

Perceived Skills Gaps in Alternative Postsecondary Education as Determinants of Hireability

John Vandivier^a

^a4400 University Dr, Fairfax, VA 22030

Abstract

This paper explores an original data set to understand the influence of perceived skill gaps on hiring. Results show that employers expect low skill from non-college graduates, even when the candidate is technically certified. Respondents expect non-college graduates to break formal and informal rules. Interestingly, this is considered a valuable behavior. State and industry effects each explain about 5 percent of outcomes, skill gaps explain about 10 percent, and interviewer perspectives on rule breakers explains about 15 percent. Perceived soft skill gaps are particularly important.

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Email address: 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]. Vocational school and other non-college means of higher education are seen to endow technical skill, but the
5 traditional degree remains associated with higher wages. This paper tests the hypothesis that perceived skill gaps explain the salary variance. In particular, this paper hypothesizes a perceived soft skills gap among non-college graduates.

The signaling model has become a standard explanation of the value of the degree. Following this model, scholars claim that the college degree signals intel-
10 ligence, work ethic, and conformity[5]. Alternatives to college signal intelligence and technical skill. This paper tests the hypothesis that employers assume a deficit in the differential candidate properties of conformity and conscientiousness.

Conscientiousness is associated with a variety of positive outcomes, but there
15 is reason for employers to value imperfect conformity. Firm innovation is attributable to underlying employee innovation, but conformity is antithetical to innovation. Leaders and high performers also behave abnormally, but in a way that is seen as desirable.

Risk aversion represents a separate reason to select for conformity. A risk
20 averse employer with low ability to distinguish high performing outliers from low performing outliers may prefer not to hire an outlier at all. The gamble is particularly expensive for small employers that are unable to spread risk across many hires. A secondary investigation in this paper will be to look for employer size effects. If large employers are favorable to alternatively educated
25 individuals, this will add weight to an explanation based on risk aversion.

Alternative credentials refer to credentials other than the undergraduate degree[6]. The category includes, for example, industry certifications, portfolios of work, and transcript, badges, or other records of unaccredited learning and achievement. Individuals pursuing alternative credentials typically intend to
30 leverage the credential toward better employment. That is, they have the same

ends as college students. Many individuals obtain alternative credentials as a supplement to the degree. Such a situation is pareto-superior to degree attainment alone and is therefore intentionally excluded from analysis. This paper focuses on alternatively credentialed non-college graduates in order to better
35 identify stigmata of interest.

2. Methodology

This study uses ordinary least squares regression analysis to estimate the effect of perceived skill gaps on willingness to hire. Perceived skill gaps and willingness to hire are included in original response data collected by online
40 survey ($n = 212$). Observations are cross-sectional and taken at the individual level. The data is available for replication or any other use¹.

Respondents were obtained through the Amazon Mechanical Turk crowd-sourcing service. Respondents were United States citizens at or over the age of eighteen. Respondents were paid for participation. The survey administration
45 took place in July of 2020.

Respondents were asked 65 questions in two sections. The first section of responses describe the respondent. There are 13 questions in this section. The second section identifies perceived skill gaps for 13 skills. Each section beings with a contextual message to normalize response anchoring. Questions are pro-
50 vided in nonrandom order for the same reason. Appendix A provides a copy of the survey.

Data from the second section is used to calculate perceived skill gaps. For each of 13 skills, the respondent is asked to imagine four types of candidates. One type of candidate is an ideal candidate. At a high level, skill gaps are
55 calculated by differencing skill levels of the ideal candidate with others.

Perceived skill is reported on a scale from 1 to 10. Perceived skill is reported for the ideal candidate, the average actual employee, the average recent college

¹See https://osf.io/8qtxf/?view_only=95b0c0b0c65e4b7983198cc87c2ab733 for data used in this study.

graduate, and the average alternatively credentialed non-college graduate. Skill gaps are technically computed in two ways. One method allows for overqualifi-
60 cation of job candidates and the other does not. Overqualification effects have been identified as important[7, 8], but these effects are often ignored during skill gap analysis[9].

When overqualification is allowed, the skill gap is measured as a raw skill gap. The raw skill gap is the skill level of the ideal candidate less the skill level
65 of the actual candidate. The skill gap without overqualification is calculated as the raw skill gap or zero if the raw skill gap value is negative.

3. Results

Alternatively credentialed non-college graduate (ACNG) hireability was generally positive. The mean response was 7.5 on a scale from one to ten ($\sigma = 1.80$).
70 Employers status was not associated with a significant response effect. Perceived skill gaps explained a significant and important portion of hireability variance.

Table 1 compares perceived skill gap explanatory power in a simple regression to explanatory power of other simple regressions involving factors of known relevance to hireability. Allowing for overqualification seems to weaken explanatory
75 power. Overqualification effects seem to be heterogeneously signed per skill, so generalizing weakens overall explanatory power relative to ignoring these effects. With overqualification, perceived skill gaps explain about fifty percent more than industrial effects or robust state effects. Without overqualification, the adjusted explanatory power of perceived skill gaps is about three times the
80 adjusted explanatory power of industry or state effects. Semi-robust state factors are dummy variables by state which are significant in a multiple regression. Robust state factors are subset of semi-robust state factors which are additionally significant in a simple regression.

Table 1 also describes the explanatory power of so-called rulebreaker effects.
85 Whether the candidate is perceived as a rule breaker is a perceived skill gap, but employers evaluate this gap in a heterogenous and multispecific way. In the

Table 1: Factor Group Explanatory Power in a Simple Regression

Effect Group Name	Adj R-Sqr	R-Sqr	Max p-value
Industry	0.0185	0.0510	0.288
Rulebreaker	0.1432	0.1554	0.053
Skill Gaps with Overqualification	0.0558	0.0737	0.106
Skill Gaps without Overqualification	0.0758	0.0933	0.115
State, Robust	0.0177	0.0503	0.227
State, Semi-Robust	0.0034	0.0648	0.831

first place, this heterogenous evaluation has sign and magnitude implications for the dependent variable of interest. Secondly, heterogenous evaluation implies a qualitatively different evaluation. These differences are captured using three
90 questions in the first section of the survey.

The three rulebreaker questions measure respondent agreement on a scale from 1 to 10 with statements about rule breakers, or "People who are willing to break formal or informal rules and norms." The first statement indicates that rule breakers present a risk to the reputation, productivity, or value of a
95 company. This statement received the least agreement and greatest response variance among three qualitatively different descriptions of people that are willing to break rules ($\mu = 6.40, \sigma = 2.55$).

The second statement states that people break rules which hold them back, and that rule breakers "could just as easily be high performers as low per-
100 formers." This statement received the most agreement and least comparative response variance as a rule breaker description ($\mu = 7.42, \sigma = 1.91$). The agreement with this statement provides evidence against the thesis that em-

employers value conformity for its own sake. In turn, this adds weight to the theory that employers value conformity as a risk aversion tactic, but they actually believe nonconformity may signal positive outlier potential. The third description of rule breakers states that they tend to be gifted in the areas of innovation or creativity, and that such people may benefit the company of a culture ($\mu = 7.25, \sigma = 2.03$).

Each of the three rulebreaker effects turns out to be independently important. These effects collectively explain more than three times as much response variance as do industrial or state effects. Rulebreaker effects are about twice as important as perceived skill gaps. This is not taken to be a general lesson about skill gaps. Willingness to break rules is a special case of a behavior which is valuable under certain parameters. This contrasts with something like poor communication skill which is generally detrimental.

Table 2 reports selected factor statistics across five least squares multiple regressions. The selected factors which are reported include any perceived skill gap which is important in any specification. Factor importance is determined by the ability of a factor to improve model adjusted explanatory power. Model 1 is a multiple regression using skill gaps that allow for overqualification. Model 2 is a multiple regression without overqualification.

Models 3 and 4 are equivalent to models 1 and 2, respectively, after normalizing for certain effects. Industry, state, and company size effects are the specific effects which are normalized. These effects are normalized for robustness by cross-referencing the subfactors from models 1 and 2. Robust effects are retained. For example, some state effects are important in one specification and not in the other. Such state effects are dropped in Models 3 and 4.

Model 5 is specified as Model 4 plus two adjustments. First, the factor for salary is dropped. The salary factor improved adjusted explanatory power in Model 2, but it provided no such benefit in any other model. Moreover, the p-value of this factor was unacceptably low in Model 4 ($p > 0.9$). The second adjustment is to add a duration factor.

The duration factor is a measure of the length of time a respondent believes

Table 2: Table of Multiple Regression on Favorability, Selected Variables

	Model 1	Model 2	Model 3	Model 4	Model 5
Gap, Body Language	-2.240e-01* (8.314e-02)	-3.831e-01** (1.124e-01)	-1.507e-01+ (8.980e-02)	-3.155e-01* (1.173e-01)	-3.060e-01* (1.145e-01)
Gap, Body Language-IT	2.199e-01+ (1.269e-01)	2.298e-01 (1.656e-01)	1.837e-01 (1.334e-01)	2.791e-01 (1.707e-01)	2.771e-01+ (1.665e-01)
Gap, Commute		-2.320e-01++ (9.720e-02)	-4.953e-02 (6.862e-02)	-1.197e-01 (1.023e-01)	-1.582e-01 (1.010e-01)
Gap, Conscientiousness	2.416e-01* (8.000e-02)	3.223e-01* (1.045e-01)	1.387e-01 (8.483e-02)	2.174e-01+ (1.129e-01)	2.175e-01++ (1.093e-01)
Gap, Customer Service	-1.259e-01+ (6.389e-02)	-1.512e-01 (9.599e-02)	-1.253e-01+ (7.162e-02)	-1.276e-01 (1.037e-01)	-1.323e-01 (1.009e-01)
Gap, Rule Breaker		-6.336e-02 (1.028e-01)	-3.896e-02 (6.054e-02)	-8.535e-02 (1.082e-01)	-1.034e-01 (1.036e-01)
Gap, Salary		-1.135e-01 (8.284e-02)	3.873e-02 (6.597e-02)	-6.250e-03 (8.575e-02)	
Gap, Teamwork		1.227e-01 (9.179e-02)	6.812e-02 (6.963e-02)	1.287e-01 (9.697e-02)	1.131e-01 (9.505e-02)
Gap, Technical	-1.274e-01+ (7.443e-02)		-9.408e-02 (7.702e-02)	-1.010e-01 (1.023e-01)	-9.806e-02 (1.001e-01)
Rulebreaker, Culture Add	2.612e-01** (7.057e-02)	2.829e-01** (7.015e-02)	2.114e-01* (7.187e-02)	2.279e-01* (7.190e-02)	2.235e-01* (7.036e-02)
Rulebreaker, Risky	1.688e-01** (4.993e-02)	1.758e-01** (4.813e-02)	1.517e-01* (5.160e-02)	1.472e-01* (5.063e-02)	1.686e-01** (5.006e-02)
Rulebreaker, Rockstars	1.406e-01+ (7.646e-02)	1.748e-01++ (7.245e-02)	1.669e-01++ (7.851e-02)	1.546e-01++ (7.754e-02)	1.655e-01++ (7.599e-02)
Adj R-sqr	0.3100	0.3491	0.2317	0.2554	0.2866
R-sqr	0.4408	0.4663	0.3409	0.3613	0.3880

Standard errors in parentheses

+ $p < 0.10$, ++ $p < 0.05$, * $p < .01$, ** $p < .001$

it takes to earn an alternative credential. Duration is a categorical variable
135 which was important in both Models 1 and 2. As a categorical variable, it was
decomposed into a boolean series for factor analysis. Models 1 and 2 retained
one or more duration dummies, but none overlapped. As a result, duration was
dropped from Models 3 and 4.

After dropping the salary factor, duration was reanalyzed in the new multiple
140 regressive context. A single duration factor proved important in this reanalysis.
The duration factor which indicates that a respondent believes it takes more
than a year to obtain an alternative credential is significantly and importantly
associated with improved willingness to hire ($\beta = 0.875, p < 0.01$).

An individual is considered an employer if they state that they contribute
145 to hiring and firing decisions. Employer effects are positively signed in all five
models, but the significance is lost after normalizing effects. This suggests that
employer favorability to alternative credentials is sensitive to industry and state
of residence.

The preferred model is able to explain roughly one third of the willingness
150 to hire. 7 of 13 skill gaps investigated contribute to this model, and two stand
out as the most significant. Technical skill gaps are insignificant but they are
robust across specifications and possess the expected negative sign. Other than
technical skill, the remaining gaps are soft skills. Body language skill gaps and
skill gaps in work ethic are the two most significant factors in this model. The
155 relative importance of soft skill gaps, and work ethic in particular, adds weight
to a revision of the usual signalling explanation as the most plausible story.

An important and complicated finding involves conscientiousness. Notice
that the effect is robustly positive across specifications. Simple intuition would
indicate that a large conscientiousness gap is associated with improved hireability.
160 This is an oversimplification which results from linear analysis.

A simple regression of conscientiousness on favorability produces an expected
negative sign. That supports the intuitive notion that a lack of conscientiousness
is associated with reduced hireability. That result is also an oversimplification.
A synthesis of both results and outside research indicates there is some bliss

165 point for work ethic. The change in the model constant from the simple regression to the multiple regression explains the robust sign inversion. In the multiple regression, the model constant is near 0.5, while in the simple regression it is about 7.5.

In one study, conscientiousness exhibited a parabolic relationship with peer-rated team contribution[10]. Adding a quadratic term to Model 5 replicates
170 a negative marginal relation between conscientiousness and teamwork skill. In addition, conscientiousness exhibits a negative marginal relation with hireability overall.

Complementary to the bliss point explanation is an explanation from attenuation. In the current data set, conscientiousness exhibits an important cross-correlation with several factors including willingness to commute and customer service skill. Conscientiousness also structurally interacts with independent rule-breaker effects. Theoretically, conscientiousness is related to rule breaking behavior, but the effect on hireability is interacted with employer perceptions of
175 those who break rules. Because these factors are entered independently in the multiple regression, the underlying component of conscientiousness is entered in redundantly. Because conscientiousness gaps have a negative effect, the overall negative effect is overstated. The direct factor of conscientiousness corrects, or attenuates, the overstated effect which is partialled in, or captured in, the
180 correlated independent factors. Removal of other skill gap factors and rule-breaker factors from Model 5 validates this explanation by yielding a negative coefficient ($\beta = -0.084, p < 0.31$).

The importance of conscientiousness does not add weight to the classic signaling explanation. The conscientiousness gap is not a comparative gap between a recent college graduate and a non-college graduate. It is a gap between an ideal
190 job candidate and an ACNG. An important note is that the conscientiousness gap among recent college graduates is statistically no different from an ACNG. Unsurprisingly, the candidate perceived to have a minimal conscientiousness gap is the typical employee already working in the labor force. A comparative gap
195 of note would be that college graduates were perceived to have better technical

skills compared to the average ACNG.

Employer size was an important factor in the preferred model. The largest category of employer is positively associated with willingness to hire an ACNG. This matches the risk aversion model. The largest category of employer has
200 lower risk, and in fact generates comparative advantage, when hiring from a high-variance pool of candidate quality.

Some state and industrial effects are identified. No particular relation among state effects was found, but further comparative policy research is encouraged. With respect to industry, an interesting interaction between body language skill
205 and employment in the information technology is identified. The interacted variable has a positive association with willingness to hire. Body language skill gaps on their own are associated with reduced willingness to hire. This specifically indicates a reduced penalty for lacking body language communication skills in the information technology industry. With less strength and more breadth, a
210 positive coefficient to the interaction variable indicates a reduced penalty for generalized soft skill deficiency in the information technology industry.

A reduced penalty for soft skill deficit helps explain the particular flourishing of alternative credentials in the information technology industry. The reduced penalty in this particular industry might be related to a relative lack
215 of deregulation in the industry. Alternatively, it might be related to cultural norms around the acceptability of an anti-social geek in a technology field. The cultural norm itself might be derived from deeper collective personality organization. That is, there is less technical need for social skills in programming and related disciplines, so introverts may naturally obtain a comparative advantage
220 in this field.

4. Conclusion

This study demonstrates that perceived skill gap variance is qualitatively different for alternatively educated non-college graduates. Perceived skill gaps do a better job of explaining willingness to hire than do other widely recognized

225 effects including industry and state effects. Employer factors better explain
candidate hireability than do the perceived skill gaps themselves. This paper
finds multiple facts in support of employer risk aversion over conformity selection
when considering job candidates that lack a college degree. Technical skill gaps
were identified with less relevance to the hiring decision when compared with
230 soft skill gaps for the ACNG job candidate.

Some evidence on the role of misinformation is demonstrated in a survey
on trade schooling taken in 2019[11]. Only 27 percent of respondents correctly
responded that lower debt is an advantage of enrolling in trade school relative to
college. Additionally, over 75 percent of respondents failed to notice that trade
235 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.

In addition to the noted applications of the results of this study, there are
240 several ways in which results could be technically improved. The preferred
model explains about one third of willingness to hire. This study uses a cross-
sectional analysis to investigate a subject that varies over time. The traditional
system of accredited undergraduate education was itself at one time an innova-
tion. Abnormal job candidates differentiated themselves using novel credentials,
245 and broad employer adoption was achieved over time. This paper concludes that
the alternative credentials of today will follow a similar pattern.

Dynamic technical analysis would yield deeper understanding of such trends
and achieve greater overall explanatory power. Dynamic analysis would also
generate better opportunity for causal understanding. Other research has con-
250 ducted some dynamic analysis of the same dependent variable with differing
independent inputs[12]. Integrated modelling of those effects with skill gap
analysis could replicate results and generate new models of better explanatory
power. Specifications that allow for overqualification effects and heterogeneous
curved relations between skill gaps and hireability would improve not only the
255 present paper, but the state of the art in skill gap analysis.

If perceived skill is representative of actual skill, then the current study concludes that employers should be more willing to hire alternatively educated non-college graduates. At the same time, this paper demonstrates plausible misalignment of perceived and actual skill in some cases. Last mile training is
260 a type of alternative education which has been specifically recommended as a remedy for technical skill gaps among recent college graduates. It is surprising that the average recent college graduate in the sample of analysis is perceived to have better technical skill compared to the average ACNG.

Employers seem to be favorable to individuals with alternative credentials.
265 In many cases, employer-perceived skill gaps are not statistically different when comparing recent college graduates with ACNG candidates. The relative social preference for the college degree may be better explained by a lack of relevant credentials for some occupations, government subsidy of the legacy system, and ignorance about available alternative opportunities on the part of students and
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