**Attitudinal Trends in Alternative Postsecondary Learning**

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Traditional postsecondary learning in the United States consists in obtaining a four-year degree and is associated with increased earnings and employment. These benefits come at substantial public and private cost. Concerns about a public debt crisis are now common. Recent scholarship questions the return of educational expenditure. Alternative approaches to education represent a technological improvement which may allow for employability signal generation and skill development at a fraction of the price of the traditional process. Key bottlenecks to adoption of alternative learning approaches include limited public awareness, limited learner favorability, and limited employer favorability. This paper identifies explanatory factors in favorability, attitudinal changes over time, and actionable strategies to solve for limited awareness and favorability.

**KEYWORDS:** Education economics, alternative education, debt crisis, signaling

**JEL CODES:** D12, I21, I22, I24, I25, I26

1. **Introduction**

The concept of a student debt crisis has found durable academic and media coverage. In 1999, Roots called the student loan debt crisis a lesson in unintended consequences[[1]](#footnote-1). He identified the issue as attributable in large part to the Guaranteed Student Loan Program of 1965.

It was neither a new lesson at that time, nor a lesson finally learned at that time. Hansendn and Rhodes discuss the student debt crisis in 1988[[2]](#footnote-2). Van Dusen published a genuinely prescient paper, *The Coming Crisis in Student Aid*, in February 1979[[3]](#footnote-3). Forbes noted in 2019[[4]](#footnote-4) that “Student loan debt in 2019 is the highest ever…There are more than 44 million borrowers who collectively owe $1.5 trillion in student loan debt in the U.S. alone.”

Recent work has called into question both the social return and the individual return to spending on education[[5]](#footnote-5). Alternatives to the status quo in education present the opportunity for significant economic benefit. From 1989 to 2012, the average cost of a year of undergraduate education in the US rose 79%[[6]](#footnote-6). Over the same period, per pupil public expenditure for K-12 students increased 27%[[7]](#footnote-7). This indicates that postsecondary education presents a particularly valuable area of exploration.

From 1989 to 2012, K-12 student expenditure increased significantly and the cost of a year of undergraduate education grew nearly three times more quickly, but the adjusted average starting salary of a college graduate decreased. In real terms, the average starting salary of a college graduate decreased about 9%[[8]](#footnote-8). Additional temporal sampling from 1960 to 2015 indicate that the longer trend for education is modestly positive, with a real increase of about 6% over that period. It’s worth noting that the highest paying years for the degree were observed around 1970 in real terms, and salaries after the Great Recession have remained lower than the early 2000s.

Because the price of college is rising several times faster than the rate at which the salary of new graduates is increasing, the traditional degree is becoming a dynamically worse financial investment, even while current research shows it is already a relatively poor choice compared to investing in a standard fund. College might still be an optimal consumption choice if students demand higher education as a leisure good, but survey data indicates that this is not the case. Among a mix of prospective and first year college students from ages 16-40[[9]](#footnote-9), Rachel Fishman finds that the top three reasons to go to college are improved employment, making more money, and getting a good job. Over 90% of respondents affirmed at least one of these reasons.

In *A New U,* Craig documents several faster and cheaper alternatives to college[[10]](#footnote-10). Craig establishes that many of these alternative education solutions are quickly growing in both supply and demand, but it is not obvious whether the programs Craig discusses representative of the broader ecosystem of alternative learning. Prior to Craig’s writing, Bryan Caplan argues for the signaling model of postsecondary credential value[[11]](#footnote-11). On Caplan’s view, the consumer of alternative credentials faces a signal composition problem which threatens the value of the credential. Traditional credentials may do a better job of signaling things like work ethic and conformity.

Alternative education, however, may endow real skills at a better rate than traditional education. If employers can obtain better-skilled workers for lower cost, they would be expected to have some willingness to give on conformity. In addition, as alternative credentials become more widely accepted, any stigma or nonconformity costs from pursuing alternative education is expected to diminish. Additionally, prior research has yet to establish magnitudes and dynamic trends on those magnitudes for many of these important effects.

This paper explores a novel attitudinal data set on alternative credentials. This paper tests the thesis that employers will favor alternative credentials as a mechanism to identify suitable entry level employment. As a secondary interest, changes over time to the relation of interest are investigated. The structure of included survey data allows for exploration of several other interesting tertiary relations.

The first section describes the organization of the paper, the motivation, and the main thesis. The second section gives theoretical and historical context. The third section presents findings. The fourth section describes applications or use cases for findings.

* 1. **Introduction to the Theory of Alternative Education**

This second section is broken into six subsections. The first subsection gives an overview of the subsequent five sections.

Because alternative education is characterized as the negation of traditional education, the second subsection begins by conceptualizing tradition. Section 2.3 moves from theoretical conceptualization of tradition into a brief inventory of actual American history, including legislation relevant to the topic of interest. The description of traditional credentials toward the end of the third section flows naturally into a discussion on alternative credentials in the fourth section. The three subtypes of alternative education are detailed throughout the fourth section. The subtypes include alternative credentials, alternative pathways, and alternative pedagogies.

Section 2.5 synthesizes these subtypes into a discussion of alternative education and alternativeness in a general way. The fifth subsection also discusses minor results from outside of the main data set which help concretize the concept of alternativeness intended throughout the paper.

To further clarify the intuition of the thesis, Subsection 2.6 describes a game-theoretic model of dynamic norms.

**2.2 Traditions Conceptualized**

Throughout the paper, the variable of interest will be referred to in a few ways. The variable of interest is most concisely described as entry-level suitability. More completely, the variable of interest is favorability on the use of alternative credentials to qualify an entry-level candidate who is applying for a career position. Technically, and most completely, the variable of interest is a response between 1 and 10 to the question, “For many professions, alternative credentials can qualify a person for an entry-level position.” A response of 10 represents a strong agreement.

Alternative credentials fit into the broader research area on alternative education. Alternative education is defined as all education other than traditional education. Alternative education decomposes into three subtopics including alternative credentials, alternative pathways, and alternative pedagogy. Each of these alternative entities is defined by the negation of their traditional counterpart.

In service of an effective description of alternative credentials, traditions are described in this subsection. Traditions can be concisely described as intertemporal social norms. As such, traditions exist in socio-temporal space. The maximum socio-temporal space that such a tradition could occupy would be from the dawn of humankind until today, and among all humans. Tradition can be viewed on a spectrum, where some processes are relatively traditional, and the modal process among a group of comparable processes is the strictly defined traditional process, implied when the singular traditional process is referred to.

* 1. **Actual Traditions: A History of Accreditation and Student Lending in the United States**

From the vantage point just established, postsecondary accreditation is a peculiar and infant approach to learning and education. Private accrediting agencies began forming in the 1880s in the United States, and private accreditation had become a well-established element of the higher education landscape by the 1930s[[12]](#footnote-12). The G.I. Bill was signed into law in 1944[[13]](#footnote-13), and provisions of the bill boosted consumption of higher education through subsidy to military service members. The number of degrees awarded by US colleges and universities more than doubled between 1940 and 1950. The increased demand for education stimulated the formation of many new colleges, and some of these were perceived to be “of dubious quality.[[14]](#footnote-14)” The G.I. Bill was reauthorized in 1952, but this time the educational benefits it included were restricted in availability to those students enrolling at an accredited institution, and the U.S. Commissioner of Education began publishing a list of federally recognized accredited institutions.

Over time, federal recognition criteria became more elaborate. The 1992 Amendments to the Higher Education Act is a notable act in this regard. Federal lending began in a military-oriented fashion with the National Defense Education Act of 1958, but lending was expanded to the general population with the 1965 Higher Education Act and subsequent legislation[[15]](#footnote-15). As earlier noted, Roots and other scholars identify this legislative trend as essentially causal to our present student debt crisis.

This brief history indicates that federal postsecondary accreditation is not only new as a human institution, but also new within the much more limited context of United States history. It’s true that market-driven accreditation has existed since the 1880s, and therefore may be considered a traditional process in United States education, but it is not true that the federal accreditation process which exists today has been around through most of American history. In this sense, federal accreditation is both causal in our present debt crisis and decidedly nontraditional.

The point of this exercise is both to familiarize the reader with a bit of relevant history, and to initiate conceptualization of traditional education as a special case of alternative education, rather than something altogether different. The traditional education of today was itself an alternative form of education at some point in time, and it remains a minority approach to education within a variety of nontrivial timeframes.

Caplan rightly argues that part of the signal of a traditional degree is to signal conformity, but throughout most of history it would be the nonconformist who possesses the thing we now call a traditional degree. Given this prior information, it becomes more plausible that society might one day return to such a situation. Obtaining a federally accredited undergraduate degree is a rather new practice, although we call it a tradition, and it has always been dubiously socially beneficial.

Traditional education is loosely synonymous with accredited education in the United States, but there are important technical differences. Accredited credentials in the context of the US include the high school diploma, the accredited undergraduate degree, and accredited graduate education. While graduate education is accredited, it is also excluded from the concept of traditional education. While tradition indicates a normal activity, graduate education is unusual. About 9% of U.S. adults had a graduate degree in 2000, and about 13% had such a degree as of 2018[[16]](#footnote-16).

In fact, it’s not technically traditional to get a college degree. Technically speaking, the American tradition is to enroll in college degree and never graduate. The history of factors leading to higher enrollment in higher education in the United States, was previously discussed, but it’s an important historical watermark to notice that 51% of Americans immediately enrolled in college after high school completion beginning in 1975[[17]](#footnote-17). Between 1975 and 2011, the immediate college enrollment rate increased from 51 percent to 68 percent. Immediate transition to college plateaued after the turn of the century. The immediate college enrollment rates for 4-year and for 2-year colleges in 2016 were not measurably different from 2000[[18]](#footnote-18).

Enrolling in college has been a tradition since 1975, but obtaining a degree never was a tradition in the same way. The fact that the trend on immediate enrollment has slowed from a positive trend into a plateau, which has now remained stably flat for more than a decade, casts doubt on the plausibility of a move back to a positive trend. For the foreseeable future, the expected trend on immediate enrollment is between flat and the possibility of a small decline.

In 2016, the percentage of students enrolling in college in the fall immediately following high school completion was 69.8%[[19]](#footnote-19), but in 2016 the percentage of the adult population with a bachelor’s degree or higher was 33.4%[[20]](#footnote-20) for “the first time in decades of data.” To reiterate the point, the strictly modal pattern of educational attainment would be for an American student to obtain a diploma, enroll in an accredited undergraduate degree program, and never obtain an undergraduate degree.

**2.4 Three Subtypes of Alternative Education**

While the final paragraph of the above section describes the strictly modal pattern of educational attainment in the modern United States, the pattern of enrollment plus noncompletion does not describe the state of being desired by those who enroll. The desired situation would be college graduation. As all ideas are antecedent to action, the desire to complete college is identified as more traditional than the actualization of college completion. The nuanced difference between a desire and its actualization is lost when speaking loosely, and as a result the actual four-year degree is loosely identified as a traditional credential.

Alternative education is a general term which includes alternative credentials, alternative pathways, and alternative pedagogies. Each of these alternative entities is characterized by the negation of a traditional counterpart.

Traditional pedagogy is the lecture format. K-12 education and higher education have both typically utilized this teaching method during and outside of the post-1975 period of interest, despite wide knowledge on the ineffectiveness of this approach. In 2014, for example, a meta-analysis of 225 studies found that undergraduate students in classes with traditional lectures are 1.5 times more likely to fail than students in classes that use active learning methods[[21]](#footnote-21).

A pathway is a series of actions culminating in the attainment of education or a credential. The traditional pathway always culminates in the traditional credential, but alternative pathways may also culminate in the traditional credential. For example, a student may obtain significant college credit or even complete an entire degree program through credit by examination. This competency-based pathway is importantly different compared to the traditional pathway based on the credit hour.

While it’s common for students to self-study in preparation for credit by examination, it’s also common for students to attend preparatory classes or even obtain knowledge for the purposes of testing out of one course by sitting in another traditional course. That situation could occur if a student took a course at one university, changed universities, and the credit would not transfer for the original course. Although their credit did not automatically transfer, the student might be able to test out at the second school. In cases like these, the student may have obtained a traditional credential through education using a traditional lecture-based pedagogy, and yet the pathway was not traditional.

The distinction of pathways might seem like splitting hairs in theory, but in practice alternative pathways like credit by examination, prior learning assessment, credit by portfolio, and similar processes hold immense potential as a time and cost savings mechanism for the student, while holding constant any concerns over lack of an accredited degree. To briefly illustrate, the price of a CLEP test is $89 in 2019 dollars[[22]](#footnote-22), while the average cost per credit hour at an accredited college is $594 in 2018 dollars[[23]](#footnote-23). A CLEP test may substitute for a 4-credit course[[24]](#footnote-24).

* 1. **Alternative Education Broadly Conceptualized**

Alternative education broadly encompasses all forms of formal and informal learning, but such a process space exceeds feasible study in a single paper, and frankly eludes sufficient study after combining many papers across several fields. Instead of studying alternative education holistically, researchers typically identify and studying a special case or particular implementation of alternative education.

One benefit of this approach is that the researcher may identify specific instances of alternative education which are faster, cheaper, or otherwise preferred in some way relative to traditional education, but a weakness of such an approach is that findings appear small, rare, disbursed, and ad hoc. To collect such effects into a strong case against the existing norm, a systematic approach is required which establishes alternativeness as an independent factor which can then be tested for effect.

Alternativeness can be conceptualized ordinally or cardinally. Remember that the three subtypes of alternative education are alternative credentials, alternative pathways, and alternative pedagogies. Within each of these three subtypes, solutions within a given subtype can be identified and ranked according to popularity. After ranking from most popular to n-popularity, an increase in rank number synonymously represents decreasing traditional status and increasing alternativeness.

By directly utilizing the underlying measure of popularity, a cardinal operationalization is achieved. Examples of popularity measures include number of applications, number of enrollments, expenditure toward a program, or survey-based measures of familiarity and favorability with respect to a specific program.

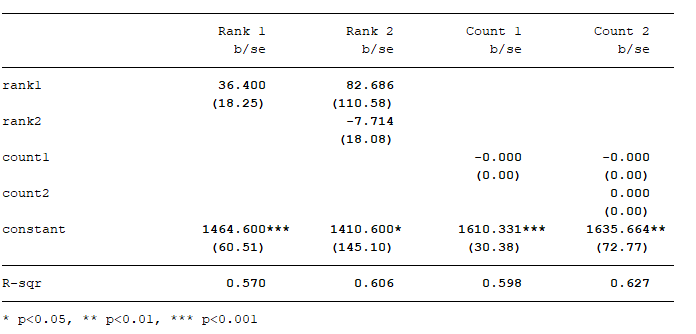
As a brief concretization, a secondary data set is investigated. The College Board, which administers the SAT, recognizes four types of high school in 2014[[25]](#footnote-25) and other years. These types include public, religiously affiliated, independent, and a group combining other and unknown types of schools. Figure 1 shows reported measures of SAT performance by type of high school, augmented with third party data for homeschoolers[[26]](#footnote-26). Table 1 shows basic model results for cardinal and ordinal operationalizations, with linear and marginal effects in their expected directions. Low significance is attributable to small sample size. Notice the non-trivial R-square values identified despite the small sample size.

Other research indicates that charter schools[[27]](#footnote-27) perform modestly better than public schools when standardizing by SAT score, although nationally representative charter school data could not be found, and gains vary importantly by state and other factors.

**Figure 1 – Summary SAT Score by School Type**



**Table 1 – Summary Models of SAT Score by Alternativeness**



* 1. **A Game-Theoretic Model of Dynamic Norms**

**\*\*TODO: a diagram**

It’s expected and intuitive that rank alternativeness would have a positive linear and negative marginal effect. Traditions are a kind of durable norm or institution. It’s a foundational lesson of New Institutional Economics that norms, institutions, and other classes of informal rules are self-sustaining and socially valued[[28]](#footnote-28). If alternativeness continued to move in a positive direction ad infinitum, this would seem to indicate that traditions are perfectly opposed to maximal social value. That would be a jarring result which would fly in the face of much of mainline economics. Instead, the observed positive linear and negative marginal effects collectively indicate something much more compatible with orthodox economics. The indication is that some of tradition’s near neighbors represent an improvement, but continuing into the deeply alternative eventually detracts from value.

Education fits a non-special case of norms models. As a completely standard example, Conley and Neilson use a prisoner’s dilemma to demonstrate equilibrium adoption of social norms[[29]](#footnote-29). Suppose we modify this approach to account for dynamic technical improvement. In the present approach, consider an infinitely repeated prisoner’s dilemma where each round adds an additional option to choose cooperateN. CooperateN pays off (1 + cooperateN-1), and in the first round the participants are known to choose cooperate, because they have already equilibrated on the cooperate choice as a social norm. For the sake of modelling, also suppose there is a defectN added in each round as well, and it pays off (defectN-1 – 1), although it’s immediately obvious that coordination on such defects never obtains.

Alternative credentials include both technological improvements, and ostensibly technological degradation, relative to present-day norms, but according to the above game-theoretic representation, it’s not expected for society to equilibrate on any of the technologically degraded choices. Instead, it’s observed in the model that society will tend to adopt those preferred alternatives as they become available over time.

In a more complex model, suppose that instead of both players gaining certain knowledge of the new cooperate option, each player had some probability of knowledge of the new cooperate option and some level of risk aversion. It’s now seen that there is some delay in adoption of the new cooperate choice, and in some rounds one or both players may prefer to remain on the prior cooperate space, but eventually all players tend toward the highest value cooperate choice.

In a third model of highest complexity, suppose that two new cooperate choices are added each round instead of a single choice each round, but players only probabilistically know about the new choices. The first new cooperate choice is revealed to both players with 99% probability, and the second cooperate choice has a payoff which is larger by one unit, but it is revealed to each player with a probability of 50%. Given standard models of nonlinear risk aversion, players will coordinate on the choice which is revealed with near certainty.

Other research echoes this story of dynamic curvilinear adoption of new technology under risk and uncertainty, with or without the game-theoretic explanation in similar or other forms. Marra et al covers this literature well in a paper on adoption of agricultural innovation[[30]](#footnote-30). Marra emphasizes that agriculture is just one instance of a general learning concern, and the present paper considers itself similarly.

This model clarifies risk aversion as a powerful mechanism for the incremental transition of norms from tradition toward alternatives. I propose that additional unmodeled mechanisms exist in the real world, but that the real-world trend nevertheless moves in the modeled direction. One example of an unmodeled consideration is that when an individual consumes alternative education in the real world, the payoff might be smaller than the traditional payoff.

* 1. **Methodology and Organization of Findings**

Comparable survey questions obtained a maximum of 1190 responses during four administration windows including portions of February 2018, October 2018, February 2019, and May 2019. Appendix 1 details the wording of questions and the answers available. Appendix 2 identifies which factors were included in each administration, notes significant factors by administration, and gives shorthand factor names. In general, significant factors and variables of interest were persisted across administration. Weak factors or tangential curiosities were included only in a subset of administrations.

The survey was created in SurveyMonkey and responses were gathered using SurveyMonkey Paid Audiences, Amazon Mechanical Turk, social media posts, and word of mouth. Responses were grouped according to their origin using a construct in SurveyMonkey which is called a collector. Collector effects were insignificant. This is interesting for two reasons. First, the source populations are known to be systematically different. Perhaps the most notable known systematic difference is that Amazon Mechanical Turk respondents were guaranteed to be U.S. High School graduates. A second reason the insignificance of collector effects is important is that response prices were significantly different. Amazon Mechanical Turk responses were more than 20% cheaper than SurveyMonkey Paid Audience responses on average.

The novel data set includes 106 right-hand variables and two left-hand variables. Variable-level sample sizes range from 240 to 1190. Appendix 3 lists technical variable names in alphabetical order along with a measure of variable strength by administration. Factors are generally operationalized into multiple variables. Appendix 3 makes this factor-to-variable mapping clear by identifying the factor short name related to each variable. For example, 9 gender variables were explored. These variables are sometimes complimentary, and in other cases they are directly redundant with another representation of the same construct.

Data exploration began by investigating arbitrary relations of interest. These ad hoc findings of interest are discussed in section 3.3. Systematic investigation of two variables of interest are discussed in section 3.2. The primary variable of interest goes by the variable name voi and is referred to in shorthand as entry-level suitability. It is structured as a favorability question on a scale from 1 to 10. See the description of question number 2 in appendix 1 for the wording of the question.

The secondary variable of interest goes by the variable name ioi and is referred to in shorthand as the index of interest. This is a 3-factor index which establishes a more general favorability measure of alternative education, whereas entry-level suitability is narrowly focused on the favorability of using alternative credentials in entry-level job application. The index of interest includes the variable of interest, and the two factors are strongly correlated, so general comments on favorability of alternative education should be considered a reference to both.

Systematic analysis leveraged ordinary least squares regression analysis and identification of four key models for each of the two left hand variables. The first model is a long model which involves multiple regression of every available right-hand variable. The second model of interest is the weak model which involves regressing all variables with a p-value less than .5. The third model is the adjusted r-squared maximizing model, and the fourth model, also called the strong model, involves regressing variables which have a p-value less than .1.

Systematic exploration began with the long model and variables were eliminated one at a time by significance until the next model of interest was discovered. The long model is interesting because it shows the maximum explanatory power of the available data set. The weak model is interesting because each variable which survives to this model is more likely than not to have an effect on the left-hand variable. The adjusted r-squared model is interesting because it balances between model complexity and explanatory power in a standard way. The strong model is interesting because it includes factors which have had an effect identified rigorously to a high degree of precision. With the probable exception of the long model, any of these models might be useful in varying applied business scenarios. While the long models seem to have high complexity relative to added value, it is interesting to note that the raw explanatory power of ??? is greater than .5. This is important because it means the long model explains more of the variation than it fails to explain among the observations it is fit against.

Because the October 2018 administration variables are a superset of the February 2018 variables, a single systematic exploration reduced all 2018 variables. As a result, instead of having 4 key models for each of those administrations, there are 4 key models in total for 2018. Similarly, May 2019 variables are a superset of February 2019.

* 1. **Preferred Models of Variables of Interest**

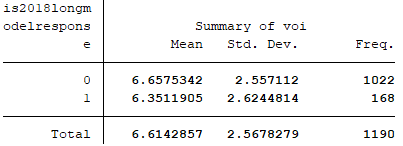
**3.2.1 Systematic Exploration of the 2018 Data Set**

6 of the 8 systematically derived models are reported in Table 3. Long models are not recorded in the table for brevity, but I will briefly describe the explanatory power of the long models, as well as the set of super-weak factors which failed to survive to the weak model. Table 4 reports models similarly derived while using the index of general favorability as the left-hand variable.

There were 168 observations in the 2018 long model. Model hardening from the long model to the weak model for 2018 resulted in a reduction from 69 to 39 variables. The 69 variables were associated with 15 questions, and the surviving 39 variables in the weak model were associated with 14 questions. Surprisingly, the only question which was fully filtered out was the question on employment status.

The original hypothesis was that employers would be willing to support alternative credentials. The systematically derived 2018 models indicate that the attitudes of those individuals who make hiring and firing decisions are not significantly different than the general population, but this simply begs a question about whether the general population supports alternative credentials. Appendix 3 answers this question by presenting summary data on all variables. The mean of the variable of interest is about 6.614, which is significantly more favorable than not across the population. Table 2 adds a bit of detail with respect to the specific sample included in the 2018 long and weak models. Individuals within this sample had an average favorability of about 6.351, although this is insignificantly different from average.

**Table 2 – Cross Tab VOI by is2018LongModelResponse**



While cross tabulation within this sample seems to hint at weak positive temporal trend, direct interrogation of time variables yields a mixed confirmation. Simple regression of linear time on the variable of interest has a super-weak (p > .5) negative effect. A regression of linear and squared time on the variable of interest yields stronger effects on each factor, but the effects are still weak (.5 > p > .1). Interestingly, the weak temporal effects are opposite expectation. Linear positive effects with a negative marginal effect would be intuitive, but the observed weak temporal effects are linearly negative and marginally positive. Positive marginal effects are generally considered unsustainable, but this finding may indicate that entry-level suitability resides on the early portion of an s-curve for adoption.

When cubic time is introduced to the right hand, linear time becomes omitted due to collinearity. The p-values of marginal and cubic effects are slightly better than the p-values of the linear and marginal effects in the simpler model, but the marginal effect has a negative value in this model. Theoretically, as time increases arbitrarily the cubic effect would dominate, so that this model also suggests unbounded increasing returns to scale. As earlier mentioned, this is generally considered theoretically unsustainable, and so a more plausible interpretation of this temporally complex model is simply that it is replicating the suggestion that entry-level suitability exists at the early phase of an adoption growth curve, prior to inflection, sometimes called the lag phase.

Based on exploration up to this point, the working answer to the hypothesis is that employers are favorable toward using alternative credentials, but so is everyone else. In addition, there is weak evidence that exponential favorability is down the road, but favorability may decrease in the immediate future and for some time. The date construct used is the number of days since 1960. Time effect coefficients indicate that the total time effect will net positive with central estimates of 80-120 years[[31]](#footnote-31). The variety of events which could occur over such a time jeopardize reasonable confidence about the magnitude of these effects, and statistical significance in these effects is low enough that it would be unsurprising for inflection to obtain within 5 years. High variability in temporal estimation underscores the potential value of additional temporal sampling.

Reducing the weak 2018 model into the 2018 adjusted r-squared maximizing model eliminates Christian identification as an important variable. This variable competed with generic religious identification, and linear religiosity survives to this model with a positive effect. Religiosity is typically associated with political conservatism, and conservatism is thought to move with status quo bias[[32]](#footnote-32). The present article gives mixed confirmation of a positive relation between religiosity and anti-innovation bias, but education appears to be an important exception.

Innovation proxy variables include favorability to artificial intelligence, cryptocurrency, and online education. These variables are cross-correlated with one another with a p-value of less than .001. Religiosity is negatively related only to artificial intelligence, but artificial intelligence is the only variable in this set of three which survives to the strong model. The negative linear correlation between religiosity and artificial intelligence is also more significant and larger in magnitude compared to the relation of religiosity to other innovation proxies.

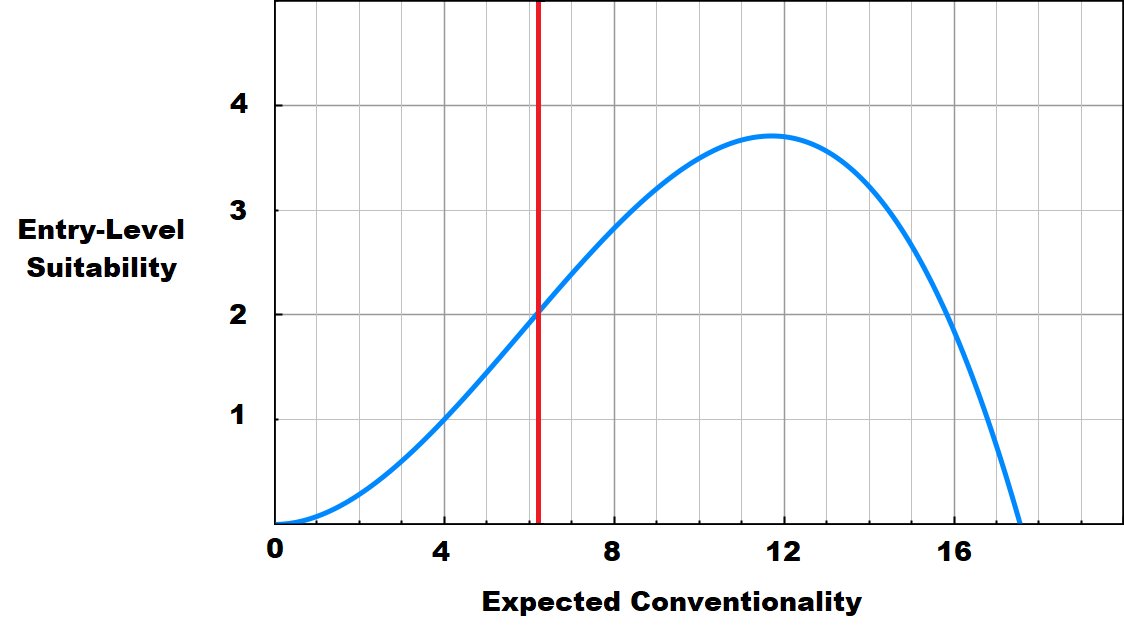
Conservatism is characterized by high religiosity and high favorability to market-based solutions. Regulatory favorability is positively associated with all proxies of innovation. This amounts to confirmation on the association of market favorability with status quo bias, but it also presents two paradoxes. First, the market is considered an effective tool of innovation[[33]](#footnote-33), so individuals seeking to maintain the status quo ought to disfavor it rather than favor it. Second, traditional education is regulated education, and alternative credentials are deregulated, so individuals committed to high levels of regulation ought to disfavor alternative credentials. One hypothesized explanation to this apparent paradox is oriented around individual personality. If those on the political left are high in openness, then they might also favor alternative credentials.

Industrial effects are common in weaker models, but fail to survive into the strong model for 2018. The most significant industrial effect was for those who chose other as their industry. The second most significant effect was for information technology. Two regions have significant effects in the strong model. The mid-atlantic region, including much of Washington DC, is associated with a positive effect. The west south central region is associated with a large negative effect. This region consists of Arkansas, Louisiana, Oklahoma, and Texas[[34]](#footnote-34). Gender, age, and income were significant. Anti-foreign bias was tested and identified, but it’s explanation is not intuitive. Anti-foreign bias is positively correlated with favorability on alternative education.

**3.2.2 Systematic Exploration of the 2019 Data Set**

The 2019 strong model identifies gender, innovation bias, expected conventionalism, online education favorability, and regulatory favorability as the strongest factors. Effects move in their expected directions, except for regulatory favorability which is linearly positive with respect to the entry level suitability. It’s interesting that the question about whether alternative credentials will be conventional soon survives into the strong model, because this reinforces two key theoretical stories in the literature. First, it highlights the importance of education as a norm, which is key to Caplan’s criticism of alternative credentials. Second, the surviving positive quadratic and negative cubic effects reinforces the story that alternative credential adoption is progressing through an s-curve. Figure 3 shows the that the effect of expected conventionality on entry-level suitability follows an s-curve. This only reinforces our temporal story if time moves with expected conventionality, and indeed with nonlinear conventionality, but it turns out that this is exactly the case. While our earlier simple analysis of time on the variable of interest involved p-values on time variables in the neighborhood of .4, a regression of linear time on nonlinear expected conventionality reveals a positive coefficient with a p-value of .024.

**Figure 3 – Effect of Expected Conventionality on Entry-Level Suitability in the 2019 Strong Model**



The vertical line in Figure 3 occurs at a value of about 6.1, which is the mean value of expected conventionality in the survey. Notice that this story about s-curve adoption is slightly different than our earlier story. The conventionality-based adoption analysis indicates that alternative credentials are past the lagged phase of adoption and recently past the point of inflection. Extrapolating far into the future seems to indicate an eventual demise to suitability, but this extrapolation is inappropriate for a few reasons. First, the model turns negative around an expected conventionality value of 11, but the maximum value this construct is capable of taking on is 10. At 10, we seem to see a marginal value near zero, which is consistent with the second extrapolation issue. In theory, we have good reason to expect decreasing marginal effects, but we have not identified any reason to expected negative marginal effects. Section 2.6 discusses some of this theory on growth curves, learning curves, and so on.

Finally, the shape of the curve is the result of analytical design. Quadratic and cubic factors were constructed rather than directly measured. These constructs are useful because they offer simple detection of non-linear effects, but not because they are optimal for all analytical purposes. S-curves are prototypically modeled as a sigmoid function, and log-log modelling is also common for learning or experience curves. While individuals are not treated and measured for learning in this paper, the idea is that society as a whole is learning about alternative credentials over time. Log-log regression for time on conventionalism was checked, and indeed it has an even better p-value of .004. Under that model there would be no extrapolative decline in entry-level suitability as a function of arbitrarily, indeed impossibly, large expected conventionality. For practical purposes there is little substantive difference in these approaches with respect to the variables in question. Expected conventionality is not binary, but transformation of this variable is possible to allow logistic regression to model a sigmoid[[35]](#footnote-35).

Logarithmic analysis obtains higher confidence, but the relation is indirect to the variable of interest. Unfortunately, log-linear and log-log analysis of time directly to the variable of interest is super-weak, so the indirect relation seems to be both our most accurate story and also a relatively complex story to predict on and reason about. The log-linear regression of expected conventionality on the variable of interest is exceedingly significance with a p-value under .001, but it is less explanatory than a multiple regression of linear, quadratic, and cubic expected conventionality on the variable of interest, and in the longer regression all right-hand variables are significant with p-values under .08.

Because the direct relation between the variable of interest and time is insignificant, but each step of an indirect relationship is significant, an indirect model is tested by generating the predicted log of expected conventionality from log time, and the variable of interest is regressed on predicted log expected conventionality. Yet, this relation is also insignificant with a p-value of .811 for the predicted coefficient in the regression.

Still, following the intuition of this indirect relation, nonlinear regressions are explored for significance. Eventually, three interesting models are identified. One strong temporal model was identified and two nonlinear regressions of expected conventionality on the variable of interest. A dynamic model was identified with the form[[36]](#footnote-36):



This temporal model obtained an r-squared of .8691 and b2 had a p-value less than .001. The estimate of b2 was less than 1, indicating exponential decay rather than exponential growth. This is the best fit temporal trend for the observed data, indicating a decreasing nonlinear trend in alternative credential suitability over the sample. Combining insights from 2018 and 2019 trend analysis, the evidence toward a short run reduction in alternative credential favorability is strong, and there is some comparatively weak evidence for a longer run reversal.

Regarding nonlinear regression of conventionality, a two-factor exponential expansion obtains an r-squared of .9029[[37]](#footnote-37). Let X represent expected conventionality, then two-factor model takes the form[[38]](#footnote-38):



A three-factor exponential expansion obtains an r-squared of .2621[[39]](#footnote-39). The three-factor model takes the form:



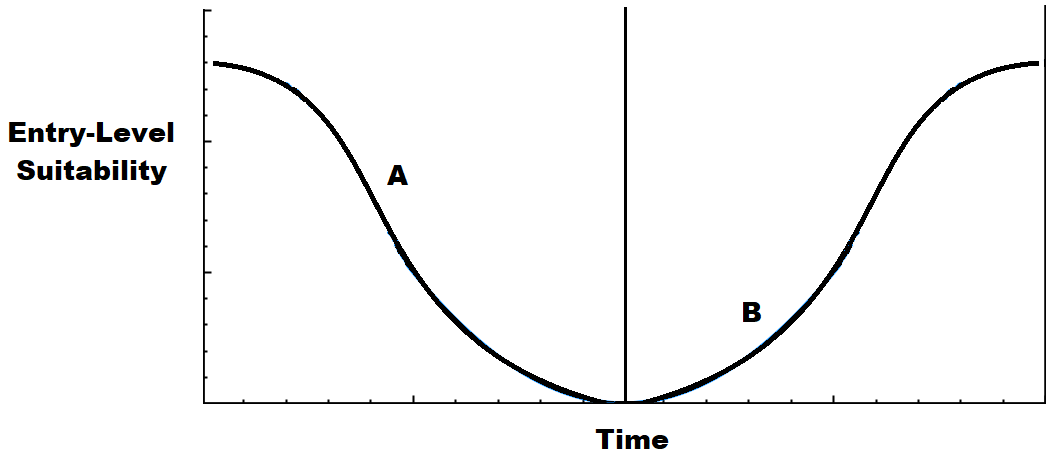
The three-factor expansion is interesting because the exponentiated parameter is identified with a t statistic of 1077.23. This immense t-statistic seems to indicate the parameter is identified with high precision. However, the constant in this model takes the implausible value of about -171, and the exponentiated parameter takes the implausible value of about 175. Remember that the variable of interest is observed between 1 and 10. The two-factor model estimates the exponentiated parameter at about 4. The two-factor model also estimates the exponentiated parameter with a t-statistic of about 33.8, and an associated p-value of about 0. While this lower t-statistic is technically a less strong identification, it is practically unimportant, and the estimated value is plausible.

The positive association between conventionality and entry-level suitability is already firmly established, as is the short run negative association between time and the variable of interest. One interesting note to add is that when expected conventionality is interacted with time, a multiple regression of time, conventionality, and the interacted variable reveals a positive relation between the interacted variable and entry-level suitability. This may point to long run normalization of alternative credentials as a mechanism toward eventual recovery in entry-level suitability.

Employer effects refer to the effect associated with an individual’s statement that they influence hiring and firing decisions in their place of work. Employer effects were weak in the 2018 sample, but additional sampling across 2018 and 2019 allowed employer effects to survive into the preferred 2019 model. The preferred 2019 model is the model which maximizes adjusted r-squared. Employer effects are negative in that model, with a coefficient of about -.47. Employer effects are slightly negative to a lesser extent in a simple regression against the variable of interest, with a coefficient of about -.1.

A simple interpretation is that employers are more pessimistic than others on alternative credentials. Another interesting possibility views this effect from a process perspective. From a process perspective, employers are a driver of changes to the labor market, so that population favorability lags employer favorability. It’s clear that entry-level suitability will decline in the short term, and this is consistent with employers having a more negative view than average. The interesting finding here is to note that when we interact time with employer status, the employer effects are already reversed from the general population. A regression of four parameters on the variable of interest is depicted in Figure 4, which illustrates a hypothetical reversal in entry-level suitability. The figure is conceptual and not to scale. The population trend is illustrated at A, and employer views are represented at B. At A, time effects are linearly negative and marginally positive. Linear employer-time effects are positive, but marginal employer-time effects are negative. The plausibility of a reversal story is enhanced when noting that interacted manager-time effects are more positive than and significant compared to ordinary time effects.

**Figure 4 – Employer-Driven Favorability**



Other interesting findings from the 2019 data analysis includes the fact that age group had a more robust effect compared to exact age, which may indicate something like a cohort effect. Prior analysis indicated that regional effects were moderately important. Ethnicity was introduced into the survey in part to distinguish between underlying policy or culture partials of regional effects. Regional effects were significant after the introduction of ethnicity, but ethnic effects were also moderately significant. Future analysis could identify state of residence to partial out policy effects to a greater extent.

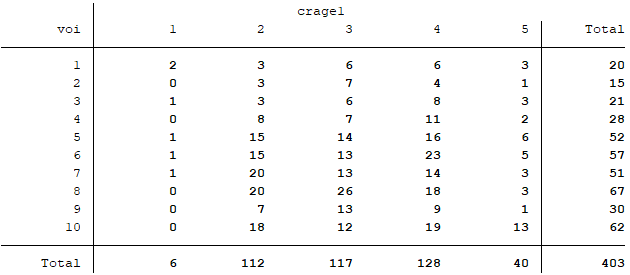
Educational attainment obtained an important effect which was more significant than either age or income effects. In addition to level of education, a dummy variable for whether education was at or greater than obtaining a college degree was found to be significant, and it had a positive effect on favorability to alternative education. It seems that individuals who have obtained a traditional degree are more appreciative of alternative education.

-csmage outlasted creag, which may indicate something like generational effects over exact age. Ethnic effects survived to maxar model but not strong model. The question on regional effects was do they represent something like state policy differences or cultural differences, and ethnicity was supposed to partial out some of the culture. State-level date could improve on this. Age effects outlasted income effects, and education effects outlasted age effects. All of these effects are theoretically important which reinforces the idea that the strong model is overly selective when trying to develop a full picture, however it’s useful when trying to rank or prioritize factor importance.

* 1. **Other Interesting Results**

Previous research found student indifference toward debt[[40]](#footnote-40) on the part of undergraduate students. The present paper replicates and extends such findings by identifying generalized youth antagonism to alternative credentials. The present data includes young people both within and without college. The age effects noted in this paper, unlike some other papers, do not simply measure selection bias among those undergraduates who have already selected into college education and the associated debt. Contrary to the stereotype of the innovative youth against the in-their-ways elderly, my research indicates alternative credentials are better marketed to the elderly. Plausible reasons include the fact that those with a college degree realize how little they obtained in the way of skills and career or life success attributable to that degree, while the youth realize a combination of risk aversion, lack of skin in the game, and a longer time horizon for repayment. Parents of college aged children may think twice before spending such a large chunk of change. Grandparents and older generations may remember a time when such a credential wasn’t needed, and society seemed to work quite well.

**Figure 2 – Crosstab of Linear Age on the Variable of Interest, Entry Level Suitability of Alternative Credentials**



1. **Applications**

There are several important microeconomic applications of the present research. Key applications include individual application during the interview process, individual application in the context of corporate politics, firm application in competitive analysis, and individual application while facing the education consumption decision.

During the application process, an individual who has received alternative education should bear in mind the preferred model of alternative education favorability. The employment candidate will have opportunities to observe interviewers who will interview on behalf of the employer and contribute to an employment decision. The candidate can strategically communicate their educational history by observing interviewers and roughly calculating their favorability to alternative education.

In the context of corporate politics, an individual may already be employed and may be seeking to garner consensus within the organization for a policy change. An example of a desired policy change might be to eliminate the requirement for a traditional degree from certain job requisitions, or to allow specific alternative credentials to substitute for that requirement in some cases. Many corporations offer thousands of dollars per employee in tuition assistance. A second example of a desired policy change might be to modify tuition assistance to target CLEP testing, so that recipients would be able to more quickly and cheaply obtain college credit, and potentially reduce assistance outlays from the employer. Bearing in mind the preferred model might assist a change advocate in identifying those individuals best predisposed to agreement with the change, facilitating consensus building and execution of that change.

For both above scenarios, a key rhetorical strategy is to ask a person about whether they are familiar with alternative credentials. If they are not, talk a bit about them. After ensuring the concept is familiar, proceed to ask whether the person thinks these will soon become conventional. This is a key non-observable factor which is extremely explanatory in the model, but when asked in conversation it comes across in a non-technical, comfortable way. Handled properly, this question can be a good ice breaker and help the person asking the question to understand their audience without giving away the views of the person asking the question. The findings in the present paper indicate that people are receptive to alternative credentials even if they aren’t familiar with the topic, and that they become more favorable as they learn more[[41]](#footnote-41). Outside of formal processes, these positive effects may indicate that conversation around alternative credentials is generally positive, and it might be applicable as ordinary leisure conversation material, which might eventually contribute to wider social acceptance by word of mouth.

Regarding competitive analysis from the firm perspective, particularly in the case of labor competition, firms already know that alternative education is important. People often learn about alternative learning providers through their employer. This is reflected in the findings from the present research in that unemployed status has a highly significant association with lack of knowledge about alternative learning providers[[42]](#footnote-42). While employers are already driving alternative learning adoption, this kind of learning is typically used as a layer of professional learning, upskilling, or continuous education on top of a prior traditional degree.

The competitive trend is the tendency to allow that learning to substitute for the degree. This improvement to the prior human resource process allows access to a larger pool of qualified candidates who tend to accept offers at lower salary. Google was in early on this trend. In 2013, Laszlo Bock, Senior Vice President at Google, was interviewed by Adam Bryant of The New York Times. He stated that Google’s data at that time indicated that on the job performance was insignificantly related to GPA or test scores after 2-3 years, and the proportion of people without any college education at Google was increased over time[[43]](#footnote-43). Years later, in 2018, a well-known salary aggregator called Glassdoor reported on 15 major companies, including Google, which no longer required a degree[[44]](#footnote-44). Glassdoor stated, “Increasingly, there are many companies offering well-paying jobs to those with non-traditional education or a high-school diploma.”

Alternative learning providers are also a key approach to improving workforce diversity[[45]](#footnote-45). In order to align with other industry-leading firms, drive down labor cost, and improve workforce diversity, the present findings suggest a best practice policy is to marginally reduce traditional educational requirements in as many professional positions as feasible for a given firm.

Facing the education consumption decision includes at least two sub-scenarios. In one scenario the consumer is the student, and in another scenario the consumer is financing a third-party student. Typically, a financier would be a parent paying for their child to receive additional education, but there are many non-parental cases of third-party financing. Employers are a key example of non-parental education financing.

The important takeaway from the findings for individuals facing education consumption choices is that most people are favorable to the idea that alternative credentials

\*\*\* revise below:

Need to write about Zuckerberg online education story and other opposition to digital, MOOC, etc. consideration about lab classes, etc. In addition to those interesting questions, I should also add a short history of alternative education to section 2. I can also add a short section on macro economic applications to the application section. One application would be remove the G.I. Bill and remove student lending practices, get rid of the department of education and so on. My findings don’t Dispute the large collection of literature which would advocate for such findings. My only protest is that it seems obviously politically infeasible. I say that not only as an academic, but also as someone who has worked as a political consultant in the DC beltway. But this is obviously politically and fees infeasible another would be remove incentives for internships to have a college Roman requirement. Another Policy would be to allow federal loans in dollars to be used outside of the accreditation system or credit system, so that they could apply at alternative learning places. Another would be to somehow drastically limit or sunsets the amount of money loans and grants and federally. If were using Clock test we could reduce by like a factor of like 10 or 20 at least. Another natural economic policy change would be not To remove or/or anything like that, but simply to freeze or prohibit from a few future growth. There is good reason to think that alternatives will continue to flourish and they will become naturally preferred on the market naturally so long as federal stimulus of the legacy system does not continue to grow. Frankly, we could even allow growth of the legacy system and federal spending on it and so forth, It would just need to be small, like a slower growth or perhaps even a constant button and non-increasing growth although those are expected to have empirically less beneficial results as we take an approach which moves with additional federal spending.

**Appendix 1 - Question Reference**

1. Do you contribute to hiring and firing decisions at your company?
   1. One selection among the following was allowed:
      1. Yes
      2. No
      3. Unemployed
2. For many professions, alternative credentials can qualify a person for an entry-level position.
   1. An integer selection inclusively between 1 and 10.
   2. Value of 1 labeled “Strongly Disagree”
   3. Value of 10 labeled “Strongly Agree”
   4. Other values unlabeled.
   5. This is the default answer pattern. If some question doesn’t specify the available answers, then the answers available are similar to question #2.
3. It will soon become fairly conventional for high school graduates to obtain alternative credentials instead of going to college.
4. When you add up the pros and cons for online education, it's probably a good thing for society overall
5. When you add up the pros and cons for artificial intelligence, it's probably a good thing for society overall.
6. When you add up the pros and cons for cryptocurrency, it's probably a good thing for society overall.
7. When evaluating an applicant's education, it is important is important to check whether the degree was awarded from a US institution.
8. Have you heard of any of the following online course providers?
   1. Zero to many selections among the following were allowed:
      1. Udacity
      2. Udemy
      3. Coursera
      4. Pluralsight
      5. Lynda.com
9. Do you work in a STEM profession?
   1. One selection among the following was allowed:
      1. Yes
      2. No
      3. Unsure
10. Which of these industries most closely matches your profession?
    1. Selections were not based on 2018 SOC codes, but in the future I would like to provide those options. https://www.bls.gov/soc/2018/major\_groups.htm
    2. One selection among the following was allowed:
       1. Agriculture
       2. Education
       3. Energy
       4. Finance, Investment, or Accounting
       5. Health
       6. Information Technology
       7. Law
       8. Manufacturing
       9. Military
       10. Other
       11. Retail
       12. Transportation
11. I consider myself religious
12. I consider myself Christian
13. Government regulation helps ensure businesses treat individuals more fairly.
14. Age
    1. Included by SurveyMonkey in 2018.
    2. In 2019 the question was explicitly asked.
    3. One selection among the following was allowed:
       1. < 18
       2. 18 -29
       3. 30-44
       4. 45-60
       5. > 60
15. Gender
    1. Included by SurveyMonkey in 2018.
    2. In 2019 the question was explicitly asked and the value of Other became a choice.
    3. One selection among the following was allowed:
       1. Male
       2. Female
       3. Other
16. Household Income
    1. Included by SurveyMonkey in 2018.
    2. In 2019 the question was explicitly asked.
    3. Measured annually, in nominal USD.
    4. One selection among the following was allowed:
       1. 0-9,999
       2. 10,000-24,999
       3. 25,000-49,999
       4. 50,000-74,999
       5. 75,000-99,999
       6. 100,000-124,999
       7. 125,000-149,999
       8. 150,000-174,999
       9. 175,000-199,999
       10. 200,000+
       11. Prefer not to answer
17. Region
    1. Included by SurveyMonkey
    2. One selection among the following was allowed:
       1. New England
       2. Middle Atlantic
       3. East North Central
       4. West North Central
       5. South Atlantic
       6. East South Central
       7. West South Central
       8. Mountain
       9. Pacific
18. Device Type
    1. Included by SurveyMonkey
    2. One selection among the following was allowed:
       1. iOS Phone / Tablet
       2. Android
       3. Other Phone / Tablet
       4. Windows Desktop
       5. MacOS Desktop
       6. Other

TODO: may administration questions

**Appendix 2 – Questions Per Survey**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Question Definition ID** | **Short Name** | **2018, Feb** | **2018, Oct** | **2019, Feb** | **2019, May** |
| 1 | Employment | X | X | X | X |
| 2 | Entry-Level Suitability | VOI | VOI | VOI | X |
| 3 | Expected Conventionality | X | S | X | X |
| 4 | Online Education | X | S | X | X |
| 5 | Artificial Intelligence |  | S | X | X |
| 6 | Cryptocurrency | S | X |  |  |
| 7 | US Degree Centrism | S | X |  |  |
| 8 | Provider Recognition | S | S | X | X |
| 9 | STEM | X | X |  |  |
| 10 | Industry | S | X | X | X |
| 11 | Religiousness |  | X |  |  |
| 12 | Christianity |  | X |  |  |
| 13 | Regulatory Policy |  | S | X | X |
| 14 | Age | X | S | X | X |
| 15 | Gender | S | S | X | X |
| 16 | Household Income | S | S | X | X |
| 17 | Region | X | X | X | X |
| 18 | Device Type | X | X | X | X |
| 19 | Time |  | C | C | C |
| 20 | Collector |  |  | C | C |
| 21 | Ethnicity |  |  |  | X |
| 22 | Traditional Education |  |  |  | X |

C - Question is a calculated question, the answer of which was determined by the analyst instead of being explicitly asked of the respondent.  
S - Question was presented and associated with a strong effect.  
X - Question was present for survey. This does not guarantee every respondent answered the question. Particularly, Q14-Q18 were presented as SurveyMonkey included data for paid responses only during 2018. Beginning in 2019, Q14-Q16 were asked of all respondents, but Q17-Q18 remained observed for SurveyMonkey paid responses.  
VOI - Question was present and represents the variable of interest.

1. <https://heinonline.org/HOL/LandingPage?handle=hein.journals/swulr29&div=22&id=&page=&t=1556581085> [↑](#footnote-ref-1)
2. <https://www.sciencedirect.com/science/article/abs/pii/0272775788900751> [↑](#footnote-ref-2)
3. <https://eric.ed.gov/?id=EJ198251> [↑](#footnote-ref-3)
4. <https://www.forbes.com/sites/zackfriedman/2019/02/25/student-loan-debt-statistics-2019/#5a7501b9133f> [↑](#footnote-ref-4)
5. A recommended example: Caplan, Bryan. *The case against education: Why the education system is a waste of time and money*. Princeton University Press, 2018. [↑](#footnote-ref-5)
6. This represents a price increase from $11,862 to $21,222 in constant 2016 dollars. This price includes tuition and fees and room and board rates charged for full-time students in degree-granting postsecondary institutions. <https://nces.ed.gov/programs/digest/d17/tables/dt17_330.10.asp> [↑](#footnote-ref-6)
7. This represents an increase from $8,654 to $11,011 in constant 2014 dollars. <https://nces.ed.gov/programs/digest/d15/tables/dt15_236.15.asp> [↑](#footnote-ref-7)
8. From 1989 to 2012, a decrease of $4,385 from $49,487 to $45,102 in constant 2016 dollars is observed. (4385/49487) = .089. From 1960 to 2012 an increase from $47,442 to $50,219 is observed. <https://www.naceweb.org/job-market/compensation/salary-trends-through-salary-survey-a-historical-perspective-on-starting-salaries-for-new-college-graduates/> [↑](#footnote-ref-8)
9. Rachel Fishman, “College Decisions Survey: Deciding to Go to College,” New America Foundation, May 28, 2015, https:// [www.newamerica.org/education-policy/edcentral/collegedecisions](http://www.newamerica.org/education-policy/edcentral/collegedecisions) [↑](#footnote-ref-9)
10. <https://www.amazon.com/New-Faster-Cheaper-Alternatives-College/dp/1946885479> [↑](#footnote-ref-10)
11. Caplan, Bryan. *The case against education: Why the education system is a waste of time and money*. Princeton University Press, 2018. [↑](#footnote-ref-11)
12. <http://www.acics.org/accreditation/content.aspx?id=2258> [↑](#footnote-ref-12)
13. <https://www.ourdocuments.gov/doc.php?flash=false&doc=76> [↑](#footnote-ref-13)
14. <https://www.chea.org/recognition-accreditation-organizations> [↑](#footnote-ref-14)
15. <https://www.luminafoundation.org/looking-back-to-move-forward-1> [↑](#footnote-ref-15)
16. <https://www.census.gov/library/stories/2019/02/number-of-people-with-masters-and-phd-degrees-double-since-2000.html> [↑](#footnote-ref-16)
17. <https://nces.ed.gov/programs/coe/pdf/Indicator_CPA/coe_cpa_2013_01.pdf> [↑](#footnote-ref-17)
18. <https://nces.ed.gov/fastfacts/display.asp?id=51> [↑](#footnote-ref-18)
19. <https://nces.ed.gov/fastfacts/display.asp?id=372> [↑](#footnote-ref-19)
20. <https://www.census.gov/newsroom/press-releases/2017/cb17-51.html> [↑](#footnote-ref-20)
21. <https://www.pnas.org/content/111/23/8410> [↑](#footnote-ref-21)
22. <https://clep.collegeboard.org/register> [↑](#footnote-ref-22)
23. <https://studentloanhero.com/featured/cost-per-credit-hour-study/> [↑](#footnote-ref-23)
24. Credit may vary and is generally decided by the awarding institution rather than the exam provider. Some CLEP tests are offered at other price points. CLEP tests are a specific product provided by The College Board and other providers may charge different prices. Other exams widely recognized for credit by examination include AP, Cambridge International, DSST, Excelsior College, and TECEP exams. [↑](#footnote-ref-24)
25. <https://secure-media.collegeboard.org/digitalServices/pdf/sat/TotalGroup-2014.pdf> [↑](#footnote-ref-25)
26. <https://hslda.org/content/docs/news/2016/201606240.asp> [↑](#footnote-ref-26)
27. Di Carlo, Matthew. "The Evidence on Charter Schools and Test Scores. Policy Brief." *Albert Shanker Institute* (2011). [↑](#footnote-ref-27)
28. Dequech, David. "Institutions and norms in institutional economics and sociology." *Journal of Economic Issues* 40.2 (2006): 473-481. [↑](#footnote-ref-28)
29. Conley, John P., and William Neilson. "Endogenous games and equilibrium adoption of social norms and ethical constraints." *Games and Economic Behavior* 66.2 (2009): 761-774. [↑](#footnote-ref-29)
30. Marra, Michele, David J. Pannell, and Amir Abadi Ghadim. "The economics of risk, uncertainty and learning in the adoption of new agricultural technologies: where are we on the learning curve?." *Agricultural systems* 75.2-3 (2003): 215-234. [↑](#footnote-ref-30)
31. The non-cubic model is approximately of the form -.139t + 3.24(10)-6t2, so that we predict a positive trend at a level of 0 when t = 42,901, or in about 117.5 years. The cubic model is of the form -3.26(10)-6t2 + 1.01(10)-10t3. This indicates a break-even date of t = 32,277, or in about 88.4 years. [↑](#footnote-ref-31)
32. Eidelman, Scott, and Christian S. Crandall. "Bias in favor of the status quo." Social and Personality Psychology Compass 6.3 (2012): 270-281. [↑](#footnote-ref-32)
33. Baumol, William J. *The free-market innovation machine: Analyzing the growth miracle of capitalism*. Princeton university press, 2002. [↑](#footnote-ref-33)
34. https://factfinder.census.gov/help/en/division.htm [↑](#footnote-ref-34)
35. Cox, Nicholas J. "Stata tip 59: Plotting on any transformed scale." *The Stata Journal* 8.1 (2008): 142-145. [↑](#footnote-ref-35)
36. Technically, this regression is executed in STATA with the syntax `nl exp2: voi ctime1`. [↑](#footnote-ref-36)
37. Technically, this regression is executed in STATA with the syntax ` nl (voi = {b0}\*(exp({b1}\*nvoifconventionalsoon1)))`. [↑](#footnote-ref-37)
38. I recommend the use of KaTeX in constructing mathematical expressions like this. <https://katex.org/> [↑](#footnote-ref-38)
39. Technically, this regression is executed in STATA with the syntax `nl (voi = {b1}+{b2=2}\*(exp({b3=0.1}\*nvoifconventionalsoon1)))`. [↑](#footnote-ref-39)
40. <https://www.sciencedirect.com/science/article/abs/pii/0167487096800146> [↑](#footnote-ref-40)
41. Technically, `reg voi cprovider1` indicates that when a person doesn’t know of any alternative learning providers, there is still a constant of 6.4 in the simple linear regression, indicating positive favorability to the variable of interest. In addition, cprovider1 itself has a significant, positive effect, indicating that informing a person about an alternative learning provider is expected to have a positive impact to the variable of interest, which is alternative credential favorability. [↑](#footnote-ref-41)
42. Technically, `reg cprovider1 isunemployed` identifies a linear effect of unemployed status on learning providers knowledge with a p-value of about 0.000 and a considerable magnitude of -.6. [↑](#footnote-ref-42)
43. <https://www.nytimes.com/2013/06/20/business/in-head-hunting-big-data-may-not-be-such-a-big-deal.html> [↑](#footnote-ref-43)
44. <https://www.glassdoor.com/blog/no-degree-required/> [↑](#footnote-ref-44)
45. <https://www.cio.com/article/3250634/want-a-more-diverse-workforce-hire-bootcamp-graduates.html> [↑](#footnote-ref-45)