

# Conformity and Soft Skills as Determinants of Alternatively Credentialed Non-College Graduate Hireability

John Vandivier<sup>a</sup>

<sup>a</sup>4400 University Dr, Fairfax, VA 22030

---

## Abstract

Despite targeting technical skills, vocational school graduates earn less than college graduates. This paper presents evidence that conformity selection and perceived skill gaps explain differences in hireability. Microdata from the United States reveals a perceived soft skill deficit for alternatively credentialed non-college graduate (ACNG) labor. Conformity is also important, but the direction of effect is heterogenous by employer type. Conformity and perceived skill gaps explain about one-third of the hireability variance. Perceived soft skill gaps explain more hireability variance than widely recognized factors like the industry of occupation. Opposite conventional explanation, results suggest that conformity reduces hireability on average. Respondents tend to perceive ACNG candidates as an even mix of high and low performers. Evidence favors employer risk aversion toward labor productivity as a preferred explanation of low ACNG demand. The conclusion incorporates discussion of public misperception on vocational school costs and suggests activities to reduce unconscious bias.

*Keywords:* education economics, signaling, hireability, conformity, vocational  
*2010 MSC:* I20, I21, J23, J24

---

---

*Email address:* [jvandivi@masonlive.gmu.edu](mailto:jvandivi@masonlive.gmu.edu) (John Vandivier)

## 1. Introduction

A substantial gap exists between the skills expected by employers and those possessed by college graduates[1, 2, 3, 4]. Experts view college alternatives, including vocational school, to be useful for technical training, but the traditional college degree retains a wage premium over vocational education. Unemployment, underemployment, and other adverse labor outcomes follow a similar pattern[5]. This paper seeks to resolve the apparent discrepancy between these outcomes while preserving the mainline economic view that employers pay for perceived job candidate skill. To explain the apparent discrepancy, this paper tests the hypothesis that employers expect an offsetting non-technical skill deficit when considering an alternatively credentialed non-college graduate (ACNG). I find evidence that employers and the general population in the United States expect a low level of soft skills from ACNG job candidates.

Alternative credentials refer to credentials other than the undergraduate degree[6]. The category includes, for example, industry certifications, portfolios of work, digital badges, and other records of unaccredited learning and achievement. Consumers of alternative education typically intend to leverage alternative credentials toward better employment. That is, they typically have the same goals as a college student. Many individuals obtain alternative credentials as a supplement to a college degree. Supplemental usage is excluded from the analysis in this paper. This paper focuses on the use of alternative credentials as a substitute for a college degree. This paper provides a comparative analysis between traditional and alternative credentials at the skill level. Education consumers and learning advisors can use results to inform strategic consumption. Learning providers can use results as a skill-level diagnostic and product improvement resource.

In a noteworthy literature review, Bills identifies seven sociological or economic theories of the relationship between schooling and job assignment[7]. A keyword search in April 2021 indicates that human capital theory, institutional theory, and signaling theory are the three theories mentioned by Bills that are

most frequently observed<sup>1</sup>. When applied to the economics of education, the institutional theory holds that an institution improves individual labor prospects by declaring some individuals to be graduates. In this application, institutional theory can be included in a signaling model with institutional effects. In the  
35 current study, institutional effects are held constant by using hypothetical questions involving anonymous institutions.

For the purpose of this study, signaling theory provides three advantages over the alternative human capital theory. First, signaling theory can explain labor outcome variance when human capital unobserved[8]. By extension, signaling  
40 theory can also explain labor outcome variance when human capital is held constant.

Second, the signaling model empowers a questionnaire research design. In a standard human capital model of wages, human capital is an input to a production function[9]. In a competitive labor market, firms are willing to pay wages  
45 equal to the marginal revenue product. The marginal revenue product for an individual is a function of human capital factors, including skills. Establishing a wide array of such skill measures would be complicated and prone to measurement sensitivities, assumptions, and errors of various kinds. In this framework, a questionnaire is a second-best design that provides a proxy for the functional  
50 measure of skill.

Signaling theory takes the reverse approach. According to the signaling model, willingness to pay is a function of perceived quality. The relationship between perceived quality and actual quality is secondary. In this framework, a questionnaire is an ideal measurement tool. The value of this research approach

---

<sup>1</sup>A Google Scholar search for “institutional theory” yields about 210,000 results. About two million results are found for control theory, but Bills notes that “In its explanatory form, control theory is indistinguishable from human capital theory.” In addition, the keyword search results on control theory include disproportionately many results that do not relate to economic analysis. The search for ‘human capital theory’ yields about 72,000 results. The sum of ‘signaling theory’ and ‘signalling theory’ is about 45,000 results. The total search result count for the other four theories is less than twenty-five thousand results.

55 is supported by the broad use of questionnaires to identify willingness to pay  
within the field of market research[10].

An additional benefit of using a questionnaire is the ability to ask hypothetical questions. Hypothetical questions avoid the problem of unobserved heterogeneity because the analyst has total knowledge over the subject of measurement.  
60

Third, signaling theorists have laid out a testable hypothesis for weak labor outcomes among non-college graduates. Following this model, scholars claim that the college degree signals intelligence, conscientiousness, and conformity[11]. This paper hypothesizes that, in contrast, alternative credentials signal nonconformity and low conscientiousness.  
65

Employer demand for conscientiousness and conformity follows a bliss point pattern. Excess individual conscientiousness can disturb team performance[12]. Conformity can lead to a lack of innovation and suboptimal organizational practices[13]. Conformity selection occurs in part through heuristic cognition or unconscious bias.  
70

Risk aversion is a distinct explanation for conformity selection. Some employers are not able to evaluate an alternative credential with confidence. Such an employer views ACNG labor as a gamble with some odds of positive or negative outlier value. The employer may not prefer to hire such a candidate due to risk aversion, even if their point estimate for ACNG labor value is higher than their point estimate for a recent college graduate. If firm size effects are positively associated with ACNG hireability, this will add weight to an explanation based on risk aversion.  
75

## 2. Data and Methodology

80 A simple model of demand for labor provides context for the hypothesis of interest. This model is clarified in Equations 1a and 1b:

$$S_j = f(H_j) \tag{1a}$$

$$w_{ij} = E_i(MRP_j) = f_i(S_j) \quad (1b)$$

Job candidate  $j$  generates a signal of productivity  $S_j$  from unobserved human capital  $H_j$ . Employer  $i$ , forms an expectation of the marginal revenue product of  $j$  on the basis of  $f_i(S_j)$ , an employer-specific evaluation of  $S_j$ . A specific employer is willing to pay a specific job candidate wages of  $w_{ij}$ .

This study uses ordinary least squares (OLS) regression analysis to estimate the effect of perceived skill gaps on hireability. An employer is willing to pay more for a relatively hireable individual. The representation of willingness to pay makes hireability a proxy of demand for labor and  $w_{ij}$ . This paper hypothesizes that employers preferentially value soft skills in the course of  $f_i(S_j)$  to explain the reduced willingness to pay for ACNG labor relative to college graduate labor. If employers do bias toward soft skills in job candidate evaluation, one or more soft skill gap factors should yield a negative coefficient in a regression on hireability.

This paper leverages an original set of online questionnaire responses ( $n = 322$ ). Responses are cross-sectional data obtained in early February of 2021. Respondents are United States citizens at or over the age of eighteen. Qualified respondents participated in the survey through the Amazon Mechanical Turk platform.

The survey includes 65 questions in two sections<sup>2</sup>. The first section captures respondent characteristics, and the second section captures a skill-level evaluation of various hypothetical job candidates. Grouping these variables into three groups simplifies discussion. There is the dependent variable of interest, independent variables of interest, and categorical controls.

In this study, the categorical variables and the control variables are the same set. The independent and dependent variables of interest are Likert-type responses on a 10-point scale<sup>3</sup>. Higher Likert-type values indicate greater agree-

---

<sup>2</sup>See Appendix A for a full copy of the survey.

<sup>3</sup>It is an accepted practice to treat Likert-type responses as either categorical or continuous

ment with the associated statement. Categorical controls include state of residence, the industry of occupation, employer status, firm size, and a measure called duration.

Duration measures the length of time the respondent believes it takes to obtain an alternative credential. Employer status describes whether an individual makes hiring and firing decisions in the course of their employment. The variable takes one of three values: yes, no, or unemployed. Employer effects refer to the case where an individual states that they do make hiring and firing decisions. State of residence refers to a state within the United States or the District of Columbia.

The dependent variable of interest is called hireability. Hireability measures agreement that, “For many professions, alternative credentials can qualify a person for an entry-level position.” The dependent variables of interest include perceived skill gaps and rulebreaker effects.

Rulebreaker effects refer to a collection of three factors that measure respondent agreement with statements about nonconformists, or “People who are willing to break formal or informal rules and norms.” The first statement indicates that nonconformists present a risk to a company’s reputation, productivity, or value. This statement received the least agreement and greatest response variance among three qualitatively different descriptions of nonconformists ( $\mu = 6.29, \sigma = 2.51$ ).

The second statement indicates that nonconformists are held back by rules, and “could just as easily be high performers as low performers.” This statement received the most agreement and least variance among rulebreaker statements ( $\mu = 6.93, \sigma = 2.10$ ). The agreement with this statement provides evidence against the thesis that employers value conformity for its own sake. In turn,

---

for regression analysis. Jaccard and Wan provide support for continuous analysis of Likert-type data. They note that severe departures from the assumptions on cardinality “do not seem to affect Type I and Type II errors dramatically,” particularly when the Likert scale is five or more points[14]. This paper uses a 10-point scale and treats these data as continuous.

135 this adds weight to the theory that employers value conformity as a risk aversion  
tactic while knowing that nonconformity signals positive outlier potential. The  
third rulebreaker effect states that rulebreakers are creative, innovative, and  
likely to benefit company culture ( $\mu = 6.71, \sigma = 2.18$ ).

Rulebreaker effects and perceived skill gaps are structurally linked. One of  
140 the skills that respondents evaluate is nonconformity, or “willingness to break  
formal or informal rules and norms.” Interpreting rulebreaker effects jointly  
with the conformity gap effect enables better explanatory power and diagnostic  
utility.

Perceived skill questions in the second section of the survey allow for two  
145 ways to calculate perceived skill gaps. Perceived skill gaps are measured separately  
with and without overqualification effects. Overqualification effects are  
important in external research[15, 16], but skill gap analysis that ignores these  
effects is also routine[17].

Perceived skill is a Likert-type response reporting agreement stating that a  
150 particular candidate has a particular skill. For each of 13 skills, the respondent  
imagines and reports skill levels for the ideal candidate, the average actual  
employee, the average recent college graduate, and the average ACNG. As a  
result, 52 of the 65 questions in the survey are questions on perceived skill  
about kind of candidate.

155 The raw skill gap for a candidate is the difference between the perceived  
skill for that candidate and the ideal candidate. The perceived skill gap with  
overqualification effects equals the raw perceived skill gap. The perceived skill  
gap without overqualification is zero if the raw skill gap is negative, and otherwise,  
it is equal to the raw skill gap.

160 The concept of skill is intentionally treated loosely in this analysis. The  
thirteen factors treated as skills include attractiveness, verbal, written, and  
body language communication skills, conscientiousness, customer service skill,  
emotional intelligence (EQ), expected salary, teamwork, technical skill, willingness  
to break formal or informal rules (nonconformity), willingness to work odd  
165 hours, and willingness to commute.

Results focus on ACNG skill gap coefficients and also comparative skill gaps between ACNG labor and recent college graduates. Perceived ACNG skill gaps are also called absolute skill gaps. Subtracting the perceived recent college graduate skill gap from the absolute skill gap yields the comparative skill gap.

170 Models of these variables will support the hypothesis if soft skills are more important than technical skill gaps. Significant rulebreaker effects would provide evidence that conformity is valued differently for different types of employers. A positive relationship between firm size and hireability would support an explanation from risk aversion.

### 175 3. Results

The median hireability response was eight out of ten. The mean response is about 7.42. Absolute skill gaps and comparative skills gaps are both important explanations of hireability. Soft skills explain hireability better than technical skill does in both absolute and comparative terms. Technical skill is not a contributing factor in any model of interest. Of the thirteen skills investigated, 180 seven skills contribute to the preferred model.

Table 1 reports five interesting multiple regressions. Models 1 through 4 maximize adjusted r-squared for a given set of factors. Factors in these models are not constrained using a p-value threshold. Model 4 is the preferred model, 185 and factors in this model have a p-value less than 0.28. Model 5 is a special case designed to answer an analytical question.

Models 1 and 2 maximizes adjusted r-squared using absolute skill gaps. Model 1 includes overqualification effects, and Model 2 excludes these effects. This model is useful to demonstrate which skills are important determinants of ACNG hireability. The key result from these two models is that measuring skill 190 gaps without overqualification is preferred.

Models 3 through 5 also exclude overqualification effects. Model 3 maximizes adjusted r-squared using comparative skill gaps. This model explains hireability by comparing ACNG labor to recent college graduates by skill. Model 4



195 synthesizes comparative and absolute skill gaps.

Table 1: Linear Models with Hireability as Dependent Variable

|                                | 1         | 2         | 3         | 4         | 5         |
|--------------------------------|-----------|-----------|-----------|-----------|-----------|
| Comparative, Attractiveness    | -0.161*** |           | -0.185*   |           |           |
| Comparative, Conscientiousness |           |           | -0.140    |           |           |
| Comparative, Customer Service  |           |           | 0.138     | 0.142*    | 0.145*    |
| Comparative, EQ                |           |           | -0.0955   |           |           |
| Comparative, Odd Hours         |           |           | -0.177*   | -0.255*** | -0.260*** |
| Comparative, Teamwork          |           |           | -0.196*   | -0.242**  | -0.251**  |
| Comparative, Writing           |           |           | 0.128     | 0.0920    | 0.0934    |
| Comparative, Rulebreaker       |           |           |           |           | 0.0182    |
| Duration                       | 0.666**   | 0.634**   | 0.811***  | 0.744**   | 0.719**   |
| Duration <sup>2</sup>          | -0.0884** | -0.0857** | -0.113*** | -0.103**  | -0.1000** |
| Employees 1-10                 |           |           |           |           | -0.187    |
| Employees 11-50                |           |           |           |           | 0.398     |
| Employees 51-200               | -0.475*   | -0.480**  | -0.364    | -0.459*   | -0.258    |
| Employees 201-500              |           |           |           |           | 0.135     |
| Employees 501-1,000            |           |           |           |           | 0.420     |
| Employees 1,001-5,000          |           |           |           |           | 0.0812    |
| Employees 5,001-10,000         |           |           |           |           | 0.0789    |
| Employees 10,000+              |           |           |           |           | 0.279     |
| Gap, Attractiveness            |           | -0.367*** |           | -0.350*** | -0.358*** |
| Gap, Body Language-IT          | 0.100     | 0.132     |           | 0.106     | 0.0874    |
| Gap, Conscientiousness         | -0.0657   | -0.0845   |           | -0.132**  | -0.134**  |
| Gap, EQ                        | -0.0966   | -0.0952   |           |           |           |
| Gap, Nonconformity             |           |           |           |           | 0.0574    |
| Industry Credentials Required  | 0.706*    | 0.722**   | 0.374     | 0.378     | 0.375     |
| Industry Credentials Normal    | 0.932**   | 0.926**   | 0.487*    | 0.436*    | 0.448*    |
| Industry Credentials Sometimes | 0.467     | 0.475     |           |           |           |
| Industry Credentials Unknown   | 0.641*    | 0.684**   |           |           |           |
| Industry, Agriculture          | 1.368     | 1.619*    |           |           |           |
| Industry, Energy               | -1.277*   | -1.190*   | -1.200*   | -1.442**  | -1.448**  |
| Industry, Finance              | -0.811*** | -0.783*** | -0.712*** | -0.715*** | -0.717*** |
| Continued on Next Page         |           |           |           |           |           |

Table 1 – Continued

|                                  | 1         | 2         | 3         | 4         | 5         |
|----------------------------------|-----------|-----------|-----------|-----------|-----------|
| Industry, Information Technology | 0.335     | 0.264     | 0.438*    | 0.306     | 0.337     |
| Industry, Law                    | -1.813*** | -1.670**  | -1.935*** | -1.876*** | -1.857*** |
| Industry, Transportation         | 1.512*    | 1.643**   | 1.216     | 1.403*    | 1.350*    |
| Is Employed Non-Manager          | -0.336    | -0.383*   | -0.497**  | -0.471**  | -0.451**  |
| Is STEM Worker                   | -0.491**  | -0.529**  | -0.525**  | -0.557**  | -0.564**  |
| Rule Breakers Risky              | 0.0732*   | 0.0715*   | 0.0880**  | 0.0747*   | 0.0762*   |
| Rule Breakers Rockstars          | 0.133**   | 0.128**   | 0.147**   | 0.141**   | 0.140**   |
| Rule Breakers Culture Add        | 0.0905    | 0.0974*   | 0.115**   | 0.112**   | 0.110**   |
| State, Arizona                   | -1.157**  | -1.048**  | -0.755    | -0.823*   | -0.790    |
| State, Arkansas                  | -2.690*** | -2.817*** | -2.489*** | -2.664*** | -2.770*** |
| State, California                | -0.575*   | -0.570**  | -0.488*   | -0.435    | -0.446    |
| State, Colorado                  | -1.446**  | -1.423**  | -1.463**  | -1.521*** | -1.508*** |
| State, Connecticut               | -1.401    | -1.550    |           |           |           |
| State, Florida                   | -0.444    | -0.454    |           |           |           |
| State, Hawaii                    | -3.232*** | -3.271*** | -2.884*** | -2.869*** | -2.812*** |
| State, Illinois                  | -0.637    | -0.699*   | -0.596    | -0.675*   | -0.698*   |
| State, Kansas                    | -3.283**  | -3.486**  | -2.923*   | -3.116**  | -3.101*   |
| State, Kentucky                  | -3.143*** | -3.167*** | -2.583*** | -2.729*** | -2.679*** |
| State, Louisiana                 | -1.455*   | -1.255*   | -0.915    | -0.941    | -0.898    |
| State, Maryland                  | -0.596    | -0.642    |           |           |           |
| State, Nebraska                  | -2.037*   | -2.167*   | -1.391    | -1.655    | -1.596    |
| State, Nevada                    | -1.406    | -1.470    | -1.465    | -1.434    | -1.409    |
| State, New Jersey                | -1.145    | -1.139    | -0.976    | -0.936    | -0.963    |
| State, New York                  | -0.692**  | -0.640*   | -0.617*   | -0.595*   | -0.590*   |
| State, Ohio                      | -3.943*** | -4.024*** | -4.051*** | -3.808*** | -3.761*** |
| State, Pennsylvania              | -0.752    | -0.687    | -0.608    | -0.534    | -0.539    |
| State, South Carolina            | -1.183    | -1.243    | -1.361    | -1.310    | -1.347    |
| State, Tennessee                 | -1.878**  | -1.909**  | -1.545*   | -1.843**  | -1.799**  |
| State, Texas                     | -0.906**  | -0.851**  | -0.797**  | -0.790**  | -0.789**  |
| State, Washington                | -0.817    | -0.863*   | -0.880*   | -0.996**  | -1.003**  |
| Constant                         | 5.036***  | 5.356***  | 4.755***  | 5.327***  | 5.343***  |
| Adjusted R-sqr                   | 0.2181    | 0.2512    | 0.2331    | 0.2784    | 0.2654    |
| Continued on Next Page           |           |           |           |           |           |

Table 1 – Continued

|  | 1      | 2      | 3      | 4      | 5      |
|--|--------|--------|--------|--------|--------|
| R-sqr  | 0.3253 | 0.3539 | 0.3310 | 0.3706 | 0.3799 |
| p(F)   | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| * $p < 0.10$ , ** $p < 0.05$ , *** $p < .01$ |        |        |        |        |        |

Rulebreaker effects are significant in all models. Nonconformity is insignificant in a multiple regression that includes rulebreaker effects. The insignificance of nonconformity is intuitive because these factors essentially describe the same thing. Rulebreaker effects describe the way a respondent qualitatively views conformity. Excluding overqualification, a conformity skill gap indicates that a respondent views ACNG labor as less conformist than ideal. The way a respondent views conformity substantially implies their ideal level of conformity and how deviations from that ideal will impact willingness to hire. This implication is substantial but imperfect. Because the implication is substantial, a conformity skill gap does not improve adjusted r-squared. Because the implication is imperfect, there is an opportunity to force the conformity skill gap into the model. While the p-value will be unacceptably high, it is still analytically interesting to obtain the direction of the conformity skill gap effect. This is what Model 5 does.

Model 5 takes Model 4 and adds additional factors for employer size, the absolute skill gap for conformity, and the comparative gap for conformity. These factors are insignificant, so the coefficient does not provide a confident estimate of the magnitude of the effect. The signs of the effects do add marginally to the cumulative evidence for conclusions. Rulebreaker effects are robustly positive and significant in all models. Positive rulebreaker effects indicate that nonconformity is positive on hireability. The positive coefficients on nonconformity skill in Model 5 reinforce this result.

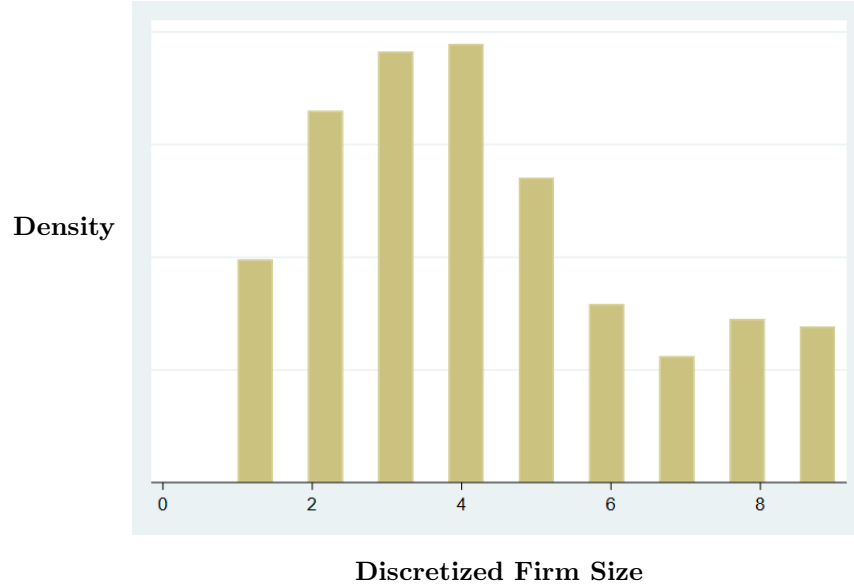
Employer size is a categorical variable, so regression technically treats this variable as a series of dummies. One employer size dummy contributes to Model

4, and it has a negative coefficient. The negative coefficient might appear to be evidence against the claim that large employers are more favorable to ACNG labor. However, the dummy in Model 4 represents an employer size that is less than average. The implication is that the model constant contains a positive effect for larger employers. Model 5 reinforces the subtle implication. Model 5 contains positive coefficients for most firm sizes, including firms at or above the median size.

Figure 1 adds to the evidence that large firms favor alternative credentials. Firm size is a categorical variable with nine possible responses. Figure 1 plots a numeric transform of the variable along the horizontal axis. The vertical axis represents the frequency of response for a given value. Responses from one through eight represent increasing intervals of firm size. The negative coefficient on employer size in Model 4 corresponds to a response of three in the horizontal axis. A response of nine indicates that the question is not applicable because the respondent is not employed. The ninth response is dropped from Model 5 to prevent multicollinearity. There is no loss of analytical power in Model 5 because the dropped dummy does not represent firms of any size. This figure further illustrates that the negative coefficient pertains to small firms. The high willingness to hire on the part of large employers adds to the explanation of low ACNG labor demand from risk aversion.

Models are specified using ordinary least squares (OLS). A robust linear model (RLM) and a generalized linear model (GLM) verify OLS results. RLM and GLM specification alters factor significance but does not alter the coefficient value. RLM and GLM models account for abnormal factor distribution. In the OLS specification of Model 4, the preferred model, p-values did not exceed 0.28. In RLM specification, p-values did not exceed 0.41. In GLM specification, p-values did not exceed 0.38. Overall, OLS seems slightly overfit, and RLM seems slightly underfit compared to GLM. This analysis is mainly concerned with the direction of factor effects rather than a precise estimate of coefficient magnitudes. The important result from robustness testing is that coefficients did not change, and the direction for each factor is plausible ( $p < 0.5 < p'$ ).

Figure 1: Distribution of Firm Size

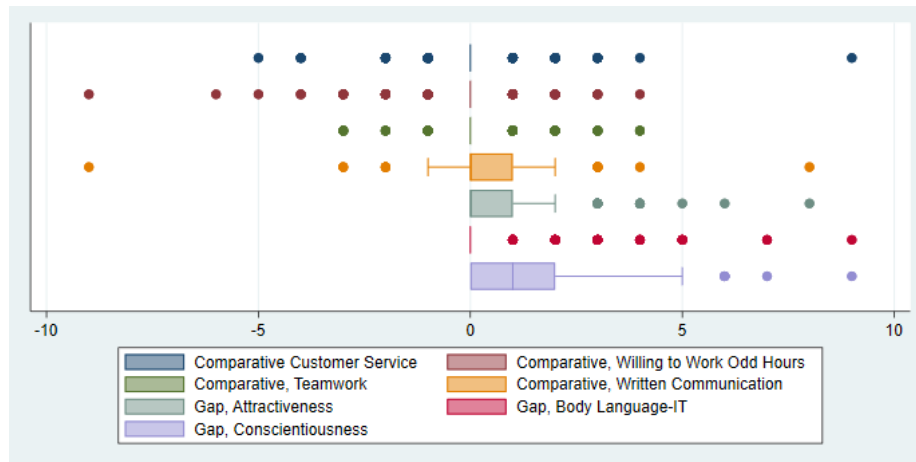


Model 4 identifies seven skill gaps as important explanatory factors. Four important skill gaps are comparative, and three are absolute gaps for ACNG candidates. Figure 2 illustrates the distribution for each important skill gap. Reflecting on this figure helps inform a diagnostic analysis for use by alternative learning providers. ACNG candidates can also supplement their learning to address these gaps. A simple remedy does not seem to apply for attractiveness and willingness to work odd hours. Conscientiousness is difficult to train, but analysis suggests perception management as a remedy. Perceived conscientiousness has a slight correlation duration (Pearson's  $r = 0.21$ ). Spending additional time to obtain a credential is a way to improve perceived conscientiousness. ACNG supplementation of a credential with additional self-study time may also improve perceived conscientiousness.

The important body language communication gap is an interaction with the information technology industry variable. The interaction indicates a reduced penalty for lack of body language communication skills in the information technology industry. A reduced penalty for soft skill deficit helps explain the partic-

ular flourishing of alternative credentials in the information technology industry. The reduced penalty in this particular industry might be related to its relative lack of regulation. Another hypothetical explanation is that the reduced penalty is related to cultural norms in the industry. Suppose that there is a diminished technical need for social skills in programming. In that case, introverts obtain a comparative advantage in this field. Further study that includes personality data is encouraged to test this hypothesis. The interacted body language skill gap and the customer service skill gap are interesting for niche learning providers.

Figure 2: Distribution of Important Gaps



The gaps in teamwork and written communication skill seem to be the best candidates for feasible remedy with broad learning provider applicability. Written communication skill is uniquely amenable to online learning. Written communication skill is also unique in the response distribution. The written communication skill gap is a comparative gap where the interquartile range favors ACNG labor. This indicates the perception that ACNG providers are generally capable of providing this skill. The distribution reflects positive and negative outliers. Positive outliers indicate that the typical provider can improve by em-

285 ulating market leaders. Negative outliers indicate that some learning providers  
are particularly poor at training this skill. If learning providers are generally  
effective in training this skill, improvement for ineffective providers is likely to  
be feasible.

Alternative learning providers can use project-based learning and social  
290 learning techniques to facilitate teamwork skill development. These are not  
the most common pedagogies, but they are an established and effective pattern.  
An online environment can implement courses with project-based learning and  
social learning. The distribution of responses indicates that improving team-  
work skill has neither the maximum penalty nor the maximum return potential  
295 compared to improving written communication. Model results preclude deci-  
sive prioritization of written communication skills. Model 4 indicates that the  
effect of teamwork skill on hireability is more reliable and larger in magnitude  
compared to the coefficient on written communication skill. Targeting both of  
these two skills is feasible and beneficial to educational quality.

300 The preferred model explains about one-third of hireability variance, but  
how much of the explanatory power is attributable to skill gaps? Table 2 pro-  
vides evidence on the importance of perceived skill gaps and rulebreaker effects  
relative to other factor groups. Model 4 is composed of factor groups. Table  
2 summarizes results for simple regressions of each factor group on hireability.  
305 Industry and state effects are factor groups regarded in external literature as  
important for models in the labor market.

Table 2 shows that perceived skill gaps and rulebreaker effects explain more  
variance in hireability compared to the state, industry, and other effects. In-  
dustry and state effects are also less stable. A simple model of industry effects  
310 on hireability results in some industry effects approaching a p-value of 1. In  
contrast, the least significant absolute skill gaps are statistically significant in  
a simple regression ( $p < 0.1$ ). These findings collectively provide evidence that  
perceived skill gaps and rulebreaker effects are factors of high importance for  
models of hireability.

Table 2: Factor Group Explanatory Power in a Simple Regression with Hireability as Dependent Variable

| Effect Group    | Adj R-Sqr | R-Sqr  | Max p-value |
|-----------------|-----------|--------|-------------|
| Absolute Gap    | 0.0615    | 0.0703 | 0.097       |
| Comparative Gap | 0.0176    | 0.0298 | 0.687       |
| Industry        | 0.0303    | 0.0454 | 0.958       |
| Other Factors   | 0.0072    | 0.0288 | 0.537       |
| Rulebreaker     | 0.0783    | 0.0869 | 0.127       |
| State           | 0.0469    | 0.1033 | 0.772       |

#### 315 4. Conclusion

This study provides evidence that the general population is favorable to alternative credentials. Hiring managers have higher hireability than employees that are not managers. Alternative credentials signal a qualitatively different basket of skills compared to recent college graduates. Americans perceive ACNG  
320 labor as weak in soft skills, but learning providers can make changes to mitigate this issue. Alternative credentials signal low conformity, but this results in added hireability on average.

Alternative credentials also signal that a candidate is risky. An explanation of low ACNG demand from employer risk aversion better explains the results  
325 compared to an explanation of selection for conformity. In addition to a direct response indicating risk perception, firm size effects support an explanation from risk aversion. Large employers face a lower risk premium for various reasons. For instance, large employers can spread risk across many hires. Risk premiums are also lower for large employers because they have access to better hiring data.

330 The classic signaling model explanation for employer preference of college graduate labor over ACNG labor is that the college degree provides a com-



parative signal of conscientiousness and conformity. This paper replicates the importance of conscientiousness. Gaps in perceived conscientiousness are important, but conscientiousness is not an important differentiator between college  
335 graduates and ACNG candidates.

While hireability is negatively associated with conformity on average, this varies importantly by the employer. Descriptions of employer preferences better explain the willingness to hire ACNG candidates than skill gaps. Industry effects are also important, but effects at the employer level are significantly  
340 more reliable than industry effects. Scholars, industry members, and others consider state effects and industry effects to be important explanations of the willingness to hire based on an alternative credential. Skill gaps better explain hireability compared to industry and state effects.

Risk aversion and conformity selection are both partially unconscious biases  
345 that lead to an inefficient organizational operation. A practical recommendation is for organizations to implement bias control processes concerning ACNG evaluation. An example of a process improvement would be for a human resources department to maintain a list of specific credentials valued for particular job families.

Another action item is for educational institutions, policymakers, and the  
350 general public to invest further in correcting alternative education misinformation. A survey on trade schooling taken in 2019 provides evidence on the role of this kind of misinformation[18]. Only 27 percent of respondents correctly responded that lower debt is an advantage of enrolling in trade school relative to  
355 college. Additionally, over 75 percent of respondents failed to notice that trade school graduates receive industry employment sooner and receive specialized training when compared to a four-year college.

Obtaining a college degree after obtaining some work experience will allow students to leverage employer tuition benefits. Because ACNG hireability varies  
360 importantly by the particular employer, ACNG job candidates can reduce the risk of a lengthy job search by applying to many employers at the outset of the job search. Social networking, online research into firm policy, and consulting

with recruiters or other industry specialists are tactics to apprehend whether  
a particular employer is a likely member of the set that is favorable to ACNG  
365 labor.

The preferred model explains about one-third of hireability. Perceived skill  
gaps and rulebreaker effects account for most of the explanatory power in the  
model. There are several means of extending this research to provide improved  
explanatory power. A longitudinal study would allow for causal analysis and  
370 improve forecasting of ACNG hireability in the future.

Firms often adopt best practices and new technologies that industry leaders  
first adopt. The result that large employers and employers in the information  
technology industry may indicate a future of general high support for alternative  
credentials. Google has not required a college degree since before 2013[19].  
375 Laszlo Bock, then Senior Vice President of People Operations at Google, stated  
the following in 2013: “After two or three years, your ability to perform at  
Google is completely unrelated to how you performed when you were in school,  
because the skills you required in college are very different.” In 2020, Google  
added three new certificate programs to an existing set and declared that all  
380 of its certificates are equivalent to an undergraduate degree for their hiring  
purposes[20].

If perceived skill represents actual skill, this study provides evidence that  
employers should be more willing to hire an ACNG. At the same time, this  
paper provides evidence that perceived and actual skill levels sometimes do  
385 not align. For example, the average recent college graduate in the sample has  
more perceived technical skills than the average ACNG. The perceived technical  
deficiency among ACNG labor is surprising because last-mile training, a kind of  
alternative education, has been specifically recommended in popular literature  
to remedy the technical skill gaps among recent college graduates. Further study  
390 of the differences between perceived and actual skills is encouraged.

In many cases, employer-perceived skill gaps are not statistically different  
when comparing recent college graduates with ACNG candidates. Employers  
are already favorable to individuals with alternative credentials, but specific

steps will prevent the loss of this favorable status. Results suggested curriculum improvements that target specific skills. In addition, public education on  
 395 alternative education, the creation of new programs in underserved industries, and public policies that give fair treatment to unaccredited education can do much to improve public support for alternative credentials.

## References

- 400 [1] K. B. McGarry, An examination of perceived employability skills between employers and college graduates, Northeastern University, 2016.
- [2] G. Malik, A. Venkatraman, “the great divide”: skill gap between the employer’s expectations and skills possessed by employees, Industrial and Commercial Training (2017).
- 405 [3] F. K. Abbasi, A. Ali, N. Bibi, Analysis of skill gap for business graduates: managerial perspective from banking industry, Education+ Training (2018).
- [4] Y. Gingras, R. Roy, Is there a skill gap in canada?, Canadian Public Policy/Analyse de politiques (2000) S159–S174.
- 410 [5] M. Smith, Spotlight on research: The distributional impact of unemployment (2011).  
 URL [https://www.philadelphiafed.org/  
 community-development/publications/cascade/77/07\\_  
 distributional-impact-of-unemployment](https://www.philadelphiafed.org/community-development/publications/cascade/77/07_distributional-impact-of-unemployment)
- 415 [6] J. Brown, M. Kurzweil, The complex universe of alternative postsecondary credentials and pathways, American Academy of Arts and Sciences Cambridge, MA, 2017.
- [7] D. B. Bills, Credentials, signals, and screens: Explaining the relationship between schooling and job assignment, Review of educational research  
 420 73 (4) (2003) 441–469.

- [8] A. Weiss, Human capital vs. signalling explanations of wages, *Journal of Economic perspectives* 9 (4) (1995) 133–154.
- [9] J. K. Hellerstein, D. Neumark, Production function and wage equation estimation with heterogeneous labor: Evidence from a new matched employer-employee data set, in: *Hard-to-measure goods and services: Essays in honor of Zvi Griliches*, University of Chicago Press, 2007, pp. 31–71.
- [10] P. T. Ingenbleek, R. T. Frambach, T. M. Verhallen, Best practices for new product pricing: Impact on market performance and price level under different conditions, *Journal of Product Innovation Management* 30 (3) (2013) 560–573.
- [11] B. Caplan, *The case against education: Why the education system is a waste of time and money*, Princeton University Press, 2018.
- [12] P. L. Curşeu, R. Ilies, D. Vîrgă, L. Maricuţoiu, F. A. Sava, Personality characteristics that are valued in teams: Not always “more is better”?, *International Journal of Psychology* 54 (5) (2019) 638–649.
- [13] G. Symon, C. Cassell, Neglected perspectives in work and organizational psychology, *Journal of Occupational and Organizational Psychology* 79 (3) (2006) 307–314.
- [14] J. Jaccard, C. K. Wan, J. Jaccard, *LISREL approaches to interaction effects in multiple regression*, no. 114, sage, 1996.
- [15] F. Green, S. McIntosh, Is there a genuine under-utilization of skills amongst the over-qualified?, *Applied Economics* 39 (4) (2007) 427–439.
- [16] M. Raybould, H. Wilkins, Over qualified and under experienced, *International journal of contemporary hospitality management* (2005).
- [17] D. Blake, Skills quotient: The solution to the ceo’s biggest problem (Oct 2018).  
URL <https://blog.degreed.com/skills-quotient-solution-ceos-biggest-problem/>

[18] J. Arabia, Survey: What do young americans really think about trade school? (Feb 2019).

450 URL <https://www.bigrentz.com/blog/trade-school-survey>

[19] A. Bryant, In head-hunting, big data may not be such a big deal, The New York Times 20 (2013).

[20] A. Hess, Google announces 100,000 scholarships for online certificates in data analytics, project management and ux (Jul 2020).

455 URL <https://www.cnbc.com/2020/07/13/google-announces-certificates-in-data-project-management-and-ux.html>