

## **CERTIFICATES AWARDED IN KENTUCKY, 2005-2006 TO 2018-2019**

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### **Summary**

Over the past twenty years, about one out of every four postsecondary credentials awarded nationally each year in the United States are certificates below the associate degree level.<sup>1</sup> In recent years, that means that US postsecondary education institutions distribute about one million such credentials annually. Yet, evidence on short-term credentials is relatively limited, even though there is notable policy push to increase the number of students pursuing short-term and vocational certificates in many states and nationally. Therefore, there is ample need to better understand educational patterns and the labor market benefits and of such pursuits.

In this report, we provide the first in a series of reports that will contribute to a better understanding of this context. In this report we describe trends in sub-baccalaureate certificates granted by postsecondary institutions in the state of Kentucky, using administrative data from the 2005-06 to 2018-19 academic years. In future work, we will continue our study through analysis of who is earning these certificates and by examining labor market benefits to pursuing certificates.

### **Policy Context**

Kentucky is an important context in which to study short-term credentials given its attention in policy debates and the rate of short-term credential seeking in the state. Kentucky has historically had among the highest rates in the country of certificates awarded per capita (nearly twice the national average), public sector certificates awarded per capita (almost three times the national average), and less than one-year certificates awarded per capita; it is also ranked in the top three states for the number of sub-baccalaureate awards per capita and the ratio of certificates awarded compared to associates degrees (with almost twice as many certificates granted as associates degrees).<sup>2</sup>

There have been high profile recent examples of policies that are likely to have affected the supply of and demand for short-term credentials in the state. For example, in the state's recently enacted performance-based funding system, institutions are credited for granting short-term credentials, and are notably given extra credit for granting credentials to low-income students and underrepresented minority students. This creates an incentive for institutions to award more credentials, which could lead to shorter credentials and particularly among certain student groups. Moreover, in 2016 state officials expanded the Work Ready Scholarship Program, boosting the availability and generosity of scholarships for students who pursue certificate and diploma study in one of five "high demand" workforce sectors.<sup>3</sup> Efforts such as these have prompted ample

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<sup>1</sup> See Digest of Education Statistics, Table 318.40. Includes bachelor and associate degrees, and certificates below the associate degree level, but not graduate degrees.

<sup>2</sup> Data from the 2007-2008 school year (see *Certificates Count*, Complete College America, 2010).

<sup>3</sup> See: <https://www.lanereport.com/103233/2018/07/bevin-expands-work-ready-kentucky-scholarship-to-include-associates-degrees-and-high-school-dual-credit-courses/>.

questions about the value proposition of short-term certificates for students and the state – questions we aspire to help the state answer.

More broadly, while short-term and stackable credentials are of acute interest to policymakers in the state of Kentucky, they are also the focus of increasing attention in many other states and nationally. There are numerous federal policies for which understanding the value of short-term credentials is critically important, including how credentials are recognized in the 2014 Workforce Innovation and Opportunity Act and current debates about Pell Grant funding for short-term credential programs. As an example of a key point of contention in the latter policy debate, policymakers are debating the extent to which short-term credentials pay off for students—and thus the extent they “merit” support with Pell Grant funds—without much evidence on which to rely.<sup>4</sup> There is also ample state-level interest in short-term credentials around the country. For example, as of 2016, at least nineteen states had legislation or appropriations that explicitly mention the stackable nature of credentials related to: (1) requirements that postsecondary institutions offer stackable credits; or (2) financial incentives to pursue stacking programs.<sup>5</sup>

### **Key Takeaways**

- The number of certificates granted in KY has increased dramatically, with annual awards over doubling from 2005-06 to 2018-19. Certificate growth well outpaced the rapid expansion of associate degrees granted over the period analyzed, and particularly in the most recent five years of data. In recent years, there are over 2.5 certificates awarded for each associate degree.
- Skilled trades are the most popular field for certificates and interest in this field has grown rapidly over time. The number of certificates granted in STEM fields and health professions have also grown, with STEM certificates having had particularly rapid growth in recent years.
- There is some evidence that the number of credits that students complete in the same field as their earned certificate is declining over time. However, data challenges make inference complicated, so this is an area in need of further inquiry.
- Credential stacking—whether from multiple certificates or from earning an associate degree after earning a certificate—appears to be gaining popularity, though further time needs to elapse to confirm that trends continue into recent years.

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<sup>4</sup> See: <https://www.insidehighered.com/news/2019/07/08/debate-over-proposed-expansion-pell-grants-short-term-job-training>. A prominent portion of this debate is focused on Pell Grant coverage for short-term programs at for-profit colleges, but similar questions are also actively debated in the public and private nonprofit sector. Further, it is not yet clear whether regulatory actions, such as the extension of Pell Grant eligibility to short-term programs, will be sought with coverage to all sectors or with different terms and conditions for public, non-profit, and for-profit institutions.

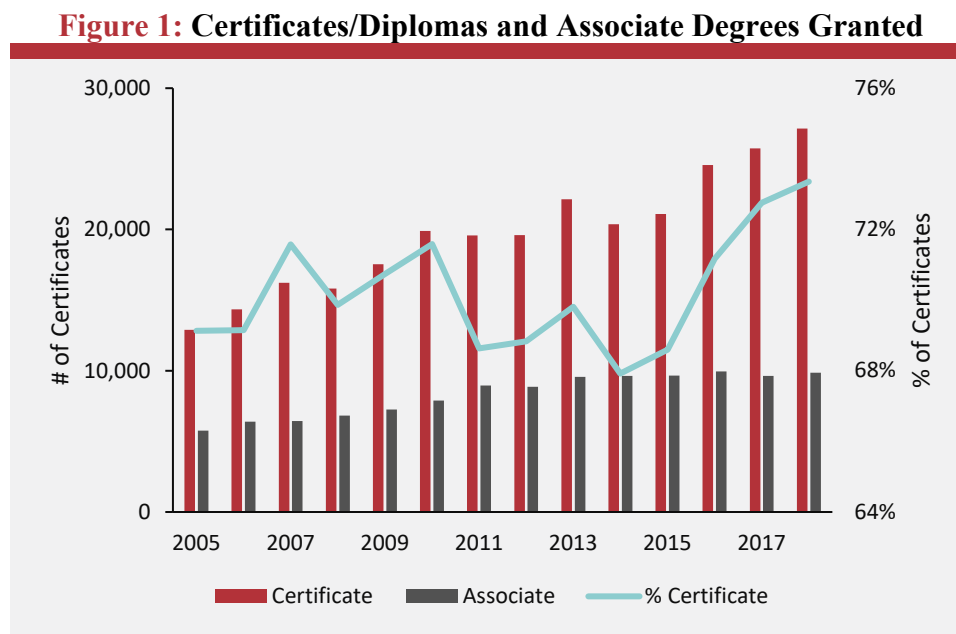
<sup>5</sup> See: National Skill Coalition, <https://www.nationalskillscoalition.org/resources/publications/file/Stackable-Credential-Scan-2.pdf>. Examples of prominent state programs are the Virginia FastForward Credentialing Program and the Minnesota ReConnect Program & Pathways to Prosperity.

## 1. Trends in Certificates Granted

### 1.1. Trends in Certificates Granted, Overall

We display the trend in certificates and diplomas granted by public 2-year colleges in Kentucky in Figure 1 (for ease of exposition we refer to both certificates and diplomas as “certificates” for the remainder of the report).<sup>6</sup> From the 2005-06 to 2018-19 academic years (note that in the graphs and text, we denote the year by the beginning year, e.g., we denote the 2005-06 academic year as 2005 and the 2018-19 academic year as 2018), the number of certificates granted has increased dramatically, over doubling from 12,901 certificates awarded in 2005 to 27,144 certificates granted in 2018. For comparison, we also include associate degrees granted in the figure. Certificate growth outpaced the rapid expansion of associate degrees granted over the period, which increased 71% from 5,760 to 9,860.

Though there was expansive growth in both certificates and associate degrees, the relatively faster growth of certificates awarded leads to the certificate share of total awards at public institutions growing from 69% to 73%. Notably, associate degree awards remained relatively flat from 2013 to 2018, while certificates awarded grew by almost a third. This means that in the most recent two years, there are over 2.5 certificates awarded for each associate degree.



Source: Author calculations based on KPEDS Degree Data in the Kentucky Longitudinal Data System. Notes: This figure represents the number and the percentage of certificates conferred between 2005 and 2018. Calculations are based on the numbers of certificates in proportion to the total number of credentials by year.

Nearly all the sub-baccalaureate certificates granted in the state of Kentucky come from the two-year public sector. However, in recent years, the 4-year public sector has granted more certificates. For example, there were 630 certificates awarded in the 4-year public sector in 2017, accounting

<sup>6</sup> Our totals are slightly different than published CPE reports.

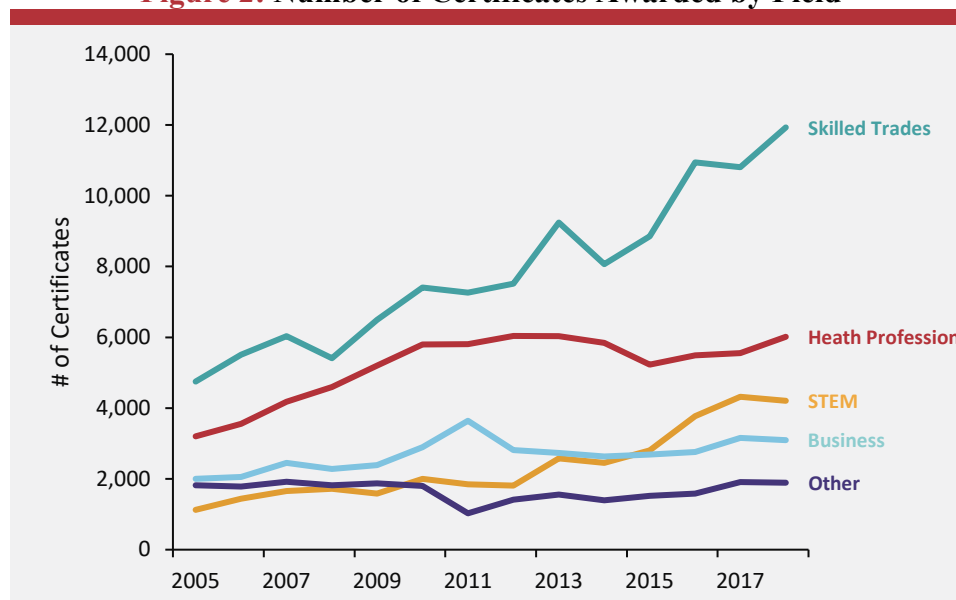
for about 2% of all certificates granted that year. Since this represents a small portion of all certificates granted, we focus our discussion in this report on the two-year sector. However, it is worth keeping an eye on certificate production in the 4-year sector in the future.

## 1.2. Trends in Certificates Granted, By Field

We next display the trend in certificates and diplomas granted by public 2-year colleges in Kentucky by field in Figures 2 and 3. We group fields of study into four general fields of study: STEM, health professions, business, and skilled trades (including construction, mechanic and repair technologies, and precision production), with the remainder of fields in the “Other” category. See Appendix Table 1 for our classification scheme.

In Figure 2, we display the number of certificates by field. Between 2005 and 2018, STEM fields experienced the largest growth from 1,125 to 4,211 (274%), which is followed by skilled trades (127%) and health profession (88%). During this period, the number of certificates conferred in business and other fields remained relatively stable. It is notable that the number of certificates conferred in STEM remained roughly flat between 2005 and 2011, but then experienced substantial growth between 2012 and 2018. In contrast, the number of certificates conferred in health profession grew markedly before around 2012 but remained relatively constant since then.

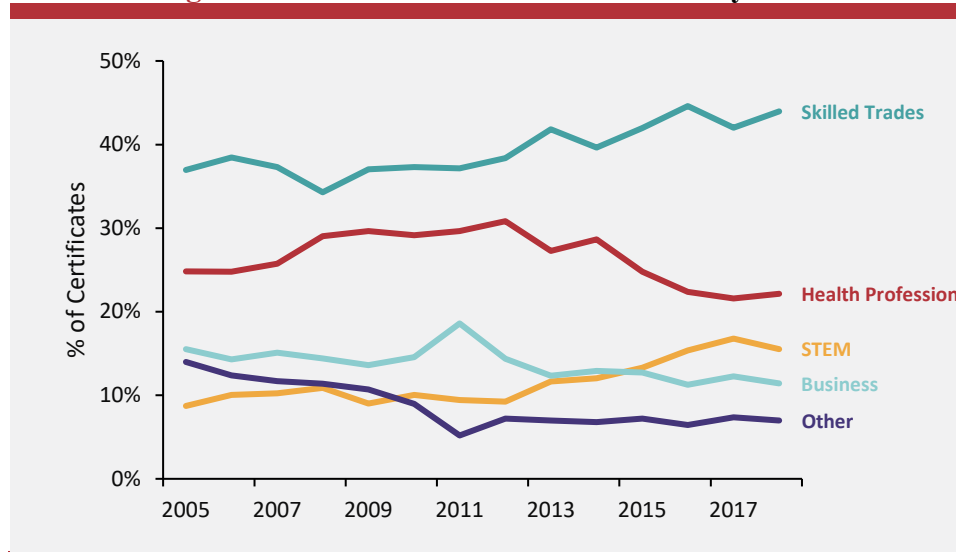
**Figure 2: Number of Certificates Awarded by Field**



Source: Author calculations based on KPEDS Degree Data in the Kentucky Longitudinal Data System. Notes: The figure presents the number of certificates conferred in each of the five fields between 2005 and 2018.

In Figure 3, we display the share of certificates by field. Certificates in STEM fields experienced the largest recent growth, increasing from around 10% of all certificates in 2012 to 17% of all certificates by 2018, while skilled trade certificates grew from 35% to 42%. During roughly this same time frame, health certificates declined from 33% to 24%. Business certificates granted were mildly decreasing, while certificates in other fields remained relatively flat.

**Figure 3: Share of Certificates Awarded by Field**



Source: Author calculations based on KPEDS Degree Data in the Kentucky Longitudinal Data System. Notes: The figure presents the percentage of certificates conferred in each of the five fields between 2005 and 2018. Calculations were based on the numbers of certificates in proportion to the total number of certificates by year and fields.

### 1.3. Trends in Certificates Granted, By Subfield

We also observe the number of certificates earned by subfield within each of the broader STEM, health professions, business, skilled trades, and other fields. We display the trends in Figure 4 below. Trends in the number of certificates show that growth in certificates conferred substantially varied by subfield.

First, we consider trends in certificate growth in health profession in panel (A). In licensed nurse training, the largest field in health profession, the number of certificates increased substantially from 2005 to 2010, dropped sharply through 2015 and increased again since then. In contrast, medical administrative assistant saw steady growth in the number of certificates awarded. Medical technology remained relatively flat between 2005 and 2017.

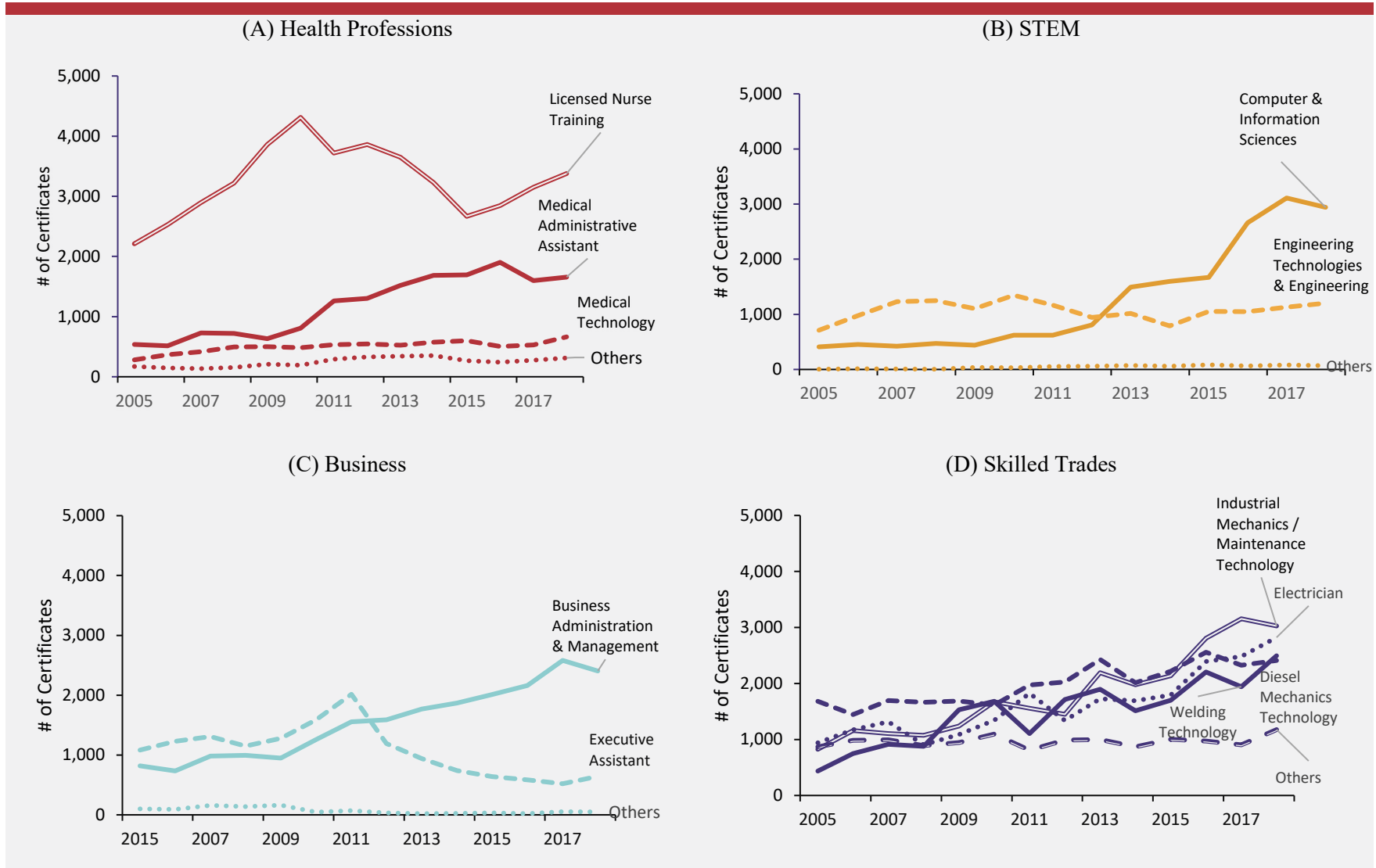
Panel (B) of Figure 4 shows trends in STEM certificates. In computer and information science, the largest field in STEM fields, the number of certificates conferred did not change much until the early 2010s and it grew substantially since then, growing about 374% from 2011 to the most recent year. Compared to computer and information science, engineering technologies and engineering experienced little change during this period.

In panel (C), we present trends in business certificates. The number of certificates awarded in executive assistant training increased and peaked at 2,150 in 2011; since then, it declined. In contrast, the number of certificates conferred in business administration and management increased continuously during this period, tripling from 821 to 2,404.

We display trends in skilled trades certificate awards in panel (D). Between 2005 and 2018, the four largest subfields: industrial mechanics/maintenance technology; electrician; diesel mechanics technology; and welding technology all grew substantially, with growth of 43% to 427%.

For brevity, we do not show trends in certificate growth in “other” fields as there were relatively fewer certificates granted in these subfields. Awards in the largest category, childcare provider and assistant, stayed generally flat over the period. We observe substantial growth in the number of certificates conferred in criminal justice/law enforcement administration (an increase from 3 to 342), commercial vehicle operators (an increase of 131% from 106 to 245), and fire science/firefighting (an increase of 690% from 11 to 87), though the absolute numbers of credentials awarded in these fields remained relatively small.

**Figure 4: Number of Certificates Awarded by Sub-Field**



Source: Author calculations based on KPEDS Degree Data in the Kentucky Longitudinal Data System. Notes: The figure presents the number of certificates conferred in each of the five subfields within each field between 2005 and 2018.

## 2. Credits Per Credential

As the number of certificates granted in the state has grown substantially, of particular interest is the length of programs pursued and the number of credits that students complete on the way to earn their credentials.

Understanding the number of credits completed is a complex task because of data limitations and student behavior. There is currently no way in the data to clearly identify which credits earned were counted for each credential; rather the data only lists courses taken by students and credits students earned for each course. Even if the data cleanly identified credits taken for each specific credential, this might not be a good reflection of investment by students since many students take more credits than are required for that certificate. It could be that taking more credits than are needed is inefficient if students are unintentionally taking courses that do not contribute to their ultimate educational goals. Indeed, the “guided pathways” movement has become popular as a way to streamline students’ choices and stay on track to their goals.<sup>7</sup> On the other hand, many community college students may choose to take courses not directly related to what is required for any specific certificate program, because they are preparing for a different educational credential (e.g., transferring credits to an associate or bachelor’s program, or preparing for a vocational certificate) or because they are investing in their human capital in a more expansive way.

In our calculation of credits per certificate, we first look at the total number of credits completed *related to the field of the certificate* (section 2.1 and 2.2) and then separately examine *overall* credits regardless of whether the credits match the academic field of the certificate (section 2.3). We consider a course to match the field of the certificate if they both have the same 2-digit Classification of Instructional Programs (“CIP”) code. This approach helps us to understand the patterns of the number of credits that students earn as they complete certificates and allows us to distinguish between credits accrued that are directly related to the certificate and those that do not share the same field. In our analysis of the number credits per certificate, we include only college-level courses passed with a letter grade of “A” through “D” or a passing grade of “P.” When students completed multiple certificates simultaneously within the same field, we calculate the average number of credits completed for each certificate by dividing the total number of credits by the total number of certificates earned by students within each field.

For the calculations *in Section 2 only*, we exclude certificates earned with or prior to completing associate degrees because it is difficult at this point to distinguish credits earned for certificates as compared to associate degrees. This limits our understanding of the full picture of credits taken as students pursue credentials, so we suggest that we engage in further discussions of how to assign credits to different educational pursuits.

We also note that our sample includes credential earners only. While understanding the pathways for non-credential earners is a critical task, such an exercise is not currently viable in our data given lack of credible information about students’ educational intentions. In future work, we aim to improve on this evidence using machine learning and other techniques.

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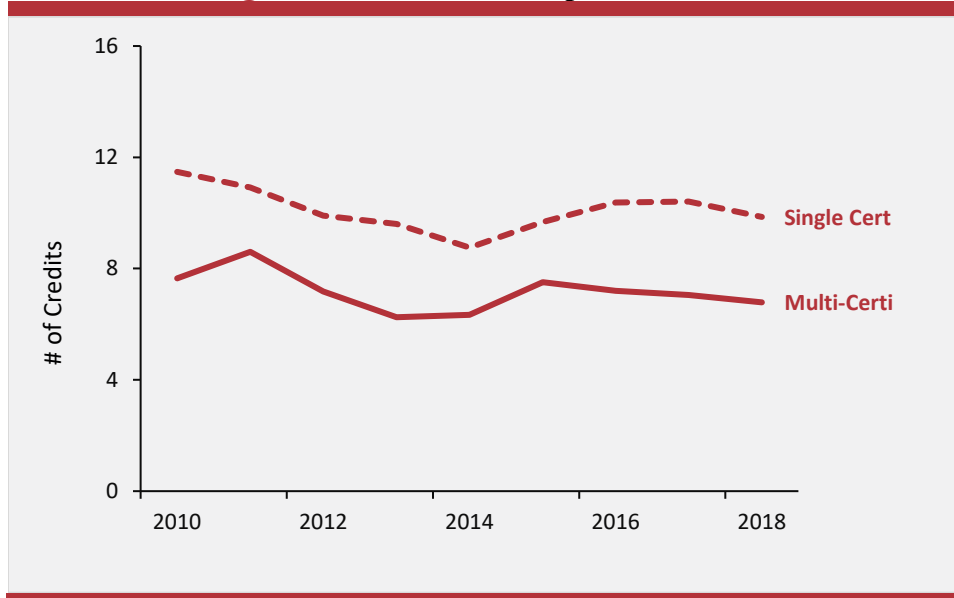
<sup>7</sup> See, for example, Bailey, Jaggars, & Jenkins (2015) *Redesigning America's Community Colleges: A Clearer Path to Student Success*.



## 2.1. Credits Per Certificate, Same Field

In this and the next section, we focus on average credits earned per certificate granted, where we consider only credits earned in *the same field as the certificate*. In Figure 5, we plot the number of credits earned per certificate from 2010 to 2018 for single certificate and multi-certificate earners. The average number of credits earned per certificate decreased for single certificate earners between 2010 and 2014 from nearly 12 to about 9 credits. It has since risen to between 10-11 credits per certificate. The average number of credits per certificate for multiple certificate earners exhibits a similar trend but multiple certificate earners generally completed less credits per certificate, on average, compared to single certificate earners.

**Figure 5: Credits Earned per Certificate**



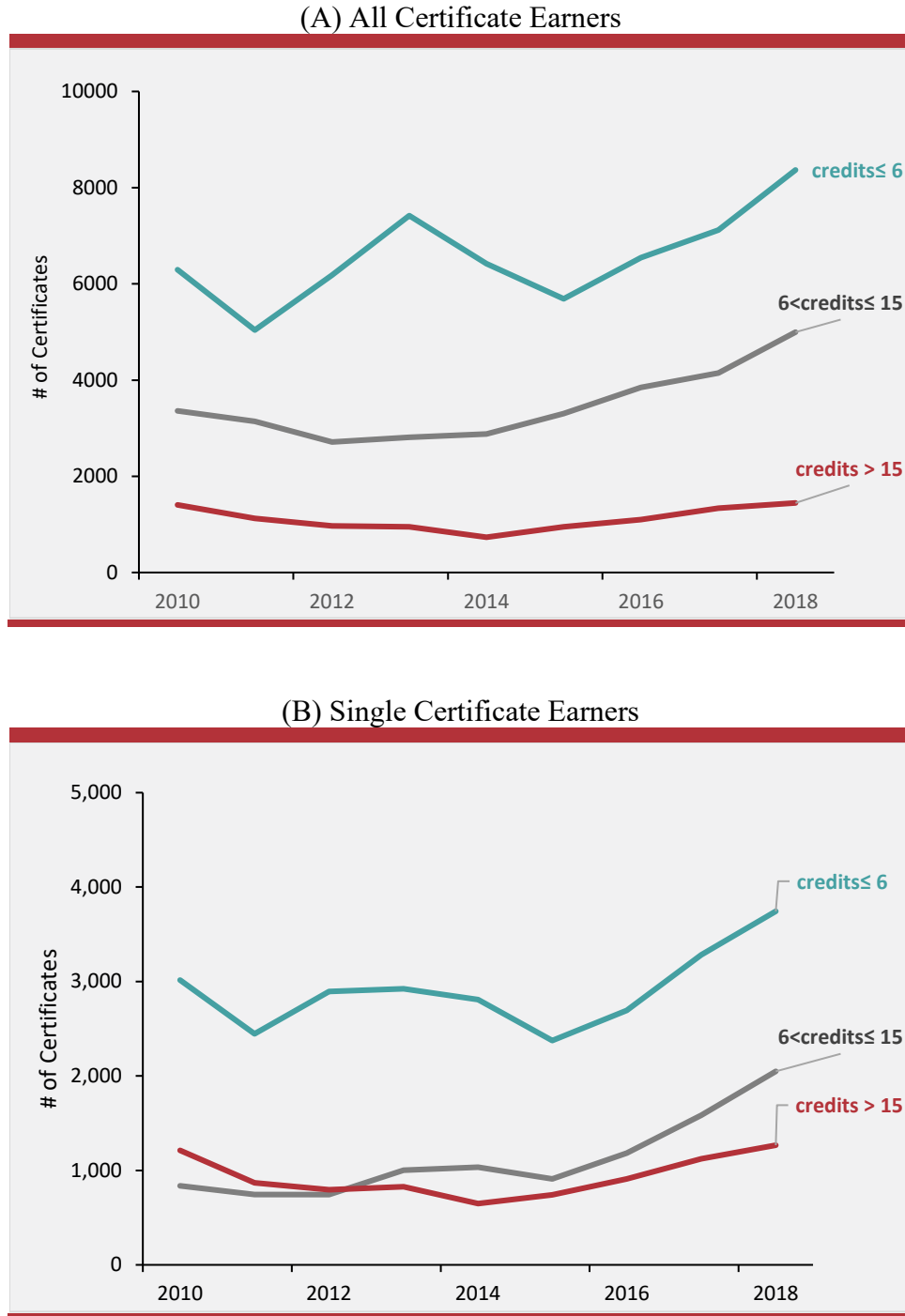
Source: Author calculations based on KPEDS Degree data and Course Enrollment data in the Kentucky Longitudinal Data System. Notes: The figure presents the average credit earned per certificate for single and multiple certificates between 2010 and 2018. Calculations were based on the courses completed in the same fields as degrees based on 2-digit CIP.

Another way to examine the trend in the length of credential programs is to examine the number of certificates earned with only a certain number of credits. To be clear, because of data limitations this figure does not reflect the required length of programs; rather, it reflects the number of credits either related to the field or overall that students took on their way to earning the certificate.

First, we consider overall certificate earners in panel (A) of Figure 6. Between 2010 and 2018, certificates completed with 6 or fewer and 6 to 15 credits in the field of the certificate increased by 32% and 49%, respectively. The number of certificates earned with 15 or more credits experienced relatively stable during this period. In Figure 6, panel (B) we present a corollary figure for just single certificate earners. Like the prior figure, we observe a notable upward trend in certificates completed with 6 or fewer credits in the same field. Though still relatively common and increasingly frequent, students earning with 6 to 15 credits before earning a certificate similarly experienced substantial growth in recent years. In contrast, the numbers of certificates

completed with more than 15 field-related credits was somewhat less frequent and the trend is generally flatter.

**Figure 6: Credits per Certificate, By Length**



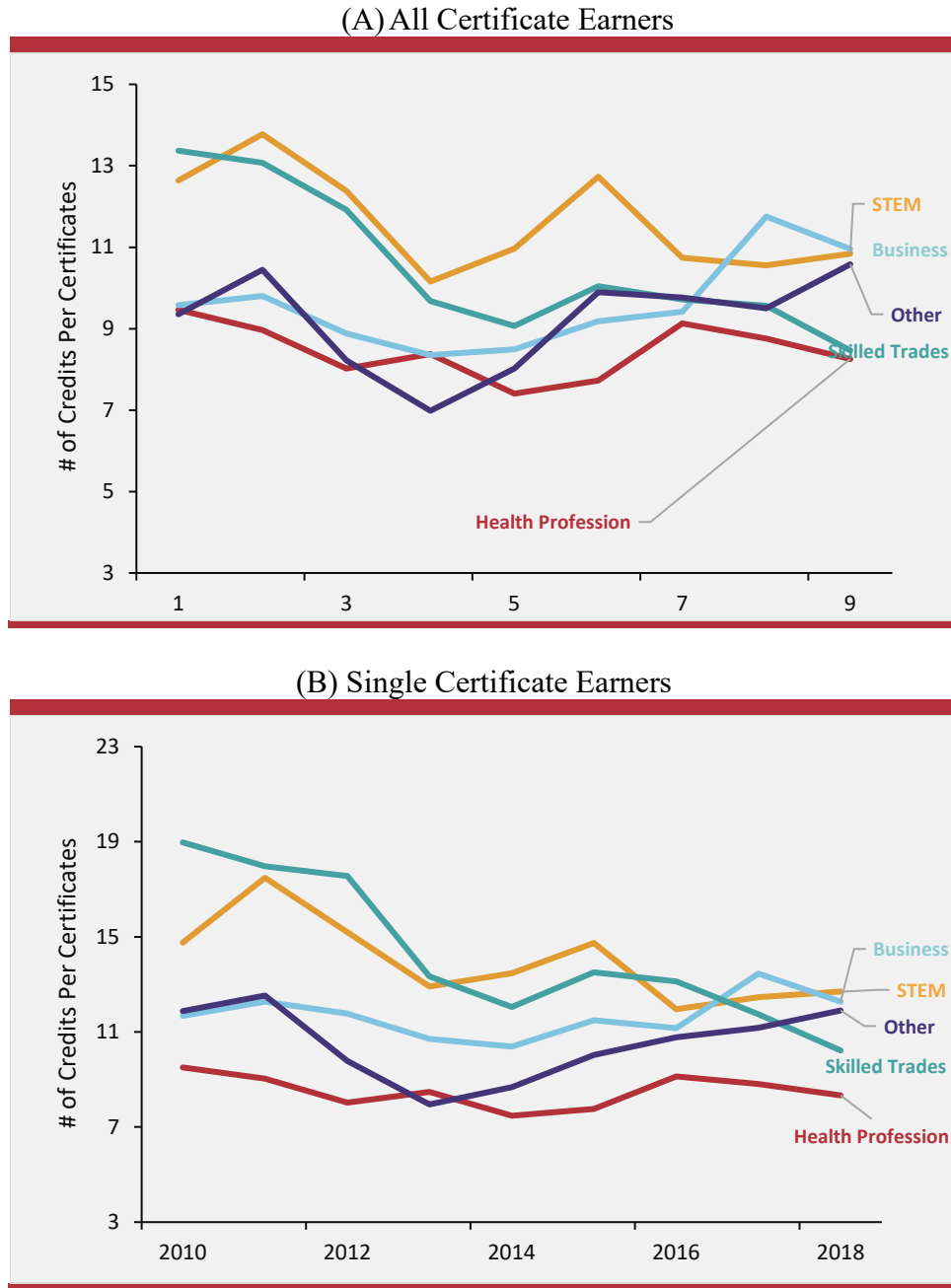
Source: Author calculations based on KPEDS Degree data and Course Enrollment data in the Kentucky Longitudinal Data System. Notes: The figure presents the number of certificates conferred in each of the six credit categories between 2010 and 2018. Calculations were based on the courses completed in the same fields as degrees based on 2-digit CIP.

## 2.2. Credits Per Certificate, By Field

We next explore whether the credits accrued per certificate vary by academic field. This section only considers credits completed in *the same field as the certificate*. In Figure 7 we present the average number of credits completed per certificate in business, STEM, health profession, skilled trades, and “other” fields both overall (Figure 7A) and then separately by single certificate earners (Figure 7B). Figure 7A shows the number of credits per certificate in STEM and skilled trades fluctuated with a downward trend between 2010 and 2018. In contrast, there was an increase in credits accrued per business certificate during this period growing from 9.6 to 11 credits. Similarly, credits per certificate in “other” fields experienced an upward trajectory, following an initial drop between 2011 and 2013. Credits per certificate in health profession remained relatively stable over time.

Figure 7B presents the average number of credits earned per certificate by field among single certificate earners between 2010 and 2018. We observe an increase in the number of credits per certificate in business and “other” fields after an initial drop between 2011 and 2014. In contrast, the number of credits per skilled trade certificate followed a downward trend during this period. Similarly, the average number of credits per STEM certificate also decreased from 14.8 in 2010 to 12.7 in 2018, with most of the decline occurring between 2011 and 2013. Health profession remained relatively steady during this period.

**Figure 7: Credits per Certificate, By Type and Field**

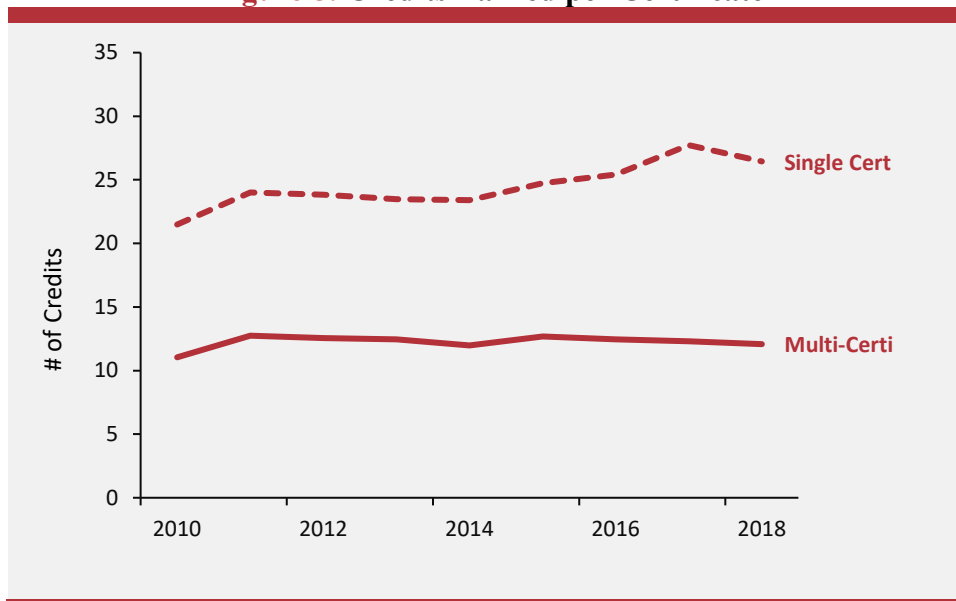


Source: Author calculations based on KPEDS Degree data and Course Enrollment data in the Kentucky Longitudinal Data System. Notes: The figures present the average credit per certificate in each of the five fields between 2010 and 2019. Calculations were based on the courses completed in the same fields as degrees based on 2-digit CIP.

### 2.3. Credits Per Certificate, Overall

In this section, we explore the number of *all* credits completed as students earn certificates, which include *credits not in the same field as the certificate*. The Figure 8 displays the number of credits completed per certificate for single and multiple certificate earners. The average number of credits per certificate increased between 2010 and 2018 among single certificate earners from about 21 credits to 27 credits. Compared to the decline in credits related to the field of certificate presented in Figure 5, this suggests that students are taking a larger number of courses that are not in the same field as the certificate. This could be because of general education requirements or could reflect churn of students as they figure out educational pathways and is worth further investigation. Overall, single certificate earners completed twice as many as credits per certificate as compared to multiple certificate earners.

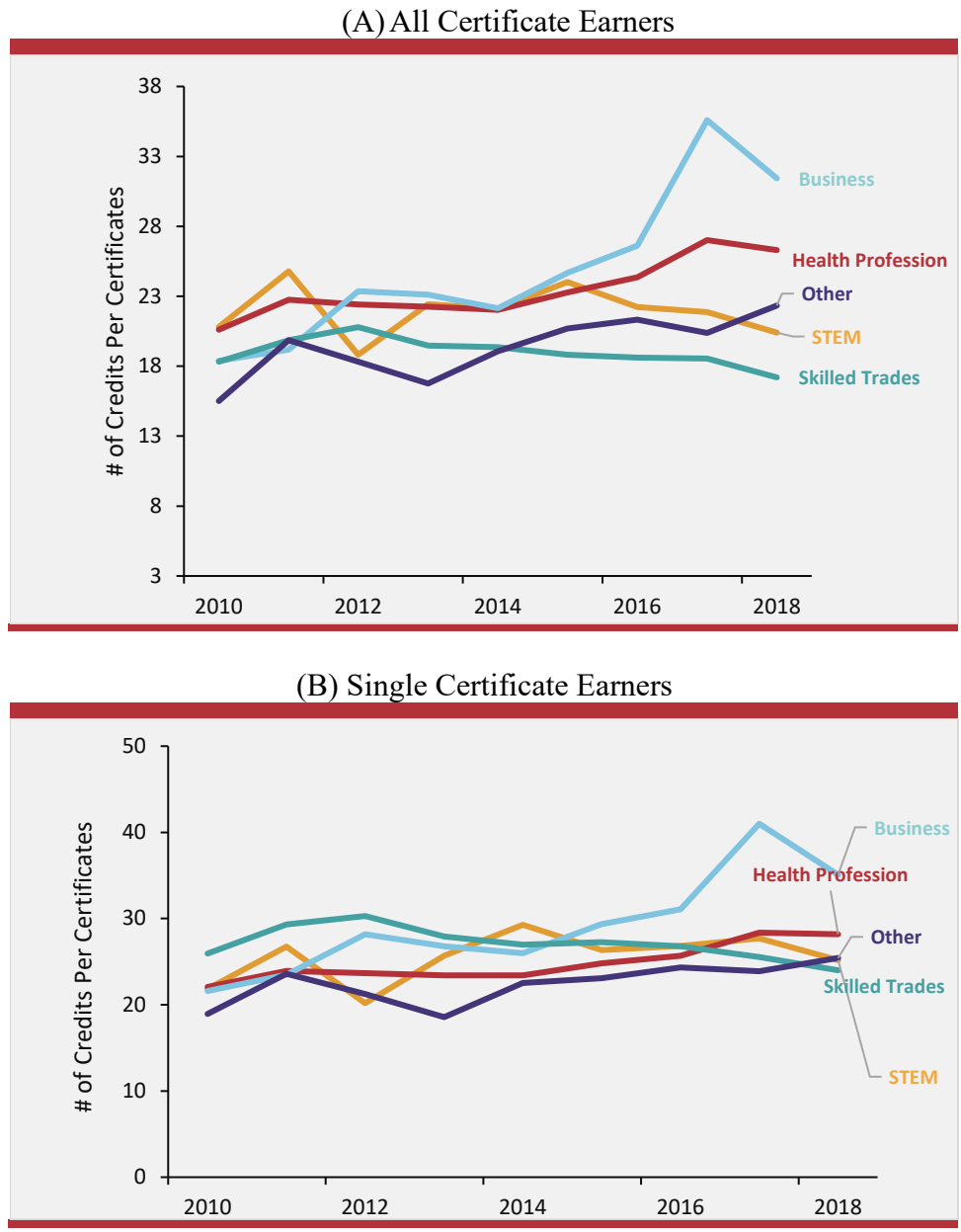
**Figure 8: Credits Earned per Certificate**



Source: Author calculations based on KPEDS Degree data and Course Enrollment data in the Kentucky Longitudinal Data System. Notes: The figure presents the average credit earned per certificate for single and multiple certificates between 2010 and 2018. Calculations were based on all the courses completed by students regardless their fields.

We next examine all the credits accrued per certificate by academic field. In Figure 9 we present the average number of credits completed per certificate in business, STEM, health profession, skilled trades, and other fields between 2005 and 2018 both overall (Figure 9A) and then separately by single certificate earners (Figure 9B). In both graphs, between 2010 and 2018, the average credits per certificate experienced with an upward trend in business, health profession, and “other fields.” The growth is the most pronounced in business. In contrast, STEM and skilled trade credits earned per certificate have been flat or slightly decreasing.

**Figure 9: Credits per Certificate, By Type and Field**



Source: Author calculations based on KPEDS Degree data and Course Enrollment data in the Kentucky Longitudinal Data System. Notes: The figure presents the average credit earned per certificate in each of the five fields between 2005 and 2018. Calculations were based on all the courses completed by students regardless their fields.

### 3. Credential Pathways

#### 3.1. Certificates Conferred Independently or With Other Credentials

We next consider the combination of certificates with other certificates and associate degrees. For *Section 3 only*, we focus on those who earned a certificate before or with any other credential (e.g., we do not include students who first earned an associate degree and subsequently earned a certificate but do include students who earned a certificate and then an associate degree or who earned a certificate and associate degree in the same term).<sup>8</sup> Overall, single certificate earners comprised the largest share of credential earners, followed by multiple certificates combined by an associate degree, multiple certificates completers, and single certificate earners who went on to earn an associate degree.

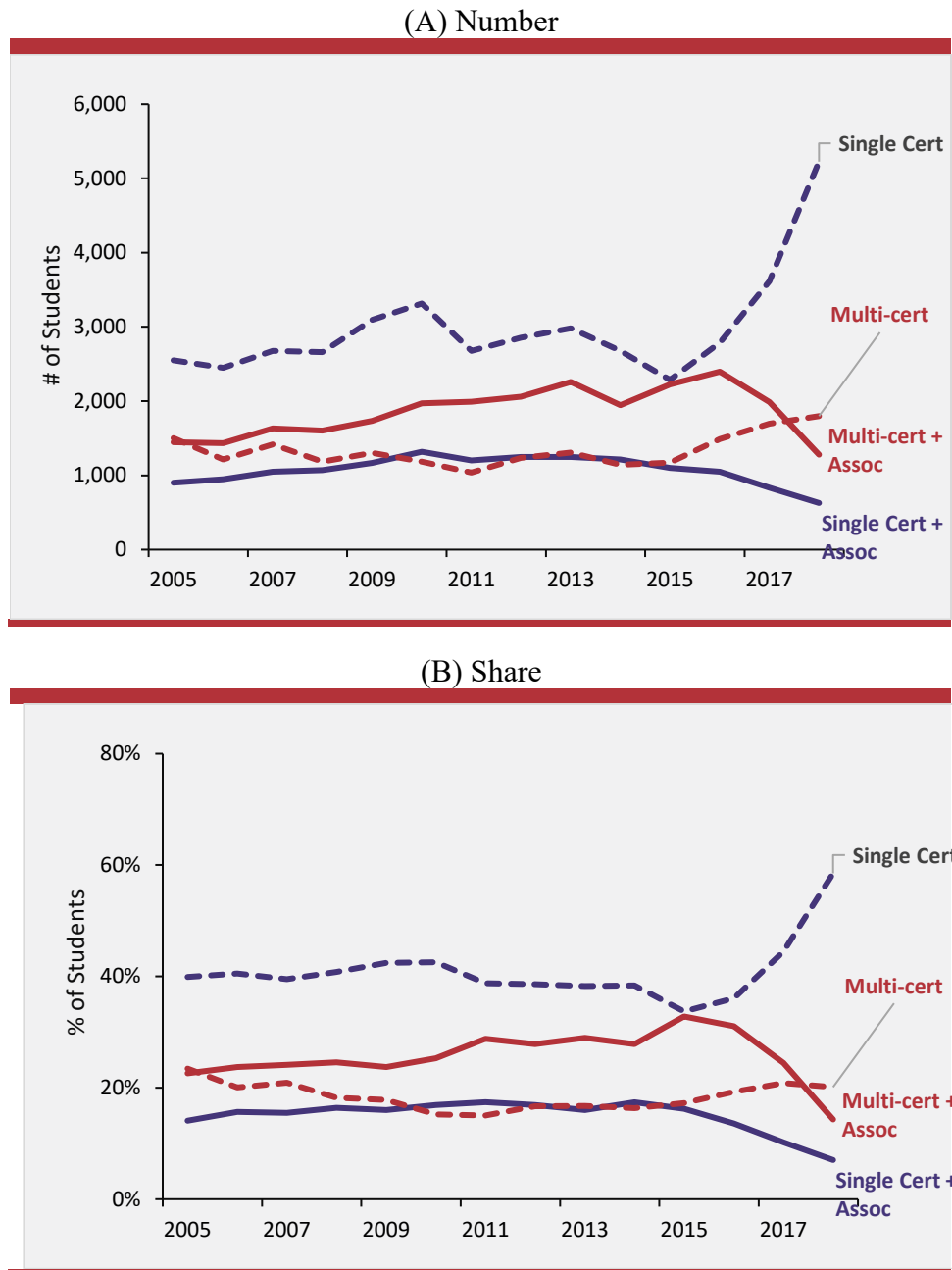
Interpreting trends necessitates considering that after some time elapses, some students who are currently in the “single certificate” category will eventually earn other credentials, shifting them into the multiple certificate or single certificate plus associate degree category. This is especially relevant for the most recent few years of data. Therefore, based on trends up until 2016 (two years before the end of our analysis period), we would expect to see a continual increase in multiple certificate-earning by students and a flattening out of single certificate pursuit for the 2017 and 2018 years when looking back a few years from now.

In Figure 8A, we display the number of first-time certificate earners who completed additional credentials by type of additional credentials. The number of students who earn a single certificate, but no other certificate or associate degree, ranged from about 2,200-3,300 from 2005 to 2015, and grew to 5,500 in 2018. This later growth should be interpreted with caution, as we explain earlier. It is relatively less common overall for students to pair multiple certificates with an associate degree, but this pathway is becoming increasingly common, growing to the level of single certificate seeking by 2016 before declining again. The frequency of students earning multiple certificates (students earning more than one certificate but not an associate degree) has grown about 50% from 2015 to 2018 after being flat for some time. It is also possible and likely that some of these students will eventually earn an associate degree. The number of students who obtain a certificate and then go on to earn an associate degree is the least common educational pathway. Reflective of these trends, up until about 2015 we observe slight increase in the percentage of students who earned multiple certificates combined by associate degrees; in contrast, the percentage of students who earned only single certificate declined (Figure 8B).

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<sup>8</sup> From 2005 to 2018, 3,726 students earned associate degrees and then earned a certificate – these students are not included in the analysis in Section 3. For the purposes of this report, we focus on students who obtained sub-baccalaureate credentials. However, from 2005 to 2018, 7,479 students who obtained certificates went on to obtain bachelor’s degrees.

**Figure 8: First-Time Certificate-Earners Who Earned Additional Credentials**



Source: Author calculations based on KPEDS Degree Data in the Kentucky Longitudinal Data System. Notes: The figure presents the number and percentage of first-time certificate earners in each of four certificate categories between 2005 and 2018. Calculations are based on the numbers of certificates in each of the categories in proportion to the total number of first-time certificate earners by year.

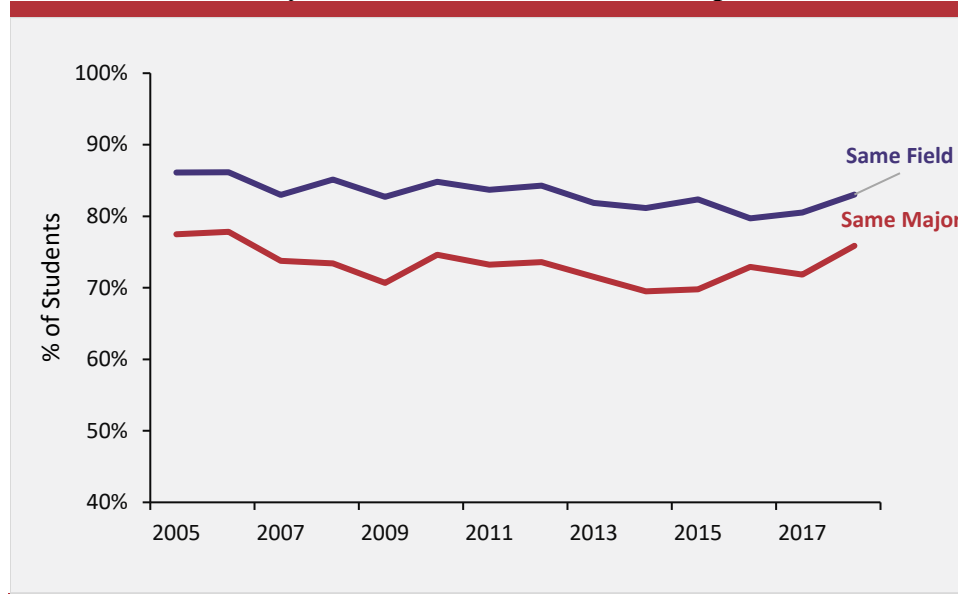


### 3.2. Field and Major Similarity

Of interest is whether students who stack credentials do so in a similar field or major. Having consistent fields of study over time might reflect good advising and guidance about pathways. To identify common fields in our data, we use 2-digit Classification of Instructional Programs (CIP) code. We classify first-time certificate earners as having the *Same Field* when they earned additional credentials in the same field as their first certificate based on 2-digit CIP code. For subcategorization of certificate domains, we use the 4-digit CIP subcode. We identify first-time certificate earners as having the *Same Major* when they earned additional credentials in the same subfield where they earned their first certificate based on 4-digit CIP subcode.

A large proportion of first-time certificate earners completed additional certificates in the field in which they earned their first certificate; on average, 83% of first-time certificate earners completed additional certificates in the field the same as that of their first certificate between 2005 and 2018. This percentage slightly declined over time with small fluctuations. We observe a similar trend for students pursuing the same major. About 73% of students who completed additional certificates did so in the same major as their first major during this period.

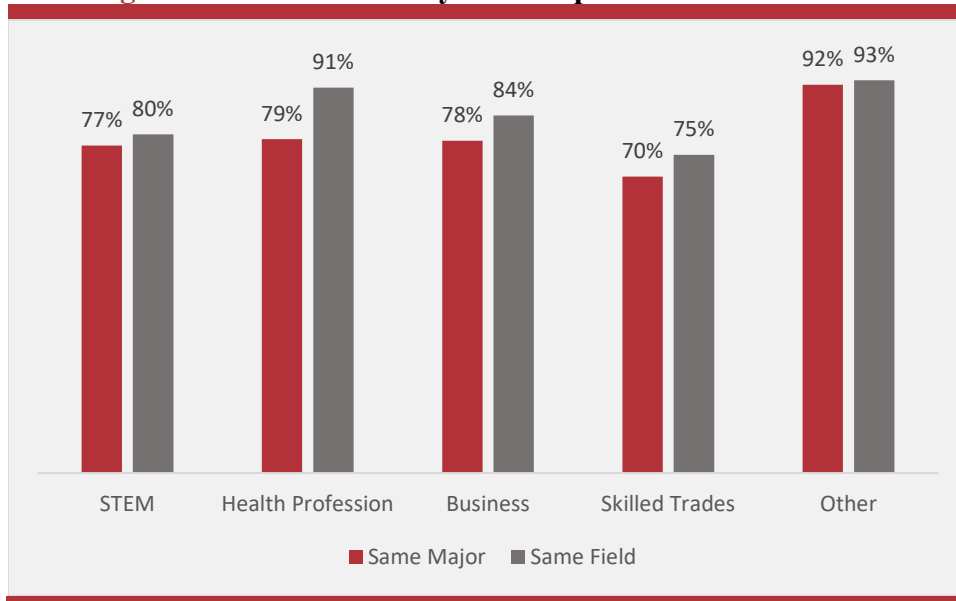
**Figure 9: Field Similarity of Stacked Certificates, Multiple Certificate Earners**



Source: Author calculations based on KPEDS Degree Data in the Kentucky Longitudinal Data System. Notes: The figure presents the percentage of first-time certificate earners in each of two categories between 2005 and 2018. Calculations are based on the numbers of certificates in each of the categories in proportion to the total number of first-time certificate earners by year.

We also examined how similarity of stacked certificates differ by fields (Figure 10). Students with credentials in the “other” fields, were most likely to stack credentials within a similar field. This behavior was also common in health fields. Though still frequent overall, consistent field certificate stacking was relatively less common in business, STEM, and skilled trades. More work is needed to investigate whether these differences are a function of the pathways in these fields or because of student choices.

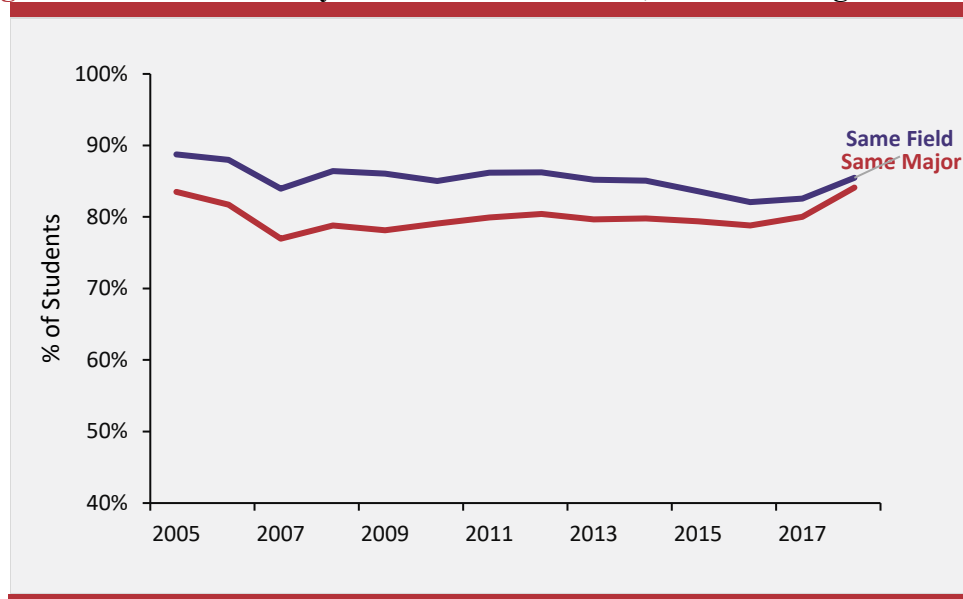
**Figure 10: Field Similarity of Multiple Certificate Earners**



Source: Author calculations based on KPEDS Degree Data in the Kentucky Longitudinal Data System. Notes: The figure presents the percentage of first-time certificate earners in each of two categories between 2005 and 2018. Calculations are based on the numbers of certificates in each of the categories in proportion to the total number of first-time certificate earners by year and by field.

In Figure 11 we present the share of first-time certificate earners who earned an associate degree in the same field or major as their first certificate. Consistent with the prior figure, we find that a higher share of students remained in their original field or major when completing an associate degree. Between 2005 and 2018, roughly 85% and 80% of first-time certificate earners completed an associate degree in the same field or in same major, respectively. While trends are generally flat, there appears to be a recent uptick in the field and major similarity of first certificate and associate degree earned.

**Figure 11: Field Similarity of Stacked certificates, Associate Degree Earners**



Source: Author calculations based on KPEDS Degree Data in the Kentucky Longitudinal Data System. Notes: The figure presents the percentage of first-time certificate earners in each of two categories between 2005 and 2018. Calculations are based on the numbers of certificates in each of the categories in proportion to the total number of first-time certificate earners by year.

#### **4. Brief Concluding Thoughts**

In this report, we describe trends in sub-baccalaureate certificates granted by postsecondary institutions in the state of Kentucky, using administrative data from the 2005-06 to 2018-19 academic years. In future work, we will continue our study through analysis of the characteristics of students who are earning these certificates, and ultimately by examining labor market returns to the certificates.

## Appendix: Data

To conduct this study, we used administrative Kentucky Postsecondary Education Data System (KPEDS) data provided by the Kentucky Council of Postsecondary Education to the Kentucky Center for Statistics (KYSTATS) and part of the broader Kentucky Longitudinal Data System (KLDS). The KLDS data contain individual-level records from state agencies that oversee kindergarten through grade 12 education, postsecondary education, and the unemployment insurance system. The primary data set used in the project are KPEDS postsecondary system records that include data on postsecondary institutions attended, courses taken, credits earned, major, and credentials completed for eight public 4-year institutions, 16 community colleges with more than 70 locations, and 17 institutions affiliated with the Association of Independent Kentucky Colleges and Universities (AIKCU) between the 2005–06 and 2018–19 academic years.

The KPEDS *institution file* provides information on institution name and sector. Using institutions' unique identifiers, we merged this file with the KPEDS *degree file* and the *Course Enrollment file*, which include data on credential attainment, courses taken, and grade and credits earned, for students attending at Kentucky's public community colleges and universities. Using these two data sources, we constructed an analytical data file that contains all individuals who earned credentials from public postsecondary education programs in Kentucky between the 2005–2006 and 2018–2019 academic years.

Our analysis samples differed for each section:

- Section 1: our sample includes all students who earned a certificate between the 2005–2006 and 2018–2019 academic years at community colleges.
- Section 2: In our analysis of the number credits per certificate, we include only college-level courses passed a grade of A through D or P. We also restricted our examination of credits students earned per certificate to certificates that were not granted with an associate degree. We also excluded certificates students earned before they obtained an associate degree within institutions from our analysis. This is because when certificates were conferred with an associate degree, it is not possible to distinguish credits earned for certificates as compared to associate degrees.
- Section 3: we include only students who completed a certificate before any other credential in our data and exclude students who first earned an associate degree and subsequently earned a certificate.

## Appendix: Field and Subfield Classification

### Field Classification

Category	CIP Code	Fields
STEM	11	Computer and Information Sciences and Support Services
	14	Engineering
	15	Engineering Technologies and Engineering-Related Fields
	26	Biological and Biomedical Sciences
	41	Science Technologies/Technicians
	10.0304	Animation, Interactive Technology, Video Graphics and Special Effects.
	13.0501	Educational/Instructional Technology.
	45.0702	Geographic Information Science and Cartography.
	51.2205	Health/Medical Physics
Skilled trades	46	Construction Trades
	47	Mechanic and Repair Technologies/Technicians
	48	Precision Production
	12.0401	Cosmetology/Cosmetologist, General
	12.0503	Culinary Arts/Chef Training
	51.0801	Medical/Clinical Assistant
Health professions	51	Health Professions and Related Clinical Sciences
Business	52	Business, Management, Marketing, and Related Support Services

Note: include only fields offered at community colleges. Our classification of skilled trade major relies on a list of skilled trade occupations compiled by a Division of the New York State Department of Labor: <https://labor.ny.gov/stats/PDFs/The-Skilled-Trades-in-NYS.pdf>. We use Darolia et al. (2020)'s classification of STEM fields to identify STEM fields.

### Subfield Classification

For subfield classification, we use the CIP 4-digit codes. The CIP 4-digit codes subdivide broad fields represented by the CIP 2-digit codes and identify narrowly specified areas within each board field. For example, CIP Code 51 (Health Professions and Related Clinical Sciences) includes programs like licensed nursing training, medical administrative assistant, and medical technology.