Stackable Credentials: Do They Have Labor Market Value?

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November 2017

CCRC Working Paper No. 97

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Funding for this research was provided by the JPMorgan Chase Foundation.

Abstract

Stackable credentials—sequential postsecondary awards that allow individuals to progress on a career path—have been suggested as a way to enhance the labor market prospects of middle-skill workers. Yet, thus far, little evidence has been provided on the economic value of these credentials. Here, we report a series of estimates on the association between stackable credentials and earnings. We use national, survey, and college-system-level datasets. A significant body of evidence indicates that the labor market returns to certificates—along with those to college degrees—are positive. But our estimates of stackable credentials show only weakly positive and inconsistent gains from these award combinations. Generally, these estimates are indistinguishable from the returns to only one postsecondary credential. There is no clear evidence of how earnings vary across types of stack—progressive, supplemental, or independent—or student characteristics. However, estimated earnings gains from stackable credentials may be imprecise. Few college students stack awards, the motives for stacking are unknown, and notably, the number of stacked awards depends on whether general vocational awards are included. Future research should examine why students stack awards and how they can choose combinations of awards that maximize their earnings gains from stacking.

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1. Introduction

Although the labor market returns to college are strongly positive (Belfield & Bailey, 2017), many students fail to make a successful transition from college into the labor market: They fail to get jobs, or the jobs that they do get do not require the skills they acquired in college (Abel & Deitz, 2014; Cappelli, 2015). One proposed way to improve the link between college and the labor market is to develop a system of shorter term "stackable" credentials. These credentials are defined as "part of a sequence of credentials that can be accumulated over time and move an individual along a career pathway or up a career ladder" (U.S. Department of Labor, 2012; see also Austin, Mellow, Rosin, & Seltzer, 2012). Stackable credentials offer considerable promise. In theory, they allow a student to acquire a credential with labor market value in less time than it would take to earn an associate or bachelor's degree. Short-term credentials have higher completion rates than degrees. And if a short-term credential can serve as part of a sequence of credentials that lead efficiently to a longer term degree, then this "stackable credential" leaves open the option for a student to acquire a degree later. Thus, stackable credentials can help improve completion rates, provide students who might not complete a longer term degree with a valuable labor market signal, and allow experienced workers to upgrade their skills without limiting long-term opportunities. By making college awards shorter, more clearly vocational and integrated, as well as more accessible to those already working or with work experience, stackable credentials may improve the connection between college and the labor market (Accenture, 2016).

By intention, stacked credentials are not simply multiple awards; they are complementary and linked awards that strengthen workers' human capital skills. Longitudinal data is needed to identify students with multiple awards. However, determining whether these awards are linked sequentially or are simply unrelated is a challenge. In our recent review on the prevalence of stackable credentials (Bailey & Belfield, 2017), we did not try to determine whether awards were related and simply defined a "stack" of credentials as a postsecondary certificate plus another award. Stacks can also differ with respect to the order in which certificates and other awards are accumulated.

Stackable credentials have garnered a great deal of attention recently because, as we have argued, they appear to solve multiple problems (see, e.g., Quinton, 2017). They were central elements of the $2 billion TAACCCT grant program created under the Obama administration. The recent emphasis on alternative credentials, which generally refer to credentials other than bachelor's degrees, also appears to favor stacking because stacking can address skepticism about the value of college while keeping open the door to postsecondary enrollment. For these reasons, foundations (e.g., Lumina Foundation) have been enthusiastic about stacking. Moreover, the concept of career pathways, which often emphasizes stacking, has been discussed at least since the early 2000s (see, e.g., Alssid et al., 2002).

Although the number of certificates earned has grown substantially since the turn of the century—with almost 1 million certificates awarded annually in recent years—the importance of stackable credentials remains debatable (Kena et al., 2015).[1] Stacking (with a certificate) does not appear to serve large numbers of students. Of those currently in the workforce, approximately 3 percent of college graduates—and fewer than 2 percent of all workers—are identified as having any stacked credentials (Bailey & Belfield, 2017, Table 2). However, this may reflect limitations in the data and specifically the absence of longitudinal data on awards over time. It may also reflect a narrow definition of stacking: Population surveys indicate that large numbers of workers—as much as one quarter of the workforce—have some kind of vocational award such as a noncredit certificate or license (Bailey & Belfield, 2017, Table 5). If some of these awards meet the definition of a stacked credential, then the number of such credentials may be substantially higher. Unfortunately, vocational awards are often self-defined, so it is unclear what skills they represent.

Whatever the actual number of stackable credentials, award sequences must have labor market value in order for them to live up to their presumed benefits. Acquiring a second or subsequent credential must further augment a student's earnings beyond the initial award. It is important to note that persons who accumulate multiple awards—but whose most recent award dominates the preceding ones—are not stacking their credentials; rather, they are acquiring an additional credential with labor market value

[1] Only 19 states have formal stackable credential policies (Wilson, 2016).

after having accumulated ones without value. Essentially, each credential should increase a worker's productivity. And, ideally, stacking is most beneficial when the cumulative effect of all credentials is greater than the effect of each one separately and by itself.

Importantly, obtaining additional credentials has additional opportunity costs in terms of both tuition and time out of the labor market. The earnings gain from each credential should therefore offset these costs. Unless each of these credentials boosts earnings or employment prospects, students may be better off with a single, more intensive college degree or even with only a single, shorter postsecondary qualification and greater labor market experience. Unless each award boosts earnings to compensate for time out of the labor market, stacking credentials is not a good investment for students.

If students and workers see that stackable credentials do lead to higher earnings, the demand for these sequences should grow (Ganzglass, 2014). But it may be difficult for students to determine whether stackable credentials are worth it, and it may be similarly difficult for colleges to decide whether to reorganize programs to be more stackable (Bailey, Jaggars, & Jenkins, 2015). Also, if some stacks yield positive returns and other stacks yield negative returns, the optimal mix of awards is not obvious. Presently, there is little evidence on the economic value of stackable awards.

In this paper, we investigate the economic value of stackable credentials. We focus primarily on differences in earnings across persons with stackable credentials and comparable workers without these awards. Following Bailey and Belfield (2017), we begin by briefly describing the types of stackable credentials; we then review the limited extant evidence on the economic value of stackable credentials. Next, we set up our model for estimating the returns to stackable credentials compared with other postsecondary awards and no awards. Using a series of relevant datasets, we then estimate the returns to stackable credentials. Finally, we consider the future of stackable credentials across the United States labor market.

2. Stackable Credentials and the Economy

For understanding their economic implications, we previously identified two key elements of stackable credentials (in Bailey & Belfield, 2017). First, each credential in the stack should be of short duration so that students do not spend too much time out of the labor market. Second, the stack should offer students a clear pathway across multiple awards toward an accumulation of college-level skills that have labor market value. For practical reasons, we adopt here the same definition of a credential stack as in Bailey and Belfield (2017). A stack is a certificate plus another award—either another certificate, an associate degree, or a bachelor's degree. Unlike degree programs, certificate programs are typically less than two years (sometimes less than one year) in duration; they can be linked together or provide credits for students progressing into other award programs; and they are usually established in vocational subjects.

This definition leads to three types of credential stacks: *Progression stacks* start with a certificate and lead to a subsequent associate or bachelor's degree; *supplemental stacks* involve earning certificates after degrees; and *independent stacks* involve earning multiple certificates in the absence of any degree. Note that if the argument in favor of stacking is that students who obtain a short-term credential have a larger probability of completing an even more valuable related subsequent award, then we should focus our examination on progression and independent stacks. Acquiring a certificate after earning a degree (a supplemental stack) may be beneficial, but it is not using a short-term credential to get a student started on his or her postsecondary pathway.

Presently, only a small percentage of workers have stackable credentials (Bailey & Belfield, 2017; Ewert & Kominski, 2014). Only a subset of all workers is college-educated and only a small subset of college-educated persons obtains these awards. Annual flows of stackable awards from postsecondary institutions across the United States are available using National Student Clearinghouse (NSC) data (NSC Research Center, 2016a, 2016b).[2] Based on data from 2014–15, *progression stacks* account for 3.2 percent of all awards; *independent stacks* account for 1.5 percent; and *supplemental stacks* account for 1.5 percent of awards. In total, the annual cohort of persons earning

[2] NSC data on enrollments and awards covers over 95 percent of all postsecondary students in the United States.

stackable credentials is 210,000 awardees; their awards account for 6.2 percent of all undergraduate awards.[3] Among young workers over their early working careers, the number with stackable credentials can be estimated from the National Longitudinal Survey of Youth 1997 (NLSY97).[4] This dataset shows that a very small proportion of college students (0.3 percent) obtained independent stacks; a small proportion (0.7 percent) obtained progression stacks, with numbers split evenly between those with associate degrees and those with bachelor's degrees. The most common pattern is supplemental stacking: 1.9 percent of students obtained a certificate after their degree. In total, 3.1 percent of all college students obtained stackable credentials; across those with postsecondary awards, the stacking group represents 5.9 percent. Finally, among college enrollees, the proportion who obtained either a progression or supplemental stack according to 2008 Survey of Income and Program Participation (SIPP) data is 5 percent.[5] Overall, we estimate that between 3 and 5 percent of all college students obtain stackable credentials in some form; expressed relative to all students who obtain an award, the proportion is approximately twice as large. But only two thirds of workers have a college education (Valletta, 2016), so the fraction of the workforce with stackable credentials is approximately 2 to 4 percent.

Stacking may vary by field. Bohn, McConville, and Gibson (2016) examined the patterns of awards in health disciplines across California's community colleges. They found that 6 percent of all who initially enrolled in health fields completed a second award within six years. Of those who completed a first award, 13 percent went on to complete a second (or third) award in a health-related field. Most of these stacks are progression stacks, as students move from short-term certificates (e.g., in emergency medical services) to long-term certificates or to associate degrees with the end goal of becoming registered or licensed practitioner nurses.

As noted above, these estimates of stackable credentials may be imprecise. It is not possible to determine if these sequences of awards are genuine stacks or simply

[3] This number is probably a ceiling for stacks involving certificates because we count all combinations and many of the multiple awards may be unrelated. Multiple awards that are not part of a sequence do not meet the definition of stackable credentials.

[4] The NLSY97 is a nationally representative survey of 8,894 youth born between 1980 and 1984. The youth were interviewed first in 1997 and subsequently annually.

[5] The SIPP is administered in regular waves primarily to collect information on welfare use, but the 2008 wave included a Topical Module on vocational certificates earned at postsecondary institutions.

multiple, unrelated awards. Also, it is not possible to identify students who intend to stack but fail to complete a necessary credential within the sequence.

The biggest challenge to identifying stacked awards is deciding which awards to include in the stack. Critically, certificates are not the only form of short-term credential that might be combined to accumulate more learning; many varied types of vocational award programs include some instructional component or competency test even though they are not credit-bearing (Brown & Kurzweil, 2017; Sikes, 2012). Some individuals with these noncredit vocational awards who also have a certificate or degree may be counted as having stackable credentials. Including these individuals leads to a significant increase in the estimate of stackable credentials. For example, the NLSY97 data show that, by age 31, more than 40 percent of all persons (college-educated and not) have some type of self-reported vocational award, noncredit certificate, or license. On the other hand, unless the student can earn credit for these awards toward a subsequent degree, then this type of sequence may not count as a stack because the student would still have to complete all the requirements of the subsequent degree despite the earlier educational experience. Nevertheless, some of these sequences may qualify as stacks, and as so many individuals have self-reported vocational awards, perhaps 10 percent of all workers might have stackable credentials. The aggregate labor market effects of stackable credentials may therefore be significant.[6]

The primary motive for increasing the availability of stackable credentials is the presumption that they have labor market value and represent a valuable first step into the labor market (Freedman Consulting, 2016). Of course, there is an overwhelming volume of literature identifying the strongly positive economic benefits of college (Avery & Turner, 2012; Barrow & Malamud, 2015). We review that evidence relevant to stacking below. Within this context, it might be expected that stackable credentials would also have high economic benefits. The focus here is on the specific awards in a stack—and in

[6] We distinguish stacking from credit for prior learning. In their review, Tate and Klein-Collins (2012) estimated that almost three quarters of students are nontraditional students who progress through college in a more flexible, sporadic, or intermittent way. In order to complete an award, these nontraditional students typically require credit for prior learning. However, this prior credit is usually for coursework that has not led to a formal qualification; therefore, these students are not stacking credentials but are completing a single award over time.

particular certificates—and their labor market consequences both in absolute terms and relative to a single award (certificate or degree).

However, there are a number of factors that may reduce the value of stacked credentials. A student who completes a second award may be doing so because the first award had low economic value. Therefore, the first award in the stack has not met its function of providing an early labor market boost. The student's labor market success therefore depends entirely on the economic value of the second award (and even this value may be undermined if the first award acts as an adverse signal or if the student could not use all of the credits earned in the first award for the second). For stackable credentials to be valuable, each award in the stack must have value, and ideally (but not necessarily) the aggregate effect will be greater than the individual effects.

So far, we have focused primarily on certificates because students accumulate credits in those programs that can then be used to meet requirements for a higher degree. If noncredit awards are part of a stack, the earnings gains for the noncredit awards may be weak, or at least the credit accumulation for the stack will be inefficient. Theoretically, a student could accumulate skills in a noncredit program that could be used for a subsequent degree, but there are two problems with this possibility. First, there does not appear to be much evidence that noncredit programs serve as on-ramps to degree programs, and second, unless the student is given credit for the learning acquired in the noncredit program, then the noncredit program is not being stacked. Thus, the large majority of the award/degree combinations involving noncredit awards are probably supplemental or independent rather than progression stacks—i.e., individuals with a degree or other award are adding on extra skills to meet labor market needs that their initial award did not meet. Thus there is still a significant question about whether these noncredit awards have any labor market value as part of a progression stack. To our knowledge, there is no clear evidence on the labor market returns to noncredit and self-reported vocational awards as components of a stacked credential.

Other factors may undercut the value of stacking credentials. One simple concern is that students may attempt to stack but may fail to complete their programs. Generally, college completion rates are low (Avery & Turner, 2012). This is partly because students have imperfect information or expectations about their programs of study, and this

discrepancy applies each time a student enrolls in a new program. Students who plan to stack are therefore at risk of failing to complete college multiple times. Bohn et al. (2016, Figure 3) have estimated that half of all students enrolling for a second award fail to complete that award. Finally, it is not obvious that many intermediate-skill jobs can be filled by individuals with a combination of awards. Students may be intending to stack awards that correspond to a meaningful career trajectory but instead may end up with unconnected credentials that do not provide a clear labor market signal.

In summary, it is not obvious that stackable credentials are beneficial relative to a single award. Individuals with more awards should have higher earnings than those with one award, but these awards are not a stack if the second award renders the first award superfluous—and any extra earnings would need to be justified against the extra time out of the labor market. Therefore, persons with stackable credentials may not have earnings that are higher than persons with only one award.

3. The Labor Market Value of Stackable Credentials

3.1 Returns to Certificates

There is substantial evidence on the high economic returns to both associate and bachelor's degrees (Belfield & Bailey, 2011; Carnevale, Jayasundera, & Hanson, 2012).[7] More recently, considerable new evidence suggests that certificates *per se* also have economic value in the labor market (see Belfield & Bailey, 2017).

In a series of linked studies, researchers have identified earnings gains by analysis of large-scale, system-wide student records linked with Unemployment Insurance data. These datasets are useful because certificate holders can be compared with students who enrolled in college but did not complete an award (rather than with students who never enrolled). Also, researchers can apply estimation methods that control for fixed individual characteristics before, during, and after college to reduce bias from unobservable attributes that might influence earnings.

[7] In comparison with high school students, certificate holders with no other college award have been found to earn significantly more (Grubb, 1997; Marcotte, Bailey, Borkoski, & Kienzl, 2005). But, as expected, returns to certificates are typically below those of degrees.

These types of data to estimate earnings gains for certificates have now been applied across nine states using fixed effects methods. The summary results from these applications are shown in Table 1 (see Bailey & Belfield, 2017; Xu & Trimble, 2016). These studies draw on longitudinal transcript data on students entering college during the 2000s and on Unemployment Insurance records of their earnings before and after college. The studies apply fixed effects methods and control for unmeasured fixed student characteristics to identify the earnings gain from completing a certificate for first-time-in-community-college students. Across the studies, the years of coverage differ slightly as do the covariates included in each specification. But overall, the studies are consistent in method and data (and have been harmonized across years post-entry to college). The coefficients reported in Table 1 are for quarterly earnings gains between 5 and 9 years after first entering college and are relative to the baseline category of persons who enrolled in community college but did not complete an award. Overall, there are substantively meaningful earnings gains—of approximately $500 to $800 per quarter—from completing a certificate relative to not completing any postsecondary award.

Table 1
Returns to Certificates Over No Award,
College Student Samples: Statewide Administrative Data

	Quarterly Earnings Gain for Certificates 5–9 Years After Entry	
State	**Female**	**Male**
California	$1,440	$1,440
Ohio	$1,040	$1,250
Michigan	$670	$990
North Carolina	$170	$530
Washington	$1,680	$210
Kentucky	$350	$360
Virginia	$450	−$180
Arkansas	$80	−$380
State-level average	$740	$530

Note. Sources: See Belfield and Bailey (2017).

Although there are earnings gains on average, the returns to certificates vary across student groups and fields of study. The high returns to women with certificates are primarily driven by the returns to awards in the health sector (Xu & Trimble, 2016). Also, certificates may only convey a short-term boost to earnings. In North Carolina, Liu, Belfield, and Trimble (2015) found that the positive returns to awards dissipate and fall to zero within 7–8 years of program completion; Xu and Trimble (2016) found a similar effect in Virginia, as did Jepsen, Troske, and Coomes (2014) in Kentucky. Also, not all certificates yield positive returns: Returns to certificates are low in Virginia and in Arkansas (and negative among women, as shown in Table 1) and are not positive in Washington State for short-term certificates (Dadgar & Trimble, 2015).

We can reach three important conclusions from these analyses. First, some certificates do meet the criteria for the first award in a stack—certificate programs are shorter term than degree programs, and obtaining a certificate can have a positive labor market value. Second, this benefit depends on the field, and health certificates appear to drive much of the positive benefit. Third, since the benefits tend to fade, it is important that the certificate holders acquire additional credentials—that is, that they stack their awards—if they want to maintain these benefits.

But what about the additional criteria for stacking—are these earnings gains augmented when certificates are stacked? Just because one certificate has labor market value does not mean that an accumulation of certificates will have greater labor market returns. Similarly, that degrees and certificates have labor market value does not imply that their combination with an additional certificate or degree will yield proportionately more value. In order to test for the aggregated effect of stacked credentials, it is necessary to examine returns for students with multiple awards using longitudinal data.

3.2 Returns to Stackable Credentials Using NLSY97

To estimate the returns to stackable credentials we use the NLSY97. For a nationally representative sample of about 9,000 youths who were 12 to 16 years old at the end of 1996, the survey collects detailed information on each youth's education, labor market participation, and behaviors, as well as living circumstances and extensive data on family background during the teenage years. To measure ability, youths were administered the Armed Services Vocational Aptitude Battery (ASVAB). By 2013, the

sample participants were between 29 and 33 years old and should have completed much of their human capital accumulation for establishing their early careers. Importantly for this analysis, the NLSY97 includes information on all postsecondary awards as well as on many various vocational awards. To identify individuals who earned certificates, we use positive responses to "Undergraduate Certificate or Diploma (Occupational or Technical Program)" received from a postsecondary institution. To identify those with vocational awards, we use responses to a general question as to whether or not the individual has a certificate.

We apply a standard Mincerian earnings function approach to estimate the returns to education and certificates for these young adults. We restrict the sample to the college-going population. For persons with non-zero earnings, we use reported incomes in 2011 and 2013 (expressed in 2013 dollars and averaged) as the dependent variable. The independent variables are a vector of family characteristics (measured in 1997), work experience, region of residence, and score on the ASVAB to control for ability. The variables of interest are degree and certificate attainment, and the interactions between these variables. Although this approach cannot yield causal estimates of the returns to human capital, Ordinary Least Squares estimation has proved highly robust to alternative specifications (see Autor, 2014; Bhuller, Mogstad, & Salvanes, 2014).

The results are shown in Tables 2 and 3. First, we see that only bachelor's degrees yield clearly significant earnings gains for persons aged 29–32. Other awards (certificates and associate degrees) do not convey earnings gains over persons with some college but no award. Second, there are no clear earnings gains from any of the combinations of stacked credentials. As shown in both Tables 2 and 3, almost none of the coefficients are statistically significant, regardless of the combination of awards or the order in which the awards were earned. So, it does not appear to matter if individuals have stacked awards, or if they obtained a certificate before or after another award (and where coefficients are significant, the results are conflicting). Also, there is no clear evidence that vocational awards convey earnings gains. As shown in columns 3 and 5 of Table 3, for men there are gains from having two vocational certificates, and for women there are gains from having a vocational certificate combined with an associate degree.

Overall, for this young cohort the only award that yields a positive effect is a bachelor's degree. The earnings gains from various types of stacking appear varied and cannot be precisely identified.

Table 2
Returns to Stackable Credentials (NLSY97)
Average Annual Earnings Gaps for College Sample (2011–13; Aged 29–32)

	Male		Female	
Certificate	−2,101		−1,316	
	[2,849]		[1,526]	
Associate degree	−1,204		−191	
	[1,850]		[1,450]	
Bachelor's degree	12,315***		8,247***	
	[1,550]		[1,256]	
Certificate only		943		−1,942
		[4,019]		[1,759]
Associate degree only		1,224		1,910
		[2,247]		[2,079]
Bachelor's degree only		13,480***		9,843***
		[1,719]		[1,407]
Associate + bachelor's		8,911***		3,338
		[3,253]		[2,043]
Certificate + certificate		8,058		−1,270
		[7,846]		[5,070]
Certificate + associate		−29,534***		5,853
		[7,351]		[8,753]
Associate + certificate		1,940		8,569**
		[6,113]		[3,941]
Certificate + bachelor's		−2,920		4,401
		[5,159]		[5,054]
Bachelor's + certificate		2,327		3,659
		[5,254]		[3,956]
Observations	1,658	1,658	1,857	1,857
R-squared	0.151	0.156	0.216	0.223

Note. Average annual earnings in 2011/2013 in 2013 dollars. Only persons with non-zero earnings included. Omitted category: high school dropout (with or without certificate). OLS models include controls for region (3); ASVAB (and missing); race/ethnicity (3); maternal education (2); family income (2); experience (squared). Degree awards included. Robust standard errors in brackets. Source: NLSY97 weighted college sample.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 3
Returns to Interacted Stackable Credentials (NLSY97)
Average Annual Earnings Gaps for College Sample (2011–13; aged 29–32)

	Male		Female	
Certificate only	935	-3,161	-1,980	-2,336
	[4,021]	[3,520]	[1,758]	[1,918]
Associate degree only	1,254	977	1,868	308
	[2,244]	[2,320]	[2,078]	[1,918]
Bachelor's degree only	13,551***	13,583***	9,794***	9,613***
	[1,718]	[1,688]	[1,406]	[1,369]
Associate + bachelor's	8,943***	8,463**	3,295	1,977
	[3,251]	[3,291]	[2,042]	[2,082]
Certificate + associate	-4,690		7,937**	
	[6,646]		[3,858]	
Certificate + bachelor's	940		3,146	
	[3,853]		[3,235]	
Certificate + certificate	8,058		-1,146	
	[7,848]		[4,993]	
Certificate + associate (vocational)		3,096		7,733**
		[3,611]		[3,387]
Certificate + bachelor's (vocational)		2,106		-15
		[3,530]		[2,256]
Certificate + certificate (vocational)		24,259***		1,424
		[7,989]		[2,995]
Observations	1,658	1,658	1,857	1,857
R-squared	0.154	0.16	0.223	0.225

Note. Average annual earnings in 2011/2013 in 2013 dollars. Only persons with non-zero earnings included. Omitted category: high school dropout (with or without certificate). OLS models include controls for region (3); ASVAB (and missing); race/ethnicity (3); maternal education (2); family income (2); experience (squared). Degree awards included. Robust standard errors in brackets. Source: NLSY97 weighted college sample.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

3.3 Returns to Vocational Awards Using SIPP

We can also use Survey of Income and Program Participation (SIPP) data to estimate the returns to general vocational awards. The SIPP from 2008 includes a Topical Module of questions that identifies certificates separately from general vocational awards: The certificate programs must be at least one year in length and completed at a postsecondary institution by instruction (rather than self-study); vocational awards are, by

contrast, any other awards workers claim to have (see Bailey & Belfield, 2012, for details on the information included in the Topical Module). We use data from this Topical Module matched to data from the regular SIPP wave to estimate the returns to stacked credentials.

The results are given in Table 4 (see Appendix Tables 1 and 2 for full results). Coefficients on education are relative to high school graduates, and earnings are monthly (in 2008 dollars). Earnings are significantly higher for persons with degrees but not for individuals with postsecondary certificates; for certificate holders the earnings gaps are not statistically significant.

Table 4
Monthly Earnings Gaps for All Persons

	Female			Male		
	(1)	(2)	(3)	(4)	(5)	(6)
Associate degree	465***	464***	451***	609***	631***	613***
	[72]	[73]	[75]	[107]	[108]	[111]
Bachelor's degree	1,620***	1,618***	1,622***	2,319***	2,337***	2,342***
	[49]	[50]	[51]	[67]	[68]	[68]
Certificate	142	112	113	148	544*	544*
	[101]	[186]	[186]	[163]	[286]	[286]
Stack: Certificate + associate/ bachelor's		42			−585*	
		[222]			[348]	
Stack: Certificate + associate			188			−363
			[299]			[467]
Stack: Certificate + bachelor's			−11			−674*
			[233]			[370]
R-squared	0.091	0.091	0.091	0.126	0.126	0.126
Observations	21,440	21,440	21,440	19,255	19,255	19,255

Note. Monthly earnings (2008 dollars) weighted by household weight. Controls for race/ethnicity, region, and experience (squared). Robust standard errors in brackets. Source*:* SIPP 2008, Wave 13, Certificate Module.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Correspondingly, the SIPP data show no evidence of positive returns to stackable credentials. In fact, the coefficients for stackable credentials are negative for males. The results are null regardless of whether the stack includes an associate degree or a bachelor's degree. Also, including variables for stacking has no effect on the returns to individual degrees (as shown in rows 1 and 2); this suggests that the labor market impact

from the certificates of workers in the SIPP sample is separate from that of degrees—and typically not significantly different from zero.

3.4 Returns to Certificates and Vocational Awards Using ELS

In a third direct investigation of stackable credentials, we use data from the Education Longitudinal Study of 2002 (ELS). The ELS is a nationally representative survey of students who were in 10th grade in 2002. A follow-up survey with these students occurred in 2004 when the sample was refreshed to be representative of students enrolled in 12th grade in the spring of 2004. Additional follow-ups occurred in 2006 (when most students had been in college for some period) and in 2012 (by which time many had terminated their postsecondary education). As a linked inquiry, students' college transcripts were obtained after 2012; these provide detailed information on what awards students received and when. Over the college years, there is information on awards obtained, as well as on college experiences and labor market activities. Thus, it is possible to test whether accumulated awards increase earnings, at least in the short run.

The ELS is representative of a cohort of high school students, not a cohort of college students. It provides longitudinal information on students aged 16 to 18 who are deciding on which college to attend (or whether to attend college at all) and which awards to accumulate. The sample is large: Drawn from 750 schools across the United States it contains 16,700 students, of which over 11,000 had attended a postsecondary institution for some period before 2012. Also, the ELS includes detailed information on high school performance prior to college enrollment and covers students' work experiences after the end of the Great Recession. However, the follow-up period is up to age 26; many individuals may not have had time to complete their stackable credentials.

The ELS has information on highest attainment, including degrees as well as certificates. We identify degrees and certificates separately.[8] With a sample weighted to be representative of 12th graders in the spring of 2003–04, we find that 9 and 12 percent of the female and male sample, respectively, had obtained some form of certificate by age 26. Separately, 7 (female) and 8 (male) percent had obtained an associate degree as their

[8] Our definition of a certificate is from the question: "What type of degree or certificate / are you currently pursuing at {name of currently attended postsecondary institution}? / were you pursuing when you were last attending {name of last-attended postsecondary institution}]?" Answer: "Undergraduate certificate or diploma (usually less than two years), including those leading to a license (for example, cosmetology)."

highest level of attainment, and 33 (female) and 37 (male) percent had obtained a bachelor's degree.

To estimate the earnings differences from certificates and stackable credentials, we use a series of Mincerian earnings functions where the dependent variable is annual earnings (in 2011 dollars) at age 26. The models include an array of controls including high school test scores (see Table 5 notes), and the education coefficients are relative to the earnings of high school dropouts.

The earnings equation results for certificates are shown in Table 5. The earnings advantage from having a certificate varies substantially: For the male sample, certificates have a strong labor market effect far below the returns to a degree but nearly comparable to graduating from high school. These gains are driven entirely by vocational certificates; licensing and general certificates convey no statistically significant advantage. However, for the female sample, none of the specifications for certificates have any effect on earnings.

Table 5
Annual Earnings Gaps for Credentials at Age 26 (ELS 2002)

	Female		Male	
Relative to High School Dropout	**(1)**	**(2)**	**(3)**	**(4)**
High school graduate	4,355**	4,346**	6,422***	6,366***
	[1,758]	[1,758]	[1,610]	[1,611]
Associate degree	3,525*	3,544*	13,353***	13,503***
	[2,064]	[2,062]	[2,268]	[2,267]
Bachelor's degree	8,864***	8,877***	15,711***	15,699***
	[1,880]	[1,878]	[1,884]	[1,884]
Certificate	−179		4,275***	
	[1,062]		[1,535]	
Certificate: Vocational		1,158		8,023***
		[1,593]		[2,509]
Certificate: License		2,778		4,344
		[2,177]		[3,533]
Certificate: General		−3,440**		2,062
		[1,730]		[2,275]
R-squared	0.121	0.122	0.105	0.106
Observations	3,506	3,506	3,685	3,685

Note. Dependent variable: Annual earnings at age 26 in 2011 dollars for sample not in college. Estimation includes controls for region, 10th grade math/reading scores, race/ethnicity, maternal/paternal education, family income, nativity, and family background. Robust standard errors in brackets. Source*:* ELS 2002, Wave 4.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

The effects on earnings of various types of stackable credentials are given in Table 6. The coefficients on the stack variables indicate the additional earnings associated with the stack above and beyond the degree received. So, a male student with a supplemental stack that includes a bachelor's degree should add together the bachelor's degree premium of $16,011 and the $26,278 for a supplement stack. If stacking credentials has additive value in the labor market, the returns to stacking should be positive and statistically significant. The returns to stacking do appear strongly positive for supplemental stacks—i.e., adding a certificate after a degree. But there are no earnings gains for progression stacks—i.e., adding a degree after a certificate, and for most estimates the results are not statistically significant.

Table 6
Annual Earnings Gaps for Stackable Credentials at Age 26 (ELS 2002)

	Female		Male	
Relative to High School Dropout	**(1)**	**(2)**	**(3)**	**(4)**
Associate degree	3,487*	3,535*	13,635***	13,598***
	[2,072]	[2,064]	[2,280]	[2,267]
Bachelor's degree	8,922***	8,882***	15,909***	16,011***
	[1,881]	[1,881]	[1,886]	[1,886]
Stack (associate + certificate)	1,365		766	
	[3,015]		[5,486]	
Stack (bachelor's + certificate)	551		6,081	
	[3,211]		[5,025]	
Progression stack (certificate -> associate)		1,359		12,195
		[6,093]		[13,364]
Progression stack (certificate -> bachelor's)		−3,200		−7,642
		[7,328]		[9,509]
Supplemental stack (associate -> certificate)		603		4,315
		[5,294]		[8,584]
Supplemental stack (bachelor's -> certificate)		2,694		26,278***
		[5,105]		[7,546]
R-squared	0.121	0.121	0.106	0.106
Observations	3,506	3,506	3,685	3,685

Notes: Dependent variable: Annual earnings at age 26 in 2011 dollars for sample not in college. Estimation includes controls for region, 10th grade math/reading scores, race/ethnicity, maternal/paternal education, family income, nativity, and family background. Robust standard errors in brackets. Source*:* ELS 2002, Wave 4.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Overall, the ELS data do not provide clear evidence that stacking credentials boosts labor market outcomes, although the associations are generally positive. It may be that students in the ELS sample were not experienced enough for stacking to have developed and served as a protective response to labor market changes.

3.5 Returns Using North Carolina Community College Data

Liu (2015) estimated the returns to stacked credentials for community college students in North Carolina for cohorts entering the state's colleges between 2002 and 2007. Using student-level transcript data matched to transfer college information and earnings, Liu regressed earnings in 2011 against a very extensive set of college award combinations. We report the results for each of the three types of stacks we have described. (One distinction is that in the North Carolina community college system students can earn credit-bearing diplomas; we assume that diplomas can be part of a stack.)

The earnings gains across different award combinations are summarized in Table 7. The coefficients in Table 7 show the earnings gains relative to no award for community college enrollees. The top panel shows that single certificates or diplomas convey no earnings advantage compared with non-completion, but that an associate degree yields earnings gains of 19–24 percent. There are no clear earnings gains from independent stacking of either certificates or diplomas or combinations of these. In fact, earnings from one certificate (diploma) are equivalent to those from two certificates (diplomas). Persons who augment a certificate or diploma with an associate degree (progression stacking) do have higher earnings. However, comparing these gains with those for a single associate degree, almost all of the earnings gain from progression stacking appears to be attributable to having an associate degree. Notably, the returns to supplemental stacking appear to be the strongest: At least for men, adding a certificate or diploma to an associate degree yields significant earnings gains.

Overall, there is some evidence that stacking is associated with higher earnings, but the additional gains from stacking over a single award appear modest.

Table 7
Quarterly Earnings Gaps in 2011 (Community College Students)

Relative to No Award	Female	Male
Certificate (single)	−0.140***	−0.026
	[0.023]	[0.026]
Diploma (single)	0.011	−0.011
	[0.021]	[0.033]
Associate degree (single)	0.225***	0.176***
	[0.016]	[0.021]
Independent stack (two certificates)	−0.142***	−0.038
	[0.032]	[0.034]
Independent stack (certificate/diploma)	0.024	−0.015
	[0.083]	[0.094]
Independent stack (diploma/certificate)	−0.231	−0.202
	[0.236]	[0.176]
Independent stack (two diplomas)	−0.089**	0.030
	[0.045]	[0.055]
Progression stack (certificate/associate degree)	0.161***	0.092*
	[0.033]	[0.056]
Progression stack (diploma/associate degree)	0.211***	0.166**
	[0.034]	[0.069]
Supplemental stack (associate degree/certificate)	0.159***	0.264***
	[0.035]	[0.042]
Supplemental stack (associate degree/diploma)	0.299***	0.169*
	[0.047]	[0.087]
R-squared	0.180	0.194
Observations	169,305	111,468

Notes: Dependent variable is log earnings. Earnings are for cohorts entering community college from 2002 to 2007. Estimation includes controls for student characteristics, financial aid status, institution and subject of study. Robust standard errors reported in brackets. Source*:* Liu (2015).

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

3.6 Returns to Stacked Health Awards

Two recent studies focus on the economic value of stacked awards in health fields.

Bohn et al. (2016) estimated returns to stacked awards in health disciplines in California. Workers with multiple awards in health experienced sustained and significant growth in earnings over the five years immediately after obtaining their first award. However, those with a single award in a health-related field experienced growth in earnings faster immediately after graduation. Unlike persons seeking stacked awards,

workers with a single award did not have to reduce their work effort to continue in college (Bohn et al., 2016, Figure 7). After five years, students with a single award had modestly higher earnings than students with multiple awards ($18,000 versus $16,000 per quarter). This gap is in part explained by differences in occupations (e.g., paramedics versus registered nurses) and student demographics, but one additional factor is likely to be having more experience in the workforce from finishing college more quickly.

Bohn et al. (2016, Figures 8 and 9) also estimated the magnitudes of earnings gains for each award. Each additional award yielded earnings gains. However, the cumulative effects were smaller if the first award was an associate degree and larger if the first award was a short-term certificate. Interestingly, for some fields the first award had a very small effect and subsequent awards appear to be significant: For credentials in medical assisting and certified nursing assistance, most of the earnings gains are attributable to the second (and third) awards. For health fields, stacking appears to be especially important because the aggregate of the certificates led to employment in registered nursing positions.[9]

Giani and Fox (2017) estimated earnings gains to stackable credentials awarded from participation in TAACCCT-funded health programs at nine community colleges. Estimating changes in earnings of individuals before and after college, Giani and Fox (2017) found no growth for those with short-term certificates compared with those who dropped out of the health programs. By contrast, earnings growth for degree completers was substantial. They concluded that short-term awards are unlikely to yield earnings gains and that stacking these awards is very unlikely to match the gains obtained from completing a degree program in the same field.

[9] Stackable credentials may enhance labor market outcomes because they help workers meet licensing requirements. These licenses may act as a barrier to entry into licensed occupations, restricting the supply of workers and raising wages. Currently, over 40 percent of licenses require a college education, thus establishing a clear link to the need for stackable credentials (Kleiner & Krueger, 2013, Tables 1 and 2). Also, licensing is consistently found to be positively associated with earnings (Kleiner, Marier, Park, & Wing, 2016). In the most recent national study, Kleiner and Krueger estimated that the advantage of having a license at work is an 18 percent increase in hourly wages. This gain is substantively large: It is significantly above the returns to union membership and similar to the male/female labor market wage gap. Potentially, and regardless of whether the license is a restrictive practice, stacking credentials to ultimately obtain a license may be one approach to securing higher wages.

4. The Economics of Stackable Credentials

Presently, there is almost no evidence on the labor market returns to stackable credentials. To identify the earnings gains to stackable credentials, we have had to cast a wide net across available surveys and datasets; these data sources cover different groups of workers at different stages of their working careers. Also, to investigate each type of stack, we have applied a series of empirical specifications. The absence of direct data and research attention has meant that this review offers only a general picture of the economic value of stackable credentials.

In summary, we conclude that the labor market evidence on stackable credentials is (at best) modestly positive: The earnings gains for degrees are robust and the gains for certificates, although not high, are generally positive. Yet, there is no clear evidence on the earnings gains explicitly from stacking these credentials. Moreover, we cannot identify which type of stack—supplemental, progression, or independent—yields the highest earnings gains. Differences across stacks by different student characteristics are also not identifiable. Although supplemental stacking follows the conventional pathway of first accumulating general capital and then vocational capital (see Bailey & Belfield, 2012), there is evidence—albeit inconsistent evidence—that each type of stack may have value. There is certainly no presumption that progression stacks, which may be the type of stack that advocates of stacking have in mind, are superior. However, given the datasets and the small samples of students currently available, it is not possible to test whether or not stacking generates multiplicative returns—i.e., whether the returns to a stack are greater than the returns to each individual qualification.

Several key aspects related to stackable credentials remain to be established; doing so would provide more information on the economic value of stackable credentials relative to a longer, single college program such as a four-year bachelor's degree. This information may help students make better college enrollment decisions. One remaining issue facing students relates to the opportunity cost in terms of lost income from pursuing stacked credentials. Students who intermittently step out of the labor market may suffer significant losses in income that more than offset any future earnings gains from an additional award. Adding extra awards means taking extra time out of the labor market. However, students who intermittently attend college while stacking credentials may have

more flexibility to participate in the labor market. Another issue is the cost of college to the student. The combined tuition and fees for a series of stacked credentials may be higher than those for a single four-year degree, especially if credits are not transferable across the stacked credentials. However, students who stack may be better able to afford college, and in some cases employers may offer incentives for workers to study (especially in programs that build firm-specific skills). Finally, students might value the option of enrolling sequentially rather than committing to four years in college (Stange, 2012); this option may be particularly valuable in a labor market with changing demand for skills. Evidence on these features of stackable credentials might assist students in deciding whether to stack or to commit to a longer college program.

Colleges also need more information on the economic consequences of offering stackable credentials. The costs of offering stackable credentials may be relatively high if there are complex articulation or curriculum requirements (linking one award to the next), if course offerings must be changed to allow students to complete a stack, or if enrollment management becomes more difficult. The financial implications of offering stackable credentials may also be significant if students are not eligible for loans for stacked awards or if parts of the stack are not eligible for federal and state subsidies. Stackable credentials may develop outside the postsecondary system (e.g., through employer certifications), but their growth will be significantly slower without loan financing or public support. Also, if tuition and fees are high, any earnings gain from stacking would be partially offset.

A final, and potentially most influential, factor is whether labor market trends will move in favor of or against stackable credentials relative to degrees. Emphatically, the U.S. workforce has become increasingly educated: In 1980, 43 percent of all workers had college degrees; as of 2015, 67 percent had at least a college degree (Valletta, 2016). Concomitantly, a significant proportion of the youth population has disappeared from the labor market: In 2000, 52 percent of youth aged 16–19 were in the labor force; by 2015, the rate had fallen to 35 percent (American Community Survey data from the U.S. Census Bureau). Many factors explain this shift toward a skilled workforce. These include competition from China, India, and Mexico; a tax code that does not incentivize work in low-income jobs; employer practices and labor regulations that encourage a “gig

economy" and "precarious work"; and the substitution of routine work tasks by robots. Against this wave of change, there are now far fewer jobs for persons without college credentials, and there is no indication that this trend will abate. It is unlikely that more experienced workers, needing to upgrade their skills, will be able to exit the labor market to completely retrain in a new profession. Instead, they will seek to augment their existing skill set. If so, stackable credentials may offer a way for marginal or displaced workers to get and hold jobs along with the college-educated workforce. At least relative to exiting the labor force completely, stackable credentials may have labor market value in the future.

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Appendix

Appendix Table 1
Individual Earnings Gaps (SIPP)

	Log Monthly Earnings	
Relative to Dropout	**Female**	**Male**
High school graduate (including GED)	0.380 [0.013]	0.224 [0.011]
Some college	0.455 [0.014]	0.348 [0.012]
Vocational certificate	0.435 [0.015]	0.348 [0.013]
Associate degree	0.667 [0.015]	0.498 [0.013]
Bachelor's degree or higher	1.086 [0.013]	0.93 [0.011]
Observations	86,768	94,774
R-squared	0.21	0.27

Note: Persons aged 18–65 only. Specifications also include experience; experience squared; marital status (married/single); ethnicity/race (White/Hispanic); and immigrant status. SIPP sample weights applied. Robust standard errors in brackets. All coefficients statistically significant. Source*:* SIPP 2008, Wave 1. Estimates from Bailey and Belfield (2012).

$p < 0.01$.

Appendix Table 2

Individual Earnings Interacted With Certificate (SIPP)

	Log Monthly Earnings	
Relative to Dropout	**Female**	**Male**
High school graduate	0.36 [0.013]	0.21 [0.010]
High school graduate + certificate	0.405 [0.016]	0.301 [0.015]
Some college	0.436 [0.014]	0.334 [0.012]
Some college + certificate	0.448 [0.017]	0.426 [0.017]
Associate degree	0.674 [0.016]	0.493 [0.014]
Associate degree + certificate	0.586 [0.020]	0.465 [0.017]
Bachelor's degree	1.082 [0.013]	0.927 [0.011]
Bachelor's degree + certificate	0.902 [0.022]	0.793 [0.022]
Observations	86,768	94,774
R-squared	0.21	0.27

Note: Persons aged 18–65 only. Specifications also include experience; experience squared; marital status (married/single); ethnicity/race (White/Hispanic); and immigrant status. SIPP sample weights applied. Robust standard errors in brackets. All coefficients statistically significant. Source*:* SIPP, 2008, Wave 1. From Bailey and Belfield (2012).

$p < 0.01$.