



TEACHERS COLLEGE, COLUMBIA UNIVERSITY

Stackable Credentials: Awards for the Future?

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Abstract

Stackable credentials—sequential postsecondary awards that allow individuals to progress on a career path—can enhance the labor market prospects of middle-skill workers. In light of recent labor market changes, these credentials may represent an important buffer against job displacement. However, very little evidence exists as to what constitutes a stackable credential and how many persons have obtained them. We distinguish three types of stacking—progression, supplemental, and independent. Using national, survey, and college-system-level datasets, we estimate that between 3 and 5 percent of the college-educated population have stackable credentials. However, there are several substantial empirical challenges in identifying stackable credentials related to the ordering of awards and to the degree of skill complementarity across awards. Significantly, we find that general vocational awards—earned at any institution and typically not credit-bearing—are often conflated with stackable certificates. The incidence of these awards is far greater than of stackable credentials. A review of the evidence shows that certificates convey modestly positive gains in earnings, but there is no evidence that stacking yields earnings gains. Finally, despite frequent changes in skills needs across the economy, we identify barriers to the expansion of stackable credentials.

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1. Introduction

The college degree, and particularly the four-year college degree, is the foundation of the traditional higher education system. Critics of the system argue that this organization fails to serve many of the workforce needs of the economy or the needs of many students, especially low-income and first-generation students. One proposed solution is to develop a system of shorter term “stackable” credentials. The U.S. Department of Labor defines stackable credentials as those that are “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 [DOL], 2012). The concept of stackable credentials has been around for many years. For example, during the early 1990s, advocates for the school-to-work model that was the basis for the 1994 School-to-Work Opportunities Act argued that “occupational credentials” earned in high school or community college would help students to find well-paying jobs as well as serve as the basis for further education (Bailey & Merritt, 1997). In this paper, we operationalize the definition of stackable credentials and use a variety of data sources to measure the prevalence of the phenomenon.

The notion of a college graduate usually evokes someone with a bachelor’s degree, not someone with an associate degree. While almost half of all undergraduates who attend college at any one time are enrolled in a community college, only one third of all degrees conferred annually are associate degrees. Even in community colleges, the large majority of entering students state that they aspire to earn a bachelor’s degree rather than an associate degree (Jenkins, 2015; Shapiro et al., 2013). And only about 30 percent of students who transfer do so after completing an associate degree, suggesting that these students see little value in the associate degree (U.S. Department of Education, 2012).

But critics have argued that the dominant focus on the bachelor’s degree does not match the overall needs of the economy (Cappelli, 2015; Rosenbaum, 2001). There are many good jobs that require intermediate-level credentials—more than a high school diploma but less than a bachelor’s degree. The National Skills Coalition reported that, in 2012, 54 percent of all jobs in the United States required more than a high school degree but less than a bachelor’s degree, yet only about 45 percent of the working-age

population fit those characteristics. According to those data, there were enough four-year college graduates to meet the demands of the labor market, but there was a surfeit of “low-skilled workers.” So both the interests of the economy and those of low-skilled workers would be served by shifting individuals from low-skills jobs into middle-skills jobs.

Moreover, skill requirements change over time. So even if individuals complete a degree, throughout their lives they may need to acquire additional skills. In many cases, they will not need another degree, so they need to have access to some shorter term educational experience that will yield a recognizable credential that certifies their newly acquired skills. This need is magnified in an era of rapid technological change, marked for example by the introduction of new artificial intelligence technologies (Executive Office of the President, 2016).

More generally, the bachelor’s degree focus does not work well for many students who enter community colleges and less selective four-year colleges. Many of these students start off with weak academic skills and little understanding of how to be successful in college. A majority of community college students are referred to remedial courses, and most of those students do not complete college-level courses. Indeed, after six years, 60 percent of community college students have not earned any postsecondary credential, and more than half are no longer enrolled in college. While the large majority of these students started off aspiring to earn a bachelor’s degree, most leave college with no credential to show for it.

Of course, students do have an option to complete an associate degree, which can be completed in as little as two years. But this is not a sufficient solution. For many students, associate degrees require remediation, extending the time to completion. Moreover, research has found that liberal arts and general studies associate degrees have little labor market value; they are useful primarily as a stepping stone to a bachelor’s degree. Many occupational associate degrees do have solid labor market value, but they account for only a minority of such degrees. Lastly, as noted above, many community college students do not bother to obtain their associate degree on their way to earning a bachelor’s degree. In effect, the enrollment share of community colleges exaggerates the labor market role of the associate degree.

Thus, many students spend time and money in college but fail to earn any credential, and many others may regard current programs as inadequate for their skills needs. One possible way to improve this is to give credentials for smaller amounts of learning. If a student leaves after a year, she would still have some formal recognition of her skills that has value in the labor market. This basically describes a postsecondary credit-bearing certificate (and perhaps some non-award, competency-based education programs; see Ellucian, 2016). Certificates are college credentials that take less than two years, and often less than one year, to complete. The large majority of certificates are in occupational areas, and they are the fastest growing postsecondary award. Certificate programs generally have higher completion rates than associate degree programs (as evidenced by the high completion rates of colleges that exclusively grant certificates, such as the Tennessee Technical Colleges; see Complete College America, 2010). Also, many certificates have robust labor market value (Jepsen, Troske, & Coomes, 2014).

These certificates or short-term credentials appear to address many of the perceived flaws in the higher education system. When targeted appropriately, they produce specific mid-level skills needed by the economy. And they reward students for smaller amounts of accumulated credits rather than leaving so many students with credits, and often debt, but with no credential recognized in the labor market. They are also appropriate for the adult worker who needs to acquire new skills for a promotion or job change or to respond to changing skill requirements. From this point of view, the rapid growth of certificates is a positive trend.

But there are some reasons to be cautious. First, one needs to interpret the positive outcomes, especially the higher completion rates, with care. It is not easy to identify who is in a certificate program, and so it is not easy to calculate the associated program completion rate. Moreover, a student who enters a specific occupational certificate program has, for better or for worse, chosen to enter a program with a well-defined occupational outcome. Students entering transfer-oriented general education programs at community college probably have much more poorly defined goals. These differences across students may explain much of the difference in outcomes.

Second, the growth of certificates as major contributors to the portfolio of higher education credentials must be accompanied by a system to help students choose programs

and occupational goals. Short-term credentials in academic or general studies areas have weaker labor market value and so may not help sub-baccalaureate students get good jobs (Belfield & Bailey, 2017).

Third, if certificates are particularly valuable for low-income and first-generation college students, then growth in certificates will lead to a further stratification of the higher education system in which high-income students earn bachelor's degrees (and more) while low-income students end up in short-term certificate programs. And, while certificates do tend to increase the earnings of certificate holders on a one-time basis, bachelor's and even associate degrees tend to lead to sustained increases in earnings (Belfield & Bailey, 2017). Thus, earning a short-term certificate is better than floundering around in a general studies program, but heavy reliance on certificates as a core higher education credential runs the risk of institutionalizing or at least reinforcing socioeconomic stratification.

One answer to the potential problems associated with giving certificates a more central role in higher education is the development of a system of stackable credentials. This system would allow a student to earn a short-term credential that would be valuable in the labor market if the student stopped out of college or needed to work full-time. Then the student could return to college at the original or another institution to continue working toward a higher degree without losing credits. For example, an individual might enroll in a certificate program to become an accounting clerk, then enroll in a program to become a payroll clerk or business assistant, and finally complete an associate degree in accounting. As another example, a student might serially acquire certificates in medical insurance and medical transcription; these might then lead to an associate in science degree and a career as a health technician.

Certificates that are stackable offer the benefits of marketable credentials based on a relatively small number of credits, and they have the potential to lead to higher level degrees and more complex skills. Thus, they do not act as a dead end to low-income or first-generation college students who face many barriers to success in college and who might benefit disproportionately from the short-term nature of the credential.

However, stackable credential programs are not a single group. So far we have discussed a stackable credential system that starts with a short-term certificate and leads

to a higher-level degree or credential. This is a way that a student can acquire a credential on the way to an associate or bachelor's degree. We refer to this type of stack as a *progression stack*. But there are other paths with different purposes that involve combining short-term credentials with each other or with degrees.

Short-term credentials can be used to supplement prior degrees. In this case, adults may find that they need to supplement their bachelor's degree in say, humanities, with a certificate in a more marketable occupational area. Or they may need to pick up a specific new skill as their job responsibilities grow or change. In earlier decades, this type of supplemental skill acquisition was often carried out through the employer, but employers are increasingly reluctant to provide any training internally (Cappelli, 2015). We refer to the circumstance in which certificates meet a new labor market need or help an individual with upskilling as a *supplemental stack*.

In a third type, the individual can accumulate a series of compatible short-term awards such that his overall skill level is higher and his labor market opportunities are improved.¹ In this case stacking does not lead to a higher level degree but rather to an accumulation of short-term credentials. Combining more or less independent certificates might be logistically easier because it would not require coordination of content to avoid loss of credit, but at the same time, it would result in an accumulation of skills that might lack coherence. We refer to these as *independent stacks*. This accords with the Department of Labor's definition of stackable credentials 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. DOL, 2012). It also fits with our above examples from the accounting and health fields. In all of these cases, the short-term credential should itself have value in the labor market and be portable among colleges.

Although we will report on the prevalence of all three types of stackable credentials, we focus primarily on progression stacks, as these are the types of sequences of credentials that can help address the deficiencies of the bachelor's degree-dominated postsecondary system design. Thus we concentrate attention on stackable credentials as a

¹ The definition of stackable credentials by Austin, Mellow, Rosin, and Seltzer (2012, p. 7) captures this idea of the benefits "so that students are able to earn shorter-term credentials with clear labor market value and then build on them to access more advanced jobs and higher wages.... Stackable credentials also increase the persistence and motivation of the learner by offering smaller, yet recognized subgoals."

way into the higher education system for students, especially for low-income and first-general students, which allows them to acquire intermediate credentials should they need to stop out of college or leave altogether but that nonetheless maintains a degree track. Supplemental stacks serve an upgrading or reskilling purpose. We have a less clear sense of the role of independent stacks, that is, of accumulating multiple short-term credentials that do not lead to a degree. (We will explore the earnings implications of multiple certificates in future research.)

Although the notion of the stackable credential is logical and attractive, and has many advocates, it is not clear how often stacking takes place and how many individuals combine short-term credentials to create a coherent and more comprehensive education. Certainly it depends on how stacking is defined and which credentials are assumed to be complementary rather than substitutes for each other. So far, empirical research on stackable credentials is very limited.² The number of such credentials obtained per year and across workers is unknown; as well, there is little information on either the characteristics of students who stack their awards or the labor market value of acquiring stackable credentials. If stackable credentials are to become an important part of higher education, we first need to identify them, estimate how many workers acquire them, and measure their value.

2. Identifying Stackable Credentials

Ideally, stackable credentials should have three key features. First, each credential in the “stack” should be of short duration. Second, they should have labor market value by themselves, thus adding to the student’s earning power. Third, for progression stacks, the sequences should be structured such that enrollees have a clear pathway over multiple awards to completion of a degree (without losing credits from earlier credentials). But in many cases, it is difficult to determine whether sequences of credentials have these characteristics.

² A search of the term “stackable credential” on Web of Science (<https://apps.webofknowledge.com/>) yields one article.

In theory, it should be straightforward to determine the length of credentials, or at least credentials that comprise a collection of credit-bearing courses, and so identify only short-term credentials as stackable. However, few surveys report this information, and many non-degree programs are not full-time. In principle, degrees could be stacked, and the associate-to-bachelor's progression could be seen as a stackable sequence. But the very low completion rate for associate degrees suggests that this sequence does not serve the goal of stackability—providing a short enough credential to significantly increase the likelihood of completion. Therefore we exclude degrees as intermediate credentials because they fail to meet this criterion.

Another challenge in designating a portfolio of awards as stackable is that the awards in the stack should have labor market value separately. There is a growing body of research on the labor market value of certificates (Jepsen et al., 2014). On average they have value, although there is mixed evidence for credentials taking less than one year. But there is significant variation in the value of certificates, with those in health and career-technical programs generally being the most valuable (Xu & Trimble, 2016). Overall, non-occupational certificates appear to have little labor market value (the same is the case for non-occupational associate degrees). Strictly speaking, these types of certificates should not therefore be included in a stackable system. Research also suggests significant variation in the value of even the same titled certificate when conferred by different colleges or in different labor markets. For simplicity we include all certificates even though we acknowledge that some may not have labor market value. Therefore our counts will be overestimates of the prevalence of stackable credentials.

Third, a stackable credential should fit in with a clear pathway to a degree over multiple credentials without losing credits. This is more difficult to identify. Ideally, a stackable system of distinct credentials could be presented formally as a sequence of courses and certificates leading to a degree. In the Appendix we present an example of a set of course requirements for an associate in science degree in computer networking that lists intermediate certificates that can be earned as the student progresses through the degree requirements (see Figure A1). Some colleges are designing such systems, but commonly available datasets do not indicate whether credentials are part of such a system. In the absence of a formally defined system, it might be possible to assess

sequence coherence by examining credential titles in transcripts, but titles differ across colleges and may not indicate any appropriate links among credentials. As a result, for practical reasons, we count all sequences that involve a certificate followed by a degree; we do not exclude some sequences involving certificates because they are not part of a coherent sequence leading to a degree. This will yield an overestimate of the prevalence of progression stacking.

An additional challenge in identifying stacks is that there are many non-credit awards that may complement credit-bearing certificates and degrees (see Ellucian, 2016). These awards are highly varied across occupations and skills, and their program content is often not explicitly set out. These awards are typically of short duration and are often described as directly vocational, and so they may serve as part of a credential stack. However, their labor market value is very much unknown, so we cannot affirm that they should be included as stackable credentials.

Finally, an individual must have more than one award in order to be included in the stackable credentials group. A student who obtains only one award within a stackable sequence may be intending—but not succeeding—to stack. As these intentions cannot be identified, stackable credentials are restricted to “persons with stackable credentials” (not persons attempting to stack credentials).

Therefore, in this paper we use a very simple definition of stackable credentials. *Progression stacks* start with certificates and lead to subsequent associate or bachelor’s degrees. *Supplemental stacks* involve certificates earned after degrees, and *independent stacks* involve multiple certificates in the absence of any degree. Without much more detailed investigation we cannot tell if any particular certificate is structured into a clear progression to a degree, yet by simply looking at the place of certificates in the sequence of credentials we will at least get a measure of the maximum extent of student participation in credential stacking. Separately, we consider how a non-credit vocational award might fit as a stackable award.

3. How Many Stackable Awards Are There?

To measure the number of stackable credentials, we examine a series of datasets. Population-level data are useful in placing upper limits on the number of persons with stackable credentials. But these datasets typically do not have sufficient information on the features of each award so as to match with the expected features of stackable credentials. Also, these datasets do not follow students over time. However, more information—including longitudinal data—is available in survey datasets and transcript files.³

3.1 Population-Level Counts

Table 1 shows the breakdown of undergraduate awards based on the prior award status of the recipient. These numbers are from the National Student Clearinghouse for the academic cohort of 2014–15 (National Student Clearinghouse Research Center, 2015, 2016). Overall, one fifth of all awards are earned by persons who had already received a postsecondary credential (21.6 percent). This group—712,200 awardees—is the annual cohort size of undergraduates with multiple awards. But not all of these awardees have stackable credentials.

Using the definition from above, the number of awardees with all three types of undergraduate stackable credentials is the sum of those who accumulate multiple certificates and those who earn a certificate either before or after a degree. Almost 15 percent of all awards are certificates, but 80 percent of these are first-time awards. Of the remainder, *progression stacks* (an associate degree/bachelor's degree after a certificate) account for 3.2 percent of all awards; *independent stacks* (at least two certificates) account for 1.5 percent; and *supplemental stacks* (certificates after completing an associate degree/bachelor's degree) account for 1.5 percent of awards. In total, the annual cohort with stackable credentials is 210,000 awardees. Their awards account for 6.2 percent of all undergraduate awards (shaded in Table 1).

³ Unfortunately, data is not available on the content of each award to establish that the credentials do stack in terms of skills acquired.

Table 1
Distribution of Degrees Awarded by Prior Award Status

	Certificate	Associate Degree	Bachelor's Degree	Total
No prior award	11.8%	23.7%	42.9%	78.4%
Prior certificate	1.5%	2.4%	0.8%	4.7%
Prior associate degree	1.0%	2.0%	10.6%	13.7%
Prior bachelor's degree	0.5%	1.0%	1.8%	3.3%
Total				100.0%
Total awards				3.3 million

Note. Source is NSC Research Center (2016, Table 1). Data representative of academic year 2014–15.

As shown in Table 1, there are award holders who might be considered to have stacked under an alternative definition where the length of award is extended. This would include: award holders who already had the same level of degree and now have two associate degrees or two bachelor's degrees; and associate degree recipients who previously obtained a bachelor's degree. If these groups are included, the count of stackable credentials awarded each year would be substantially larger (approximately tripling in size). Students who earn an associate degree on the way to a bachelor's degree, which is the traditional transfer pathway from a community college to a four-year college, account for most of this increase. But we have ruled this out because we have required stacks to include at least one certificate.

The NSC data establish the flow of stacked credentials each year, which is the number of stacked credentials that are added in a year. However, there have been significant changes in numbers and types of awards over the last decade (on certificates, see Bailey & Belfield, 2012), and there may be awards outside the NSC records. Therefore, it is important to check how this flow relates to the overall stock of adults in the U.S. labor force who have stackable credentials.

3.2 Survey Data: NLSY97

The number of stackable certificates people accumulate over time can be seen using longitudinal survey data. Here we examine the 1997 cohort of the National Longitudinal Survey of Youth (NLSY97) and look longitudinally over adults' early working lives (up to age 31); in the next section we examine cross-sectional evidence for all adults from the 2008 panel of the Survey of Income and Program Participation

(SIPP).⁴ Both surveys have detailed information on postsecondary education, but neither is perfect: NLSY97 has the date of each award and is very recent, but it has a short window; the SIPP has a lot of detail but is from 2008 and does not have the date of each award. Nevertheless, for both datasets we can distinguish between those with certificates and those with either a non-credit certificate or a license to practice in a profession.

Table 2 shows the proportions of individuals with certificates by age 31, based on data from the NLSY97. This survey has followed 8,984 persons born in 1980–84 from their high school experiences up to the current time (2013). Critically, Table 2 is derived from the postsecondary transcript file of the NLSY97; this file is created directly from the college transcripts of the survey individuals and not from their self-reported information. These transcripts yield precise information about certificate accumulation. The transcript code is “Undergraduate Certificate or Diploma (Occupational or Technical Program)” received from a postsecondary institution. The college transcript sample in column 1 is contrasted with the full sample in column 2.

Across the college sample, 55 percent have any postsecondary award. Looking at awards per student, 7 percent have a certificate, 13 percent have an associate degree, and 40 percent have a bachelor’s degree. These awards are not mutually exclusive; on average, each college completer accumulates 1.1 awards.

Award combinations are given in the lower rows of Table 2. A very small proportion of college students (0.3 percent) are independent stackers. A small proportion of college students (0.7 percent) obtained progression stacks, with numbers split evenly between those with associate and those with bachelor’s degrees. The most common pattern is supplemental stacking: 1.9 percent of students obtained a certificate after their degree. This proportion is not trivial given the relatively young sample and the overall rate of certificate accumulation of 7.3 percent. In total, we identify 3.1 percent of all college students as stacking. Across those with postsecondary awards, the stacking group represents 5.9 percent. Notably, this figure is close to the flow estimate of 6.2 percent derived above using NSC data.

⁴ We do not use data from the Educational Longitudinal Survey of 2002, although this does include transcripts. The follow-up for these respondents is to age 26 only.

Table 2
Educational Attainment and Certificates: NLSY

	College Sample (%)	Full Sample (%)
Certificate, associate degree, or bachelor's degree	54.8	29.7
Certificate	7.3	3.9
Associate degree	13.3	7.2
Bachelor's degree	40.2	22.0
Independent stacks (>1 certificate)	0.3	0.1
Progression stacks (certificate before associate degree)	0.3	0.2
Progression stacks (certificate before bachelor's degree)	0.4	0.3
Supplemental stacks (certificate after associate degree)	1.0	0.5
Supplemental stacks (certificate after bachelor's degree)	0.9	0.5
All stacked credentials	3.1	1.7
Observations	3,818	8,984

Note. Source is the NLSY97 postsecondary transcript file. Individuals may have multiple awards, including certificates before and after degrees. Bachelor's degree group includes those with advanced degrees. Postsecondary transcript weights and 2013 panel weights applied.

3.3 Survey Data: SIPP

We also examine the Survey of Income and Program Participation (SIPP) data for information on stacking. The SIPP is a national survey of individuals and households and so comes closest to a stock measure of stacking across the population. Unfortunately, regular waves of SIPP do not include much information about certificates. In the 2008 wave, a special module of questions was asked about professional awards as well as for-credit and non-credit certificates. We use responses to this module to investigate stacking (see also the summary report by Ewert & Kominski, 2014).

Frequencies of postsecondary attainment from the SIPP are shown in Table 3, with the college sample in column 1 and the full population sample in column 2. For those who ever attended college, almost seven in ten received an award. Across the college sample, about 6 percent obtained a certificate, 16 percent an associate degree, and 53 percent a bachelor's degree. These groupings are not mutually exclusive (they thus add up to more than 69 percent), again implying that some persons received multiple awards.

The SIPP module allows for detailed investigations of the different definitions of certificates. Specifically, a certificate is defined as a credit-bearing award earned at a

postsecondary institution that required at least one month of study conducted mostly through instruction (rather than self-study).⁵ As shown in Table 3, a large proportion of certificate holders obtained multiple awards, with 1.4 percent of all college attendees also getting an associate degree and 3.6 percent also getting a bachelor’s degree (the order of receipt is not available in SIPP). Hence, the total proportion of college enrollees who obtained either a progression or supplemental stack is 5 percent.

Table 3
Educational Attainment and Certificates: SIPP

	College Sample (%)	Full Sample (%)
Award	69.1	40.3
Certificate	5.7	3.8
Associate degree	16.3	8.9
Bachelor’s degree	52.8	28.9
Progression/supplemental stacks:		
Certificate with associate degree	1.4	0.7
Certificate with bachelor’s degree	3.6	2.0
Observations	23,834	44,702

Note. Source is SIPP2008, Wave 13 Module. Individuals may have more than one award. Independent stacks omitted: multiple certificates are not recorded. Date of awards unknown. Bachelor’s degree group includes those with advanced degrees. 2013 panel weights applied. Persons aged 18–65.

Results from the SIPP show higher rates of stacking than the NLSY97. Much of the difference is because the SIPP includes all adult workers: if we restrict the SIPP sample to persons aged under 32, the rate of progression/supplemental stacking is 3.3 percent for the college-going population (and 1.8 percent for all persons). This estimate is very close to the 3.1 percent (and 1.7 percent) reported with NLSY97 data in Table 2.

⁵ For counting these certificates, the key distinction is whether to include awards from a trade, vocational, technical, or business school (outside of the postsecondary college system). In our analysis, these awards are excluded.

3.4 Community College Transcript Information

To supplement evidence from population and survey data, we analyze transcript-level data from the North Carolina Community College System (NCCCS) and the Virginia community college system (VCCS).⁶ As well as providing alternative descriptions of stacking, the data provided by these college systems allow us to look in more detail at patterns of credentials. However, these data are primarily indicative of multiple awards rather than a sequence of awards that lead to a structured career path. For students who started in the NCCCS, Table 4 shows the distribution of awards attained (Liu, 2014). These are cohorts who started in 2002–07 and are followed until 2014. As shown in the first row, 82 percent of awardees received one award within this time frame, and 18 percent received more than one award.

Nevertheless, Table 4 shows that a significant proportion of award holders have stackable credentials. Progression stacks are 2.8 percent of all awards. Supplemental stacks are 2 percent and independent stacks are 6.3 percent of all awards. Unsurprisingly, by providing many certificate programs, community colleges play a large role in the provision of independent stacks. Weighted to the national level, this equates to approximately 110,000 stackable credentials annually from the community college sector; this total is more than half of all stackable awards.

Table 4
Distribution of Degrees Attained by Prior Award Status for North Carolina Community College System Entrants (2002–07)

	Certificate	Associate Degree	Bachelor's Degree	Total
No prior award	16.2%	35.4%	30.2%	81.8%
Prior certificate	6.3%	2.6%	0.2%	9.1%
Prior associate degree	2.0%	0.8%	6.3%	9.1%
Total				100.0%
Total awards				132,800

Note. Adapted from Liu (2014, Table 2). Cohorts entering NCCCS from 2002–07. No students entered NCCCS with prior bachelor's degrees. Certificates include diplomas.

⁶ Data provided in February 21, 2016 memorandum from Anna Wen to VCCS.

NCCCS data also show that stackable credentials are found across all subjects, although they are more common in construction/mechanics programs (in which one quarter of all awardees obtained a stackable credential) and cosmetology (in which one fifth of all awardees obtained a stackable credential). Thus, patterns of stacked awards do not clearly match with overall patterns of certificates, where almost half are in health, nursing, or allied health fields (Bailey & Belfield, 2012).

Within the Virginia community college system, VCCS reports that approximately 3 percent of all certificates are stacked (although its definition of stackable awards is much narrower).⁷ As found for North Carolina, stackable credentials are found in most fields of study, although the most common fields are general education, health/nursing, and protective services (12 percent of awardees in these fields obtained a stackable credential).

However, administrative records may yield imprecise estimates of stackable awards. Approximately 2 percent of community college awardees received two awards at the same time; these awards may be double majors or stacked awards (and if all are stacked, this would double the number of stacked awards). Also, administrative system files cover only a limited time horizon (seven years in this case) and only the colleges within that system. It is unclear how many individuals return to college later to obtain a stacked credential.

3.5 Characteristics of Persons Who Stack Credentials

Overall, we estimate that 3–5 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. Transcript data can help identify any distinctive characteristics of individuals who stack credentials. We use NLSY97 and SIPP data to model the characteristics of individuals who stack credentials compared to the broader college-going population (including non-completers).

Correlational results are given in Appendix Table A1. These show coefficients from logistic regressions with individual-level stackable credentials as the dependent variable. Compared to the college-going population, those with stackable credentials are

⁷ As well as the restrictions described above, VCCS counts awards as stackable based on the length of the certificate.

more likely to be women and less likely to be minority students. They are more likely to come from families with lower parental education and lower family income. Also, stacking varies by region, with fewer students in the Northeast and South obtaining stackable credentials.

Using NCCCS data, community college students who stack credentials have similar characteristics to the general certificate-holding student population. In terms of high school GPA, race/ethnicity, expected financial aid contribution, and age at entry, those with stackable credentials closely compare with those who have certificates as their highest qualification (Liu, 2014).⁸

4. Vocational Awards

We have focused our analysis of stackable credentials, especially progression stacks, on certificates. The most important reason for this is that they comprise credit-bearing courses taught at institutions of higher education and appear on transcripts. This has allowed us to observe how certificates have been combined with other certificates and degrees. But certificates are not the only form of short-term credential that might be combined to aggregate more learning: there are many, varied types of vocational award that may include some instructional component or competency test but that are not credit-bearing. These may substitute for a certificate, and so including these vocational awards may lead to a significant increase in the prevalence of stackable credentials (although their link to completion of a degree is not obvious). To estimate how these vocational awards fit with stackable credentials, we re-analyze our two main longitudinal datasets.

The NLSY97 includes questions on vocational awards, including any credentials obtained for licenses or for vocational purposes. These questions in NLSY97 show much higher rates of credentialism (see Table A2). By age 31, more than two fifths of all persons have some type of vocational award or non-credit certificate. However, there are two reasons for doubting that these certificates should count as stackable. First, the extent

⁸ Using the “purely vocational” certification definition as applied by Ewert and Kominski (2014, Table 3), there are some distinctions from the general student population. For those with some college but no bachelor’s degree, certificate holders were less likely to be of racial/ethnic minority status and more likely to be employed workers aged 30–50; but there was no difference by gender.

to which these awards are sufficiently rigorous as to merit being classified as stackable is hard to know (in some cases, the title of a non-credit certificate is informative, but mostly as an indication that this award is not a complement to credit-bearing college credits).⁹ Second, more than one half of persons with these awards either have a high school diploma or GED as their highest level of enrollment. Potentially, these persons may be independent stackers if multiple non-credit bearing programs can be assumed to stack together. Nevertheless, excluding those with no postsecondary enrollment, NLSY97 shows that 18 percent of individuals have a certificate or degree plus some form of vocational award. Two thirds of these would be classified as progression stacks and the remainder as supplemental stacks. Thus, even if some of these awards may convey few skills, non-credit vocational awards play a significant role in skills upgrading and might be a more significant complement than additional postsecondary stacking.

We explore the overlap between vocational awards and stacking in Table 5. The NLSY97 has information on vocational awards, including vocational certificates, medical certificates, vocational licenses, and competency-based certificates. We classify all these as vocational awards and cross-tabulate them with postsecondary certificates and degrees.¹⁰ Under this expansive definition of certificates, three in ten college students stack credentials, and each type of stacking is increased sizably. Notably, 8.6 percent of college students have stacked at least two vocational awards. As noted above, we cannot establish that this form of independent stacking is valuable. Nevertheless, it shows that many college students are using the informal education market to obtain skills. Similarly, progression and supplemental stacking rates are much higher if vocational awards are counted.

⁹ For example, respondents indicate possession of certificates in basic training, first aid, food handling, and driving.

¹⁰ As we do not know the dates of the vocational awards, we cannot distinguish supplemental and progression stacks.

Table 5
Stacking Credit and Non-credit Awards, NLSY97

	College Sample (%)	Full Sample (%)
Stacking total	30.6	22.4
Independent stacking:		
Vocational awards >1	8.6	7.9
Vocational award + certificate	2.7	1.8
Progression/supplemental stacking:		
Vocational award with associate degree	5.6	3.7
Vocational award with bachelor's degree	13.7	9.0
Observations	4,470	7,141

Note. Source is NLSY97 data. Weighted percentages as of 2013. Vocational award includes vocational certificate, license, competency-based certificate, medical certificate, and certificate license.

Data on certifications in SIPP yields a similar conclusion. Appendix Table A3 shows the magnitude and distribution of general vocational certification, based on SIPP data. Almost one quarter of the U.S. adult population (53 million persons) has a vocational certificate or license of some kind. Again, the majority of these credential holders have no college experience, so they would not be included in our definition of holders of stackable credentials. Nevertheless, 56 percent of all vocational awards holders (or 29 million persons) have a degree. Also, SIPP data is suggestive of significant numbers who are independent stackers: three quarters of certificate holders also possess a vocational award; potentially, these two areas might connote an independent stack. Therefore, as with NLSY97 data, including vocational awards would significantly increase the incidence of stacking. With SIPP, certification and certificates overlap only moderately.

Clearly, many individuals are acquiring some form of vocational award or skill credentials, in addition to traditional associate or bachelor's degrees or postsecondary certificates. Theoretically, a student could earn a certificate based on knowledge accumulated from any source and have that applied as credit for a degree; or an institution might confer a degree based on the accumulation of a series of vocational awards. Indeed, over the last few years, educators have worked to develop competency-based awards that would confer degrees based on successful completion of some assessments. While some progress has been made, this movement is still very much in its

infancy. Until very recently, even postsecondary certificates have not been incorporated formally into degree requirements in the sense that they have replaced credits accumulated through courses; articulating links between degrees and the varied vocational awards is much more challenging. This suggests to us that the large majority of the award/degree combinations identified in these datasets are supplemental rather than progression stacks; that is, college graduates are simply adding on extra skills to meet labor market needs that their initial degree did not meet.

This conclusion holds most strongly for the extensive non-credit instruction and vocational awards (Ellucian, 2016). These credentials do not meet the criterion that requires stackable credentials to be part of a clear pathway to a degree without loss of credit. Although we do not have systematic data, we suspect that, to the extent that they might involve something similar to stackable credentials, they would not be part of a progression stack because they cannot, by definition, add credits toward a degree. If they result in some sort of informal indication of skill acquisition, then they might be part of an independent or supplemental stack. Moreover, there is still the significant issue as to whether these vocational awards do have any labor market value. To our knowledge, there is no clear information on the labor market returns to non-credit and vocational awards.

5. The Future of Stackable Credentials

Stacking credentials—combining short-term awards either with other short-term awards or with degrees—has the potential to help align skill supply with skill demand, especially for low-income and first-generation college students. But there are various types of stacks—progression, supplemental, and independent—and they are likely to have different labor market impacts and meet different student needs.

There is no question that short-term awards are growing, including vocational credentials and more formal, credit-bearing certificates. But how this growth matches with the growth of stacking is unclear. First, many of the vocational credentials stand alone and are not combined with degrees. Second, when our definition of stacks is limited to certificates, none of the three forms of stacks account for any more than single digit

percent shares of degrees. Within this category, the largest group is independent stacks—accumulation of more than one certificate—even as progression stacks—certificates that lead on to degrees—would ideally be most impactful. Progression stacks have the potential to address some of the completion barriers faced especially by low-income and first-generation college students. Third, our measure of progression stacking includes any sequence in which a certificate is earned before an associate or bachelor’s degree. This measure does not reject awards that are in different disciplines or that are do not build on each other without losing credits, and as such it is expansive in what is counted as progression stacking. Hence, a narrower definition more consistent with the underlying conceptual model suggests a trivial amount of stacking in the aggregate.

Better data on vocational credentials might show a wider spread of stackable credentials. Indeed, from the cross-sectional survey data that we do have, we conclude that supplemental stacks are important and are probably growing significantly. In contrast, what we do know about vocational credentials suggests that so far they have not been incorporated in large numbers into progression stacks. Thus our conclusion that progression stacking is not a significant phenomenon based on an analysis of combinations of certificates with degrees would not change even if we could take better account of these credentials.

But this may be changing. There is a growing interest in working toward accumulating different types of short-term credentials. These include digital badges, different types of certification based on competency-based education, and credit for prior learning. All of these might provide some form of short-term credential that could be used in the labor market while or before a student pursues a degree through additional education. Digital badges in particular have attracted a great deal of attention lately. For example, reformers have advocated the use of digital badges to recognize specific skills learned within a program. But badges do not yet seem to be building blocks leading to a degree but rather an indication of special supplemental skills and activities.¹¹ Of course, it would be possible to design these badges as modules that add up to degrees. Other structures like Khan Academy courses could be combined in a coherent way to add up to

¹¹ For example, here is one badge earned by a student in the Illinois State University Honors program: “Congratulations! This badge recognizes your active participation in the Honors Program 2nd Annual Professional Development Night” (see <https://credly.com/credit/13195234>).

degrees or at least to be initial components of a degree program. Indeed in 2012 and 2013, many educators thought that higher education might be “unbundled” such that students would be able to assemble their education from many sources on the Internet or at various institutions and stack the indications of skill acquisition into complete degrees (Kelly & Carey, 2013).

Another change may come from growth in fully online degrees and even degrees based on competencies (where students independently assemble their own education using various sources for learning). However, the types of students for whom progression stacks might be most useful—first-generation college students or students facing various barriers—are least likely to benefit from online or independent degrees (Xu & Jaggars, 2014). Indeed, one reason that the interest in unbundled higher education has lost steam is the discouraging results in online courses for developmental education math students (Rivard, 2013). This suggests that the types of students for whom progression stacks might be most useful—students who might have trouble getting through a full degree program—would not be served well by an education system in which individual students, more or less on their own, would stack a series of credentials to piece together a degree.

Perhaps the most significant opportunity for the growth of stackable credentials emerges from the “guided pathways” literature (Bailey, Jaggars, & Jenkins, 2015). Students, especially first-generation college students who lack social and financial support for their college experience, need more structure and guidance rather than less. So in contrast to the unbundling strategy, “guided pathways” to degrees may provide an opportunity to develop progression stacks that would be helpful for low-income and first-generation college students. This approach involves a more explicit, coherent, and self-conscious design of course sequences leading to degrees and the development of program maps that indicate the sequence of courses that a student needs to take to successfully complete a degree (see the details in Bailey et al., 2015). Designed appropriately, these maps can include intermediate shorter term credentials that students can earn (perhaps even automatically) as they progress through their sequence of courses. Indeed, the example of the networking associate degree from St. Petersburg College in Florida discussed earlier (see Appendix Figure A1) was designed explicitly as part of a guided

pathways reform. And in the summer of 2015, St. Petersburg embedded certificates into the majority of their associate of science degree programs. The college introduced a system of “auto-graduation” in which students automatically earn a certificate when they complete the appropriate courses as they move through their degree sequence. As of the winter of 2017, more than 300 colleges have explicitly embarked on guided pathways reforms, which include the development of explicit program maps. While most are not embedding certificates (yet), the program maps can form the basis of the spread of progression stacks.

Perhaps the meager progress in the development of stackable credentials, or at least progression stacks, over the last two decades—despite widespread discussion and enthusiasm—results from the lack of a coherent framework within which to incorporate short-term credentials into degrees. Movement to create more coherent and easily understood degree designs and maps may provide that framework and may serve to finally facilitate the significant growth of progression stacks.

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Appendix

Table A1
Characteristics of Persons with Stackable Credentials Versus College-Going Population

Characteristic	Stackable Credential	
	NLSY97	SIPP
Female	0.364*** [0.000]	0.390*** [0.000]
Black	-0.033*** [0.001]	-0.442*** [0.000]
Hispanic	-0.288*** [0.001]	-0.585*** [0.000]
Region		
Northeast	-0.685*** [0.001]	-0.090*** [0.000]
South	-0.472*** [0.000]	0.261*** [0.000]
North Central	-0.254*** [0.000]	
West		0.126*** [0.000]
ASVAB Score in 1997	-0.000*** [0.000]	
Mother's high school graduation status		
Dropped out	0.315*** [0.000]	
Graduated	0.241*** [0.000]	
Family income (000s)	-0.000*** [0.000]	
<i>N</i>	3,418	28,429

Note. Sources include NLSY97 and SIPP2008 data. Stackable credential includes progression, independent, and supplemental stacks as per Tables 2 and 3. Logistic regression. Robust standard errors in brackets. NLSY97 includes dummy variable for missing ASVAB score and missing family income.

*** $p < 0.01$.

Table A2
Educational Attainment and Vocational Awards, NLSY97

	Women (%)	Men (%)
Vocational award (any)	43.2	39.0
Vocational award; no college award	22.6	25.6
Progression stacking:		
Vocational award before associate degree	3.4	2.1
Vocational award before bachelor's degree	9.0	6.0
Supplemental stacking:		
Vocational award after associate degree	2.1	1.7
Vocational award after bachelor's degree	6.1	3.6

Note. Source is NLSY97, $N_{\text{male}} = 2,908$; $N_{\text{female}} = 3,230$. Unweighted percentages as of 2011. Vocational awards include general certificates and those for licenses and vocational purposes. Bachelor's degree includes advanced degrees.

Table A3
Vocational Award by Educational Level, SIPP

	Total
Percent of all adults with any vocational award	24.8%
Number	53.4 million
Of all vocational award holders:	
High school dropout/graduate or some college	43.8%
Associate degree	12.2%
Bachelor's degree	44.0%

Note. Sources are SIPP data (2008, wave 13) and Ewert and Kominski (2014, Table 1). Certificate includes professional license, certification, or education certificate. Bachelor's degree group includes advanced degree holders.

**Figure A1
Academic Pathway Course List**

ACADEMIC PATHWAY
Computer Networking Associate in Science Degree

Seq #	Course	Course Title	Credit	Type	Term Offered	Pre-Req.	Options Avail.
1	CGS 1070	Basic Computer and Information Literacy	1	Gen Ed	F, Sp, Su		Y
2	PHI 1600	Studies in Applied Ethics	3	Gen Ed	F, Sp, Su		Y
3	COP 1000	Introduction to Computer Programming	3	Core ^{1,2}	F, Sp, Su		
4	MAT 1033	Intermediate Algebra	3	PreReq	F, Sp, Su		
5	CET 1171C	Computer Repair Essentials	3	Core ^{1,4}	F, Sp, Su		
6	MAC 1105	College Algebra	3	Gen Ed	F, Sp, Su	Y	
7	CNT 1000	Local Area Network Concepts	3	Subplan ^{1,2,3}	F, Sp, Su	Y	
8	CET 1172C	Computer Support Technician	3	Core ^{1,4}	F, Sp, Su		
PREPARATION FOR COMPTIA+ INDUSTRY CERTIFICATION COMPLETED							
9	ENC 1101	Composition I	3	Gen Ed	F, Sp, Su		Y
10	SPC 1065	Business and Professional Speaking	3	Gen Ed	F, Sp, Su		Y
11	CTS 1327	Configuring and Administering MS Windows Client	3	Subplan ^{1,2,3}	F, Sp, Su		
12	CTS 1328	Installing and Configuring Windows Server	3	Subplan ^{1,3}	F, Sp, Su	Y	
13	CTS 2106	Fundamentals of the Linux/Unix Operating Environment	3	Subplan ^{1,2,3}	F, Sp, Su	Y	
COMPUTER SUPPORT CERTIFICATE COMPLETED							
14	POS 2041	American National Government	3	Gen Ed	F, Sp, Su		Y
15	CTS 2321	Linux System Administration I	3	Subplan ²	F, Sp	Y	
16	CTS 2322	Linux System Administration II	3	Subplan ²	F, Sp	Y	
LINUX SYSTEM ADMINISTRATOR CERTIFICATE COMPLETED							
17	HUM 2270	Humanities (East-West Synthesis)	3	Gen Ed	F, Sp, Su		Y
18	CTS 1334	Administering Windows Servers	3	Subplan ³	F, Sp	Y	
19	CTS 1303	Configuring Advanced Windows Server Services	3	Subplan ³	F, Sp	Y	
MICROSOFT CERTIFIED IT PROFESSIONAL: SERVER ADMINISTRATOR CERTIFICATE COMPLETED							
20	CIS 2321	Systems Analysis and Design	3	Core	F, Sp, Su	Y	
21	CTS 1411	Fundamentals of Information Storage and Management	3	Core	F, Sp	Y	
22	CTS 2370	Configuring and Managing Virtualization	3	Core	F, Sp	Y	
23	CNT 2940	Computer Networking Internship	3	Core	F, Sp, Su		

Total program credits: 67

(Includes MAT 1033 & Computer Competency)

¹ Part of Computer Support Certificate

² Part of Linux System Administrator Certificate

³ Part of Microsoft Certified IT Professional: Server Administrator Certificate

⁴ Preparation Course for CompTia A+ Industry Certification

Term Offered: F - Fall | SP - Spring | SU - Summer | Type of Course: Core - Required for the Program | Elective - Options based upon personal interest | Gen Ed - General Education | PreReq - Prerequisite | Subplan - Specific to a particular degree option