month. Hence the sample sizes are considerably smaller than those in Section 4.2 below.
[22] Our goal is not to identify the true causal effect of education on earnings but to examine differentials within education levels and between metro/non-metro residents. See Belfield & Bailey (2011) for a discussion of the extent to which the Mincerian function approximates to a causal effect of education on earnings.

sample and the best national data to estimate the returns to field of study.[23] Information also exists on whether the individual lives in a metropolitan area. Our results can then be compared to an earlier exercise using SIPP by Grubb (1997).

First, we estimate the general returns to education using the standard human capital framework. We note again here that evidence of significant returns to associate and bachelor's degrees is in itself evidence of returns to occupational programs because these are the majority of such degrees. In conjunction, we look at the labor market effects of vocational certificates. Our second estimation looks within each level of education to see whether academic or career education yields higher labor market returns and which fields yield the highest returns. For each estimation we report results for the full sample, for samples split by metropolitan versus non-metropolitan residence, and by gender. We also include a set of covariates and use the SIPP sampling weights (see Table Notes for details).

4.2 The Returns to Education

Vocational certificates. In this Section we look at the returns to education using the standard Mincerian framework. In our first estimation, a certificate is interpreted as a qualification above high school but mutually exclusive of any other higher education qualification (so certificate holders are assumed not to have an associate degree, for example).

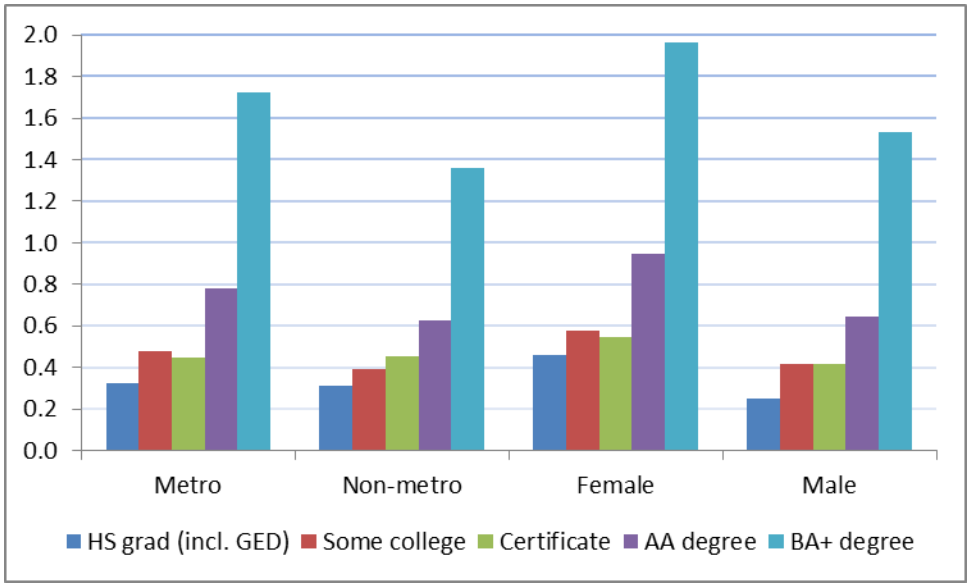
For separate equations for metro versus non-metro and by gender, the coefficients on each attainment and vocational attainment level are presented in Figure 1.[24] (See Appendix Table 2 for the full set of specifications). There is a clear earnings advantage for higher levels of attainment over being a high school dropout. Certificates and "some college" have very similar premiums, but both are higher than the premium for high school graduation. The "some college" category is highly heterogeneous and includes students who may have taken a course or two at a community college and those who have accumulated two or three years of credits at a four-year institution. Certificates make

[23] The SIPP is somewhat limited in personal characteristics and labor market history, which restricts the number of covariates that we can include.

[24] The figures use percentage factors (not coefficient values) on the vertical axis. That is, a value of 1 denotes earnings that are 100% higher than those of the default category.

particular sense for men, while going from a high school degree to a certificate has only a small effect on earnings for women. In contrast, the associate degree represents a larger increment over a high school degree for women than it does for men. Figure 1 also shows the two general findings: returns to education are lower for non-metro residents and the gap increases with education level (Wheeler, 2004), and returns are higher for females.

Figure 1
Earnings Premium Over High School Dropout (Percentage Factor)



Source: SIPP 2008 data. See Appendix Table 2 for coefficients and model estimation.
Note. Percentage factor refers to extent to which earnings exceed those of dropouts (1 = 100%).

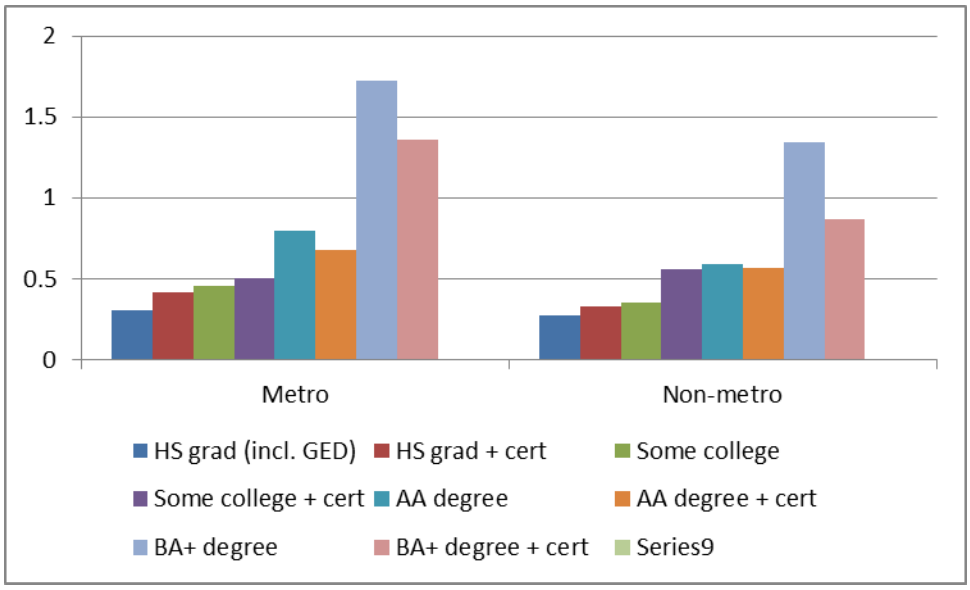
However, vocational certificates are not always part of a fixed sequence of educational credentials: GED holders can obtain them, as can bachelor's degree holders. Previous analyses of certificates have focused on the returns to certificates when they are the highest degree attained: in those analyses, no distinction is made between a student with a bachelor's degree and a certificate and one with only a bachelor's degree. Appendix Table 3 provides information on the share of students with various levels of attainment who also have certificates. Fifteen percent of all individuals in the sample (including high school dropouts) have an occupational certificate. Two thirds of those have no other degree. Thus for these students, a certificate is in effect a terminal degree.

Since certificate instruction has very little general education, then these students learned their general or academic skills (if they learned those skills) in high school. This also suggests that certificates are not primarily intermediate steps to higher degrees. But one third of all certificate students did also have a higher degree such that any returns to a certificate may in fact be partially the returns to the other qualification.

We model the relationship between earnings and educational attainment, with vocational certificates interacting with degree attainment. Figures 2A and 2B show the interaction between degree attainment and completing a certificate (see Appendix Table 4 for the full specifications). Completing a certificate does increase earnings above those earned by high school graduates, thus the premiums for the groups "high school graduate plus certificate" and "some college plus certificate" are both above the high school graduate earnings (and these results are statistically significant). On the other hand, individuals whom combine certificates with associate degrees or with bachelor's degrees earn less than those who have those degrees without a certificate.

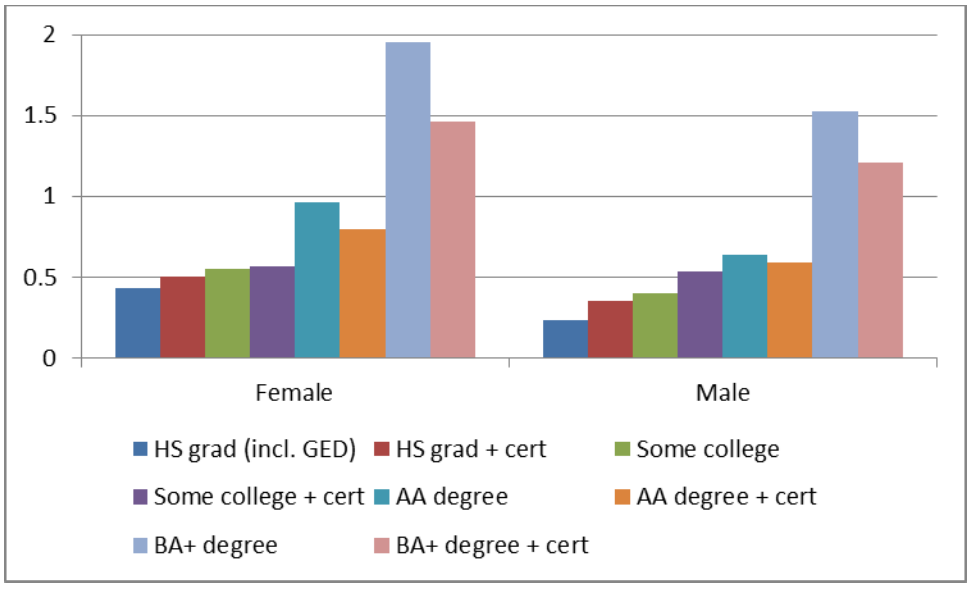
Unfortunately, these data do not indicate whether students earned their certificates before or after their "higher" degrees. If students with higher degrees do return to get a certificate, then this might offer an explanation for the lower earnings of students who combine higher degrees and certificates. Perhaps older students with degrees decide to seek a certificate either if economic changes have made their jobs obsolete or if they find that their initial degrees have little value in the labor market. Thus the lower labor market premiums for students who combine certificates and degrees may result more from the circumstances that motivate older students to seek certificates rather than the labor market value of those certificates.

Figure 2A
Earnings Premium Over High School Dropout:
Interacted with Certificate (Percentage Factor)



Source: SIPP, 2008, wave 1.
Note. Coefficients relative to high school dropout (OLS regression). Model includes female, experience, experience squared. Metro *N* = 141,987; non-metro *N* = 39,555. Persons aged 18–65 only. See Appendix Table 4.

Figure 2B
Earnings Premium Over High School Dropout:
Interacted with Certificate (Percentage Factor)



Source: SIPP, 2008, wave 1.
Note. Coefficients relative to high school dropout (OLS regression). Model includes female, experience, experience squared. Female *N* = 86,447; non-metro *N* = 97,664. Persons aged 18–65 only. See Appendix Table 4.

Associate and bachelor's degrees in academic or career fields. We now turn to specific fields of study to examine whether the labor market returns to certificates and associate degrees are concentrated in particular disciplines or occupations. Here we use the subsample from the second wave of SIPP 2008. As an initial investigation, we classify individuals as having either an academic or career qualification (using NCES categories). In Table 6 we report the coefficients for career education over academic education at both the associate and bachelor's degree level. As shown in column 1, individuals with degrees in career education earn approximately 5% more than individuals with degrees in academic disciplines. This differential remains when the sample is split by metropolitan residence status, although because the sample sizes are smaller the effect is less precisely estimated. Notably, career education pays off significantly for females in career fields. This result is particularly strong for associate degrees: women with career associate degrees earn approximately 14% more than those with academic associate degrees.

Field of study. To further identify the influence of field of study, we divide the academic and career education groups by discipline. Here we are able to include estimates for individuals with vocational certificates as well as associate degrees and bachelor's degrees. The full specifications are reported in Tables 7 and 8 (and for bachelor's degree holders, in Appendix Table 5).[25]

Table 7 shows the returns across vocational credentials relative to a credential in a service industry (e.g., hotel management). Across the full sample, vocational awards in computing, business, police/protective services, and construction are associated with higher earnings; notably, returns for vocational certificates in health are statistically insignificant. When we disaggregate by metropolitan area residence, few fields emerge as especially beneficial. For females, there are earnings premiums over the service sector for business certificates; the coefficient for health certificates is positive but the standard errors are wide. For males, there is no obvious premium across field of certificate.

[25] We do not test whether the individual was employed in an occupation that matched their field of study. Using High School and Beyond data, Yakusheva (2010) found that the earnings premiums are stronger for individuals whose field of study matches their occupation.

Table 6
Log Monthly Earnings: Associate Degree Holders and Bachelor's Degree Holders Only

	(1) Full Sample	(2) Metro Residents	(3) Non-Metro Residents	(4) Female	(5) Male
Career associate degree field relative to academic field	0.053	0.051	0.092	0.142	-0.044
	[0.029]*	[0.033]	[0.065]	[0.039]***	[0.043]
Observations	3,877	2,972	9,05	2,206	1,671
R-squared	0.12	0.12	0.10	0.06	0.14
Career bachelor's degree field relative to academic field	0.046	0.046	0.046	0.085	0.015
	[0.020]**	[0.022]**	[0.050]	[0.030]***	[0.027]
Observations	8,315	6,938	1,377	4,242	4,073
R-squared	0.09	0.10	0.09	0.03	0.09

Source: SIPP, 2008, wave 2.
Note. Career associate degree field is agriculture, computing, business, education, health, communications, engineering, policy, vocational, and visual arts. Career bachelor's degree field is agriculture, business, computing, education, health, communications, and art/architecture. Persons with non-zero earnings aged 18–65 only. Specifications also include experience; experience squared; marital status (married/single); ethnicity/race (White/Hispanic); and immigrant status. Models (1)–(3) include gender. SIPP sample weights applied. Robust standard errors in brackets.
*$p < 0.1$. **$p < 0.05$. ***$p < 0.01$.

Table 7
Log Monthly Earnings: Vocational Credential Holders Only

	(1) Full Sample	(2) Metro Residents	(3) Non-Metro Residents	(4) Female	(5) Male
Vocational field relative to service industry					
Computing	0.204	0.165	0.398	0.206	0.165
	[0.103]**	[0.124]	[0.161]**	[0.170]	[0.120]
Business	0.238	0.252	0.203	0.343	0.044
	[0.098]**	[0.118]**	[0.145]	[0.147]**	[0.137]
Police	0.214	0.230	0.118	0.130	0.161
	[0.121]*	[0.143]	[0.216]	[0.268]	[0.134]
Construction	0.201	0.208	0.208	0.244	0.102
	[0.093]**	[0.113]*	[0.132]	[0.208]	[0.104]
Other	0.156	0.141	0.226	0.213	0.076
	[0.090]*	[0.110]	[0.115]**	[0.145]	[0.104]
Health	0.128	0.142	0.092	0.222	-0.159
	[0.097]	[0.115]	[0.153]	[0.143]	[0.207]
Mechanical	0.120	0.121	0.140	0.131	0.021
	[0.095]	[0.115]	[0.139]	[0.261]	[0.106]
Cosmetology	-0.073	-0.025	-0.249	-0.009	0.034
	[0.104]	[0.123]	[0.178]	[0.152]	[0.210]
Observations	4,461	3,368	1,093	2,203	2,258
R-squared	0.12	0.11	0.18	0.04	0.09

Source: SIPP, 2008, wave 2.
Note. Persons with non-zero earnings aged 18–65 only. Sample does not include persons with associate degrees or above. Specifications also include experience; experience squared; marital status (married/single); ethnicity/race (White/Hispanic); and immigrant status. Models (1)–(3) include gender. SIPP sample weights applied. Robust standard errors in brackets.
*$p < 0.1$. **$p < 0.05$. ***$p < 0.01$.

Table 8
Log Monthly Earnings: Associate Degree Holders Only

	(1) Full Sample	(2) Metro Residents	(3) Non-Metro Residents	(4) Female	(5) Male
Associate degree field relative to social sciences					
Health	0.203	0.165	0.382	0.277	0.018
	[0.043]***	[0.048]***	[0.096]***	[0.052]***	[0.086]
Computing	0.114	0.120	0.067	0.246	0.029
	[0.056]**	[0.062]*	[0.120]	[0.085]***	[0.071]
Engineering	0.063	0.058	0.063	0.214	-0.012
	[0.063]	[0.066]	[0.183]	[0.170]	[0.068]
Sciences	0.056	-0.005	0.327	0.058	0.018
	[0.077]	[0.086]	[0.176]*	[0.093]	[0.128]
Communications	-0.039	-0.129	0.621	0.314	-0.313
	[0.192]	[0.213]	[0.156]***	[0.218]	[0.278]
Business	-0.005	0.004	-0.003	-0.008	0.026
	[0.042]	[0.046]	[0.099]	[0.058]	[0.060]
Police	-0.077	-0.111	0.063	-0.049	-0.120
	[0.162]	[0.207]	[0.151]	[0.154]	[0.209]
Vocational	-0.029	-0.045	0.024	0.004	-0.058
	[0.056]	[0.064]	[0.110]	[0.096]	[0.069]
Visual arts	-0.052	-0.106	0.202	-0.008	-0.117
	[0.095]	[0.101]	[0.282]	[0.122]	[0.134]
Arts	-0.068	-0.095	0.020	-0.146	0.041
	[0.060]	[0.067]	[0.141]	[0.078]*	[0.096]
Education	-0.191	-0.203	-0.138	-0.139	-0.341
	[0.071]***	[0.080]**	[0.148]	[0.078]*	[0.172]**
Agriculture	-0.283	-0.203	-0.270	-0.145	-0.310
	[0.136]**	[0.185]	[0.198]	[0.471]	[0.144]**
Observations	3,877	2,972	905	2,206	1,671
R-squared	0.13	0.14	0.13	0.08	0.15

Source: SIPP, 2008, wave 2.
Notes. Persons with non-zero earnings aged 18-65 only. Specifications also include experience; experience squared; marital status (married/single); ethnicity/race (White/Hispanic); and immigrant status. Models (1)-(3) include gender. SIPP sample weights applied. Robust standard errors in brackets.
*$p < 0.1$. **$p < 0.05$. ***$p < 0.01$.

Table 8 shows the returns across fields for individuals who have an associate degree. The reference field is social sciences (academic). Only a few fields of study—either occupational or academic—have returns that are statistically different than those in the social sciences. Across the full sample, health and computing degrees yield the highest earnings; education and agriculture have the lowest, with associate degrees in arts also having low returns. This last result affirms the general evidence reported above. Again, the differences are attenuated when the sample is split by metropolitan residence status. Notably, females obtain earnings premiums in health and computing but have lower earnings with degrees in arts, education, and agriculture. For males, the only distinct fields are education and agriculture.

Finally, we estimate the returns across fields for bachelor's degree holders. We report these in Appendix Table 7 for comparison purposes, as there exists a considerable literature on the returns to field of study at the bachelor's degree level. For this group there are significant differences by field, with graduates in career education fields—engineering, computing, business, and health—having higher returns (this is also the case in one academic field—sciences). In this case there is little distinction between metropolitan and non-metropolitan residents and between males and females, except of course in that only female bachelor's degree holders have higher earnings as a result of studying health disciplines.

5. Conclusions

5.1 Lessons for Policy from the Evidence

Are community college occupational degrees worth it? Our preliminary answer is that on average both certificates and associate degrees are associated with an increase in earnings above the earnings of a high school graduate. The large majority of certificates are in occupational fields and, within associate degrees, occupational awards are at least equivalent to academic awards, and our analysis of SIPP (along with other research) suggests that on average the returns to occupational degrees are higher than those for academic degrees. On the other hand, these two categories are heterogeneous:

occupational degrees combine nursing and cosmetology; and academic degrees combine studies in the humanities or arts, which have low returns, and technical fields that have much higher returns. This may explain why there are generally mixed conclusions on the comparison between academic and occupational associate degrees.

The perspective that makes a sharp distinction between academic and occupational (or career) areas is also misleading because it treats a longitudinal process as a cross section. In most cases, academic and career instruction are not substitutes but complements—academic education is primarily preparation for a subsequent level of education while occupational instruction takes place more or less as the last stage of education before entering work. This is consistent with a finding that for those who stop at an associate degree, an occupational award probably makes more sense than an academic credential. (The concepts are further complicated when academic education is occupational preparation for some occupations). To be sure, some specific occupational preparation may not be necessary, but calls for more academic education in preparation for a particular occupation is more or less synonymous with calls for more education—adding more general education to necessary occupational instruction.

The lower the level of the degree, the more difficult it is to combine academic and occupational instruction: there is simply less time. This is particularly difficult tension in programs that attract adult students. These students usually have very specific goals and less time for general educational exploration. In these cases, it is particularly important to determine the academic and specific vocational skills that are necessary. To the extent that high school provides a stronger academic foundation, then it will be easier to arrive at an optimal balance for short awards.

Educators have been working toward designing so-called career pathway programs and ladders that allow students to alternate between work and school. This model recognizes the circumstances of students who cannot attend school full-time well into adulthood. The problem, though, is that an education that shifts gradually from academic to occupational instruction is not consistent with an education that consists of several discrete pieces, each leading to a particular job or occupation (stackable credentials). In a four-year degree in accounting, the first two years are primarily general education, while the two years of an associate program in accounting will include a

substantial component of specific instruction in business and accounting. This may be why career pathway models or programs for stackable credentials have been difficult to implement or why so few students who earn certificates move on to higher degrees. The associate (ADN) and bachelor's (BSN) nursing degrees are an apparent example of a sequence of degrees that allow individuals to move back and forth between work and education. But this is deceptive. The ADN programs solve the problem of general education by requiring substantial general education prerequisites for admissions—college level courses that a BSN student would often take in the first two years.

Coordinating program levels to facilitate this type of educational process would require a differentiation between academic prerequisites for specific occupational courses (these need to be taken early in the educational sequence) and academic courses or experiences that provide more general skills and competencies (these could be taken at different times in a college career). It would also require the different institutions or departments to work together to jointly redesign their programs with this type of mobility in mind.

For the most part, the measurement of the returns to degrees is based on measuring the earnings premium for individuals who have completed those degrees. But we have seen that the probability of completing a degree for those who start degree programs differs by program and degree level. The expected earnings benefit for a student who starts a program should take account of the probability of completing the degree relative to the probability of completing the alternative.[26] This may be particularly important for community college students with very weak academic skills who often get lost in remedial classes and never emerge into college-level instruction. If the overall completion rate for certificates does reflect the probability of completion for an individual in a particular program, then certificate programs do look attractive for these students.[27] This is especially true for men who, according to our estimations using the SIPP, do not experience a large increase in earnings going from a certificate to an associate degree. One problem with a strategy of guiding these students into certificate

[26] And it should be adjusted for the value of the courses taken by the degree non-completer.

[27] As we have suggested earlier in this paper, the high certificate completion rate may reflect student characteristics rather than the effectiveness of the programs in getting the students to finish. More research is needed to understand the certificate completion rate. This will help in understanding the for-profit completion rate, since two-year for-profits primarily confer certificates.

programs is that few students move on from these programs. A redesign of certificate and associate degree programs to facilitate transfer, as we suggested above, might address this criticism.

5.2 Final Thoughts on the Great Recession

This paper has been about the economic value of occupational and academic programs, but that value depends on the demand for the skills learned in those programs. A program that perfectly balances occupational and academic instruction to produce the most effective professional will not lead to an earnings premium if there is no demand for those skills in the labor market. In prior decades, demand has been strong. But the Great Recession from December 2007 to June 2009 has caused the most serious labor market disruption in more than half a century. Some changes appear to be structural rather than cyclical. We conclude by considering what implications this might have for the interaction between academic and occupational education.

The Great Recession washed through the labor market in the same way most recessions do: raising unemployment levels among the lowest skilled and least experienced workers. Of course, it has washed through very powerfully and in concentrated ways on these groups. But in terms of impacts, it has affected the same groups as past downturns. That said, there are some distinctions about the Great Recession.

First, the housing crisis has substantially impaired labor market flexibility as workers cannot move to find new jobs. Whereas in the past workers might have moved to find a job that matches their skills, they may now have a greater need to change their skills to match jobs in their local labor market. This will clearly reduce overall flexibility, but it does put a premium on general skills that might facilitate retraining. At the same time, it will reduce the value of specific occupational credentials if employment in those occupations is not available locally.

Second, the Great Recession has accelerated the change in the nature of the employment contract. Long-term attachment to a firm has become less common as the employment relationship has become more precarious, uncertain, intermittent, and variable (Kalleberg, 2009). This also puts a premium on flexibility, although in this case

specific occupational credentials may be advantageous, assuming that relevant jobs are available.

Third, the rise in unemployment has been concentrated among permanent job losers and the long-term unemployed; the former will not reenter the labor market and the latter will have a very hard time finding work as the recession ends. The Great Recession has also closed off labor market participation to many marginally attached workers, i.e., persons already only working or looking for work intermittently. In principle, job retraining might help these workers find employment, but the structural changes appear to be profound, and these workers may find themselves at the end of a job queue for a declining number of jobs, especially jobs requiring low or moderate skills. It is asking a great deal of a retraining program to strengthen these workers skills enough to allow them to compete successfully in these circumstances. It is unlikely that education programs—unless they are extensive— can address much of the damage to this population caused by the Great Recession.

Structural changes in the economy, labor market, work organization, and technology over the last decades have created a need for both more specialization and more adaptability. This has led to a general increase in education, as students presumably learn more of both general and occupational skills, and to a more varied and interactive relationship between the labor market and education: individuals move back and forth between these two institutions, rather than completing education and moving definitively into the labor market. These developments have made it more difficult to plan and implement an optimal combination of academic and occupational instruction. The Great Recession has made that even more difficult while severely reducing the resources available to solve these problems. Simply adding more of both kinds of education for everyone is not an option. A successful strategy will combine a better understanding of the appropriate balance between academic and occupational skills, new methods of relating and combining instruction in the two areas, and inter-institutional cooperation that can lead to a more effective instructional division of labor.

References

Alfonso, M. (2006). The impact of community college attendance on baccalaureate attainment. *Research in Higher Education, 47*(8), 873–903.

Arum, R., & Roksa, J. (2011). *Academically adrift: Limited learning on college campuses.* Chicago, IL: University of Chicago Press.

Autor, D. H., Levy, F., & Murnane, R. J. (2003). The skill content of recent technological change: An empirical explanation. *Quarterly Journal of Economics, 118*(4), 1279–1333.

Bailey, T. (2011, February). *Can community colleges achieve ambitious graduation goals?* Paper presented at the American Enterprise Institute, Washington, DC. Retrieved from http://www.aei.org/docLib/Can%20Community%20Colleges%20Achieve%20Ambitious%20Graduation%20Goals%20by%20Thomas%20Bailey.pdf

Bailey, T., Jeong, D. W., & Cho, S.-W. (2010). Referral, enrollment, and completion in developmental education sequences in community colleges. *Economics of Education Review, 29*(2), 255–270.

Bailey, T., Kienzl, G. S., & Marcotte, D. E. (2004). The returns to a sub-baccalaureate education: The effects of schooling, credentials, and program of study on economic outcomes [Monograph]. New York, NY: Columbia University, Teachers College, Community College Research Center.

Bailey, T., & Merritt, D. (1997). School-to-work for the college bound (MDS-799). Berkeley, CA: University of California, National Center for Research in Vocational Education. Retrieved from http://vocserve.berkeley.edu/abstracts/MDS-799/MDS-799.html

Belfield, C. R., & Bailey, T. (2011). The benefits of attending community college: A review of the evidence. *Community College Review, 39*(1), 46–68.

Belfield, C. R., & Levin, H. M. (Eds.). (2007). *The price we pay: The economic and social consequences of inadequate education.* Washington, DC: Brookings Institution Press.

Bosworth, B. (2010). *Certificates count: An analysis of sub-baccalaureate certificates*. Washington, DC: Complete College America and Future Works. Retrieved from http://www.completecollege.org/docs/Certificates%20Count%20FINAL%2012-05.pdf

Boudarbat, B. (2008). Field of study choice by community college students in Canada. *Economics of Education Review, 27*(1), 79–93.

Card, D., & Lemieux, T. (2001). Can falling supply explain the rising return to college for younger men? A cohort-based analysis. *Quarterly Journal of Economics, 116*(2), 705–746.

Carnevale, A. P., Smith, N., & Strohl, J. (2009). Help wanted: Projections of jobs and education requirements through 2018. Washington, DC: Georgetown University, Center on Education and the Workforce. Retrieved from http://www9.georgetown.edu/grad/gppi/hpi/cew/pdfs/FullReport.pdf

Clark, B. R. (1960). The "cooling out" function in higher education. *American Journal of Sociology*, *65*(6), 569–576.

Community Research Partners [CRP]. (2008). Ohio stackable certificates: Models for success. Columbus, OH: Author. Retrieved from www.communityresearchpartners.org/uploads/publications/Ohio_Stackable_Certificates_Models_for_Success.pdf

Council of Economic Advisers. (2009). *Preparing the workers of today for the jobs of tomorrow*. Washington, DC: Executive Office of the President. Retrieved from http://www.whitehouse.gov/assets/documents/Jobs_of_the_Future.pdf

Dewey, John. (1917/1944). *Democracy and education*. New York, NY: The Free Press.

Fortin, N. M. (2006). Higher-education policies and the college wage premium: Cross-state evidence from the 1990s. *American Economic Review, 96*(4), 959–987.

Fischer, K. (2011, May 15). Crisis of Confidence Threatens Colleges. *The Chronicle of Higher Education.* Retrieved from http://chronicle.com

Freeman, J. A., & Hirsch, B. T. (2008). College majors and the knowledge content of jobs. *Economics of Education Review, 27*(5), 517–535.

Gill, A. M., & Leigh, D. E. (2003). Do the returns to community colleges differ between academic and vocational programs? *Journal of Human Resources, 38*(1), 134–155.

Grubb, W. N. (1997). The returns to education in the sub-baccalaureate labor market, 1984–1990. *Economics of Education Review*, *16*(3), 231–245.

Heckman, J. J., Lochner, L. J., & Todd, P. E. (2008). Earnings functions and rates of return. *Journal of Human Capital*, *2*1, 1–31.

Jacobson, L., & Mokher, C. (2009). *Pathways to boosting the earnings of low-income students by increasing their educational attainment*. Washington, DC: Hudson Institute Center for Employment Policy.

Jacobson, L., LaLonde, R. J., & Sullivan, D. (2005). The impact of community college retraining on older displaced workers: Should we teach old dogs new tricks? *Industrial and Labor Relations Review, 583*(3), 398–416.

Jaeger, D. A., & Page, M. E. (1996). Degrees matter: New evidence on sheepskin effects in the returns to education. *Review of Economics and Statistics, 784*(4), 733–40.

Jepsen, C., Troske, K., & Coomes, P. (2009). *The labor-market returns to community college degrees, diplomas, and certificates* (Discussion Paper Series 2009-08). Lexington, KY: University of Kentucky, Center for Poverty Research.

Kalleberg, A. L. (2009). Precarious work, insecure workers: Employment relations in transition. *American Sociological Review, 74*(1), 1–22.

Karp, M. M., Jacobs, J., & Hughes, K. L. (2002). *Credentials, curriculum, and access: The debate over nurse preparation.* Washington, DC: Community College Press.

Goldin, C., & Katz, L. F. (2008). *The race between education and technology*. Cambridge, MA: Belknap Press of Harvard University.

Kleiner, M. M., & Krueger, A. B. (2010). The prevalence and effects of occupational licensing. *British Journal of Industrial Relations, 48*(4), 676–687.

Marcotte, D. E., Bailey, T., Borkoski, C., & Kienzl, G. S. (2005). The returns of a community college education: Evidence from the National Education Longitudinal Survey. *Educational Evaluation and Policy Analysis, 272*(2), 157–175.

Marcotte, D. E. (2010). The earnings effect of education at community college. *Contemporary Economic Policy, 28*(1), 36–51

Mark, B., Harless, D. W., & Spetz, J. (2009). California's minimum-nurse-staffing legislation and nurses' wages. *Health Affairs, 28*(2), 326–334.

NCES [National Center for Education Statistics]. (n.d.). Career/technical education (CTE) statistics. Retrieved from http://nces.ed.gov/surveys/ctes/tables/index.asp

Offenstein, J., & Shulock, N. (2009). Technical difficulties: Meeting California's workforce needs in science, technology, engineering, and math (STEM) fields. Sacramento, CA: California State University, Institute for Higher Education Leadership and Policy. Retrieved from http://www.csus.edu/ihelp/PDFs/R_STEM_06-09.pdf

Roksa, J. (2006). Does the vocational focus of community colleges hinder students' educational attainment? *Review of Higher Education, 29*(4), 499–526.

Rosenbaum, J. E., Deil-Amen, R., & Person, A. E. (2006). *After admission: From college access to college success*. New York, NY: Russell Sage Foundation.

Ryan, C. L. (2005). What it's worth: Field of training and economic status in 2001 (Current Population Reports Series No. P70-98). Washington, DC: U.S. Census Bureau.

Schneider, C. G. (2011, May 1). 'Degrees for what jobs?' Wrong questions, wrong answers. *The Chronicle of Higher Education*. Retrieved from http://chronicle.com

Scott-Clayton, J. (2011). *The shapeless river: Does a lack of structure inhibit students' progress at community colleges?* (CCRC Working Paper No. 25, Assessment of Evidence Series). New York, NY: Columbia University, Teachers College, Community College Research Center. Retrieved from http://ccrc.tc.columbia.edu/Publication.asp?uid=839

Scott-Clayton, J. & Weiss, M. J. (2011). Institutional variation in credential completion: Evidence from Washington State Community and Technical Colleges (CCRC Working Paper No. 33). New York, NY: Columbia University, Teachers College, Community College Research Center. Retrieved from http://ccrc.tc.columbia.edu/Publication.asp?uid=916

The Secretary's Commission on Achieving Necessary Skills. (1991). *What work requires of schools: A SCANS report for America 2000*. Washington, DC: U.S. Department of Labor.

Tienda, M., & Alon, S. (2007). Diversity and the demographic dividend: Achieving educational equity in an aging white society. In C. R. Belfield & H. M. Levin (Eds.) *The price we pay: Economic and social consequences of inadequate education* (pp. 48–73). Washington, DC: Brookings Institution Press.

Xu, Z., Hannaway, J., & Taylor, C. (2007). *Making a difference? The effect of Teach for America on student performance in high school* (Working Paper No. 17). Washington, DC: The Urban Institute. Retrieved from http://www.urban.org/publications/411642.html

Wheeler, C. H. (2004). *Cities, skills, and inequality* (Working Paper No. 2004-020A). St. Louis, MO: Federal Reserve Bank of St. Louis. Retrieved from http://research.stlouisfed.org/wp/2004/2004-020.pdf

Wolfe, B., & Zuvekas, S. (1997). Nonmarket outcomes of schooling. *International Journal of Educational Research, 27*(6), 491–501.

Yakusheva, O. (2010). Return to college education revisited: Is relevance relevant? *Economics of Education Review, 29*(6), 1125–1142.

Appendix: Additional Tables

Appendix Table 1
Composition of Sub-Baccalaureate Credentials by State

	Percentage of Sub-Baccalaureate Credentials That Are Associate Degrees
Lowest ten	
Georgia	18%
California	27%
Kansas	27%
Arizona	28%
Arkansas	28%
Florida	28%
Kentucky	28%
Colorado	29%
Texas	32%
Connecticut	33%
Median	
Massachusetts	46%
Highest ten	
New Hampshire	61%
New York	64%
Maine	65%
Mississippi	65%
Hawaii	67%
Indiana	67%
North Dakota	68%
Vermont	74%
Montana	75%
South Dakota	75%

Source: IPEDS data (2006).

Appendix Table 2
Individual Earnings

	Log Earnings (Previous Month)			
	(1) Metro	(2) Non-Metro	(3) Female	(4) Male
Relative to dropout				
High school graduate (incl. GED)	0.280	0.271	0.380	0.224
	[0.009]	[0.017]	[0.013]	[0.011]
Some college	0.390	0.330	0.455	0.348
	[0.010]	[0.019]	[0.014]	[0.012]
Vocational certificate	0.371	0.375	0.435	0.348
	[0.011]	[0.020]	[0.015]	[0.013]
Associate degree	0.576	0.486	0.667	0.498
	[0.011]	[0.020]	[0.015]	[0.013]
Bachelor's degree or higher	1.003	0.858	1.086	0.930
	[0.010]	[0.018]	[0.013]	[0.011]
Observations	141,987	39,555	86,768	94,774
R-squared	0.27	0.21	0.21	0.27

Source: SIPP, 2008, wave 1.
Note. Persons aged 18–65 only. Specifications also include experience; experience squared; marital status (married/single); ethnicity/race (White/Hispanic); and immigrant status. Models (1)–(2) include gender. SIPP sample weights applied. Robust standard errors in brackets. All coefficients statistically significant. $p < 0.01$.

Appendix Table 3
Proportions with Vocational Certificates

	No Vocational Certificate	Vocational Certificate
High school dropout	18%	1%
High school graduate (incl. GED)	24%	6%
Some college	14%	4%
Associate degree	5%	2%
Bachelor's degree	15%	2%
Master's or professional degree	8%	1%
Total	5%	15%
Observations	335,908	

Appendix Table 4
Individual Earnings Interacted with Certificate

	Log Monthly Earnings			
	(1) Metro	(2) Non-Metro	(3) Female	(4) Male
Relative to dropout				
HS graduate	0.266	0.244	0.360	0.210
	[0.009]	[0.016]	[0.013]	[0.010]
HS graduate + certificate	0.347	0.283	0.405	0.301
	[0.013]	[0.021]	[0.016]	[0.015]
Some college	0.377	0.304	0.436	0.334
	[0.010]	[0.019]	[0.014]	[0.012]
Some college + certificate	0.408	0.446	0.448	0.426
	[0.013]	[0.027]	[0.017]	[0.017]
Associate degree	0.586	0.464	0.674	0.493
	[0.012]	[0.021]	[0.016]	[0.014]
Associate degree + certificate	0.515	0.448	0.586	0.465
	[0.015]	[0.030]	[0.020]	[0.017]
Bachelor's degree	1.003	0.851	1.082	0.927
	[0.009]	[0.018]	[0.013]	[0.011]
Bachelor's degree + certificate	0.857	0.623	0.902	0.793
	[0.017]	[0.039]	[0.022]	[0.022]
Observations	141,987	39,555	86,768	94,774
R-squared	0.27	0.21	0.21	0.27

Source: SIPP, 2008, wave 1.
Note. Persons aged 18–65 only. Specifications also include experience; experience squared; marital status (married/single); ethnicity/race (White/Hispanic); and immigrant status. Models (1)–(2) include gender. SIPP sample weights applied. Robust standard errors in brackets. All coefficients statistically significant. $p < 0.01$.

Appendix Table 5
Log Monthly Earnings for Bachelor's Degree-Holders

	(1) Full Sample	(2) Metro Residents	(3) Non-Metro Residents	(4) Female	(5) Male
Bachelor's degree relative to social sciences					
Engineering	0.522	0.520	0.490	0.691	0.487
	[0.051]***	[0.056]***	[0.116]***	[0.136]***	[0.067]***
Computing	0.470	0.476	0.356	0.540	0.430
	[0.056]***	[0.061]***	[0.132]***	[0.097]***	[0.074]***
Business	0.298	0.298	0.263	0.296	0.284
	[0.044]***	[0.049]***	[0.099]***	[0.060]***	[0.064]***
Health	0.263	0.214	0.509	0.305	0.117
	[0.055]***	[0.062]***	[0.114]***	[0.066]***	[0.102]
Sciences	0.145	0.161	0.052	0.076	0.177
	[0.056]***	[0.062]***	[0.123]	[0.083]	[0.077]**
Other	0.154	0.160	0.093	0.155	0.147
	[0.045]***	[0.050]***	[0.100]	[0.062]**	[0.066]**
Languages	0.114	0.082	0.258	0.105	0.143
	[0.072]	[0.080]	[0.165]	[0.093]	[0.110]
Communications	0.139	0.154	0.006	0.150	0.102
	[0.066]**	[0.071]**	[0.200]	[0.095]	[0.090]
Arts	0.067	0.067	0.018	0.057	0.065
	[0.061]	[0.066]	[0.148]	[0.079]	[0.092]
Agriculture	-0.049	-0.075	0.033	0.028	-0.026
	[0.053]	[0.055]	[0.163]	[0.063]	[0.105]
Education	0.017	0.048	-0.087	0.035	-0.010
	[0.048]	[0.054]	[0.104]	[0.061]	[0.081]
Art/architecture	-0.007	-0.003	-0.070	-0.035	-0.011
	[0.082]	[0.087]	[0.254]	[0.127]	[0.100]
Observations	8,315	6,938	1,377	4,242	4,073
R-squared	0.12	0.12	0.13	0.05	0.12

Source: SIPP, 2008, wave 2.
Note. Persons with non-zero earnings aged 18–65 only. Specifications also include experience; experience squared; marital status (married/single); ethnicity/race (White/Hispanic); and immigrant status. Models (1)–(3) include gender. SIPP sample weights applied. Robust standard errors in brackets.
*$p < 0.1$. **$p < 0.05$. ***$p < 0.01$.