

COVID-19 and Alternative Postsecondary Learning

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Abstract

The coronavirus pandemic has induced an increase in remote activity. Prior research shows that a variety of K-12 educational practices, public preferences, policies, and outcomes have changed as a result of the pandemic. This paper extends the literature on the impact of coronavirus on education to solve for the lack of analysis on professional certifications and other unaccredited postsecondary credentials. This paper investigates the results of an original online questionnaire (n=350) to understand the effects of COVID-19 on support for alternative postsecondary learning. Respondents are U.S. citizens over the age of 18. Cross-sectional analysis using ordinary least squares (OLS) and Iteratively Reweighted Least Squares (IRLS) indicates that individual perception of a large negative impact from coronavirus is significantly correlated with higher favorability to alternative credentials. Analysis indicates that important control factors include industry, ethnicity, and state of residence. Age, gender, income, and level of education are insignificant.

Keywords: education economics, alternative education, coronavirus

2010 MSC: I21, I22, J20

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1. Introduction

This study is concerned with alternative postsecondary credentials. This category includes professional certifications, coding bootcamps, work portfolios, and other proof of education other than traditional credentials. In this study, traditional credentials mainly refer to the accredited college degree. Remote learning was an alternative approach to education from inception, and it continues to be deeply involved in alternative learning. This study hypothesizes that the impact of coronavirus is positive on favorability to alternative credentials. Results favor the hypothesis, with evidence that exposure to remote learning is a critical mechanism.

There are three theoretical reasons to suppose that a pandemic would make alternative postsecondary credentials more attractive. The first is that the pandemic response has resulted in exposure to remote activity, and exposure effects are often positive on favorability. Second, alternative learning providers face different incentives compared to traditional providers. Differing incentives may provide an adaptive advantage in the face of rapid social change. A recent paper on organizational agility in higher education points to regulatory challenges and deep, centralized, hierarchical organizational structure as notable disadvantages[1].

The third theory is that a pandemic is a time when normal strangeness increases across society. When the normal level of strangeness increases, things that were already finitely strange become relatively less strange. Alternative credentials are strange in some sense by construction, but the relative stigma associated with these credentials might decrease in a time like that of the present pandemic, where all sorts of previously strange behaviors have become a new normal.

While exposure to some stigma generally increases favorability, there are several special cases where it declines instead. Coronavirus-induced exposure could be such a case of negative exposure for a few reasons. Direct exposure to disease is generally harmful, unwanted, and forced. Disease-induced activities are not

strictly involuntary, but they might be perceived unfavorably by association. The mere exposure effect[2] and familiarity bias[3] are generally positive on favorability to some stimulus, but these exposures are often voluntary. Unwanted exposure that involves harm tends to reduce favorability. Backfire, boomerang, and blowback effects are examples of a negative response to exposure [4, 5, 6]. One study relates closely to the COVID-19 pandemic in finding a backfire effect in efforts to market flu vaccine usage [7]. Interestingly, repeated negative exposure can lead to positive favorability, as documented in work on Stockholm syndrome[8].

The exposure effect of coronavirus and related social changes might reflect a combination of the above effects. As a result, the direction of effect is not apparent without empirical study. Individual favorability to alternative credentials is also like to vary for various personal reasons unrelated to the pandemic. This paper uses multiple regression to hold these sources of variation constant.

There are already several papers examining the impact of coronavirus on the education system. These papers focus on education from kindergarten through high school, but they inspire the hypothesis of a similar situation in higher education. One paper in the Journal of School Choice examined the educational experiences of families under COVID-19[9]. The study found that 57 percent of parents found remote learning worked better than they expected.

2. Description of Data and Methodology

This paper leverages an original set of online questionnaire responses ($n = 350$). Responses are cross-sectional data obtained in early February of 2021, about one year after a public health emergency due to the coronavirus outbreak was declared in the United States[10]. Respondents are United States citizens at or over the age of eighteen. Qualified respondents participated in the survey through the Amazon Mechanical Turk platform.

This study uses multiple regression of linear and curvilinear factors to gen-

erate results ¹. Each model in this study follows an ordinary linear model or
60 a robust linear model (RLM) specification. Ordinary linear models compute
factor coefficients using ordinary least squares (OLS), and robust linear mod-
els use iteratively reweighted least squares (IRLS). Factor coefficients across
these models are comparable, but RLM does not generate a useful R-squared
statistic for model-level comparison. Robust linear models are useful to improve
65 estimation when outliers exist[11] and 11 outliers exist in the sample.

Appendix A contains the exact wording and response options for each ques-
tion. Appendix A also contains the wording for a priming message presented at
the start of the survey. The priming message lays out the definition of alterna-
tive credentials for the purposes of the study. The message also provides several
70 concrete examples of alternative credentials, including "a Certified Project Man-
ager certification, a portfolio of work, a Khan Academy profile, or a Nanodegree
from Udacity."

The questionnaire is composed of fourteen questions. Favorability is the
dependent variable of interest. Coronavirus impact is the independent variable
75 of interest. There are also ten control factors and two questions on causality.

Eight of the ten control factors are common controls in the literature. These
eight controls are categorical measures for for age, gender, ethnicity, income,
level of education, employment status, the industry of occupation, and state of
residence.

80 The two remaining controls are unique to this study. Expected convention-
ality is the first unique control. Expected conventionality is the term used to
describe the response to question three in the appendix. Expected convention-
ality explains the effect on favorability that is attributable to the future social
acceptability of alternative credentials. Correcting for social acceptability al-
85 lows the remaining effects to be interpreted more accurately as an individual

¹While the data for this analysis is not public, the analytical code is open-
source. See [https://github.com/Vandivier/research-dissertation-case-for-alt-ed/
tree/master/papers/alt-ed-covid-2/data](https://github.com/Vandivier/research-dissertation-case-for-alt-ed/tree/master/papers/alt-ed-covid-2/data)

preference.

The second unique control is support for online education. Online education is the response to question four in the appendix. This control allows an analyst to hold constant the mode of instruction when interpreting favorability to
90 alternative credentials.

The primary interest of this study is to identify the effect of coronavirus on favorability. If the effect of coronavirus is significant, a description of the origin of that effect improves the value of the results. The two unique controls and the two questions about causality support investigation into exposure to remote
95 activity as an explanation.

The variables of interest, causality questions, and the two unique controls obtain Likert-type responses. The impact of coronavirus and the causality questions use a 4-point scale. Favorability and the unique controls use a 10-point scale. Continuous treatment of items on the 10-point scale permits curvilinear
100 analysis, allowing investigation of marginal effects ².

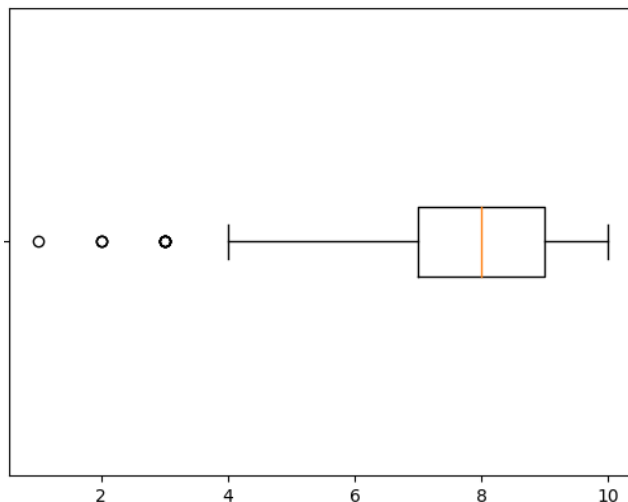
3. Results

The median favorability response was eight out of ten. Figure 1 visualizes the distribution of responses. Of 350 responses, 11 responses indicate a favorability of less than four out of ten. Regression analysis indicates a significant and
105 positive coronavirus impact effect. Analysis with and without outliers does not show a meaningful difference in the effect.

The average response was 7.65 on a 10-point scale. Excluding outliers, over 96 percent of responses fall into the normal range. The average response in the

²It is an accepted practice to treat Likert-type responses as either categorical or continuous 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[12]. This paper treats responses on a 10-point scale as continuous. This paper treats responses on a 4-point scale as categorical.

Figure 1: Distribution of Favorability to Alternative Credentials



normal range was about 7.81. Table 1 summarizes statistics about favorability
 110 and the direct measure of coronavirus impact. The table also includes summary
 results for the two causality questions.

Table 1 reports statistics across the total population and also for three sub-
 populations. The subpopulations include the normal range, the outlier pop-
 ulation, and the Tens. Because factors in Table 1 dummy variables, with an
 115 exception for favorability, the mean values for each variable can be interpreted
 as the proportion of the population that affirms the response.

The Tens are those individuals that responded with a favorability of 10 to
 alternative credentials. The Tens are not an outlier group, but inspection of
 this group assists in understanding the response distribution. The Tens report
 120 a large perceived impact at a disproportionately high rate. In contrast, no
 member of the negative outlier group also reports a large perceived impact of
 coronavirus.

This data is consistent with external reporting that COVID-19 impacts most
 Americans[13], but it adds the wrinkle that most Americans consider the impact
 125 to be minor. Perceived COVID-19 impact is another case where outliers and
 Tens importantly differ from the average. The Tens report higher coronavirus

Table 1: Summary Statistics for Factors of Interest

	Total Range	Normal Range	Outliers	Tens
N	350	339	11	58
Favorability	7.65	7.81	2.55	10
Small COVID Impact	0.526	0.534	0.272	0.534
Medium COVID Impact	0.294	0.286	0.545	0.224
Large COVID Impact	0.094	0.097	0	0.138
Small Change to Remote Activity	0.323	0.324	0.273	0.190
Medium Change to Remote Activity	0.274	0.277	0.182	0.190
Large Change to Remote Activity	0.271	0.268	0.364	0.414
Small Increase to Remote Favorability	0.311	0.319	0.091	0.241
Medium Increase to Remote Favorability	0.360	0.360	0.364	0.276
Large Increase to Remote Favorability	0.160	0.156	0.273	0.224

impact while the outliers cluster around a medium impact response.

Table 2 provides factor coefficients for four interesting OLS models. Model 1 is the adjusted R-squared maximizing model. Model 4 is composed only of significant factors. Model 2 is Model 4 plus a dummy for a large coronavirus impact. Model 3 follows the same specification as Model 2, but Model 3 excludes outliers.

The direct effect of coronavirus appears to be positive and also insignificant. The response indicating that a person has perceived a large impact from coronavirus is the only dummy within this categorical variable to appear in any of these models of interest. Notice that the large impact factor is invariant to the outlier subpopulation because no negative outlier reported a large impact.

In a simple regression of the large coronavirus impact dummy on favorability, the variable becomes more significant and important ($\beta = 0.46, p < 0.15$). The two questions on causality³ partial out the explanation from the direct measure. This is evidence that a coronavirus-induced remote activity exposure accounts for most of the effect attributable to coronavirus.

The two causality questions are significant across models. The coefficients

³These include questions thirteen and fourteen in Appendix A.

Table 2: Table of Multiple Regressions

	Model 1	Model 2	Model 3	Model 4
Favor Online Education ²	0.11***	0.10***	0.10***	0.10***
Expected Conventionality	0.44***	0.45***	0.38***	0.45***
Large Change to Remote Activity	0.55***	0.51**	0.58***	0.56***
Large COVID Impact	0.32	0.32	0.07	
Small Increase to Remote Favorability	-0.64**	-0.52**	-0.66***	-0.53**
Medium Increase to Remote Favorability	-0.75***	-0.65***	-0.70***	-0.66***
Large Increase to Remote Favorability	-1.00***	-0.85***	-0.71**	-0.80***
Is a Manager	0.32*			
Ethnicity, Caucasian	0.48***	0.43**	0.38**	0.44**
Ethnicity, Hispanic	0.80*	0.77*	0.59	0.76*
Ethnicity, Other	1.51*	1.58**	1.39**	1.52*
Income, 10,000 - 24,999	0.43			
Income, 100,000 - 124,999	0.45			
Income, 125,000 - 149,999	1.15			
Industry, Health	0.56*	0.52*	0.62**	0.55*
Industry, Information Technology	0.35*	0.34*	0.36**	0.34*
Industry, Manufacturing	0.57*	0.66**	0.73***	0.68**
Industry, Real Estate	1.06*	1.13*	0.87	1.14*
State, Florida	-0.38			
State, Georgia	1.21**	1.18**	1.08**	1.22**
State, Idaho	-0.89			
State, Iowa	-2.48***	-2.63***	-0.87	-2.66***
State, Kentucky	-1.28*	-1.22*	-0.33	-1.24*
State, North Carolina	0.73			
State, Ohio	-1.46**	-1.35**	-1.59***	-1.34**
State, Pennsylvania	-1.02**	-1.04**	-0.71	-0.99**
State, Tennessee	-1.75			
Intercept	3.29***	3.48***	4.13***	3.48***
N	350	350	339	350
R-squared	0.39	0.36	0.35	0.35
R-squared Adj.	0.33	0.32	0.31	0.32

range from half a point to a point, which indicates moderate importance. The
145 first causality question asks whether coronavirus caused an increased degree
of remote activity for the respondent. The coefficient on the dummy variable
indicating a large coronavirus-induced increase to remote activity is positive.
This is consistent with the hypothesis of a positive exposure effect.

The second question on causality asks whether coronavirus-induced remote
150 activities cause an increase to favorability about remote learning. The exact
wording is: "To what degree has coronavirus-induced remote activity improved
your favorability to remote learning (either for yourself or for other people)?"
Referring back to Table 1, about 83.1 percent of the full population of Ameri-
cans indicate a small, medium, or large increase in favorability of remote learning
155 caused by coronavirus-induced remote activity. This study separately demon-
strates a positive relationship between favorability to remote learning and fa-
vorability to alternative credentials. Taken together, these two factors provide
positive evidence toward the hypothesis that coronavirus-induced exposure to
remote learning results in an increase in favorability to alternative credentials.

160 The observation of nonzero responses to the factor for coronavirus-induced
remote learning favorability is causal evidence. The fact that these nonzero
responses are negatively related to favorability is a non-causal association. This
association indicates that those who gained the most favorability also ended
with less than average favorability, while those with prior high favorability did
165 not move much higher. This interpretation is reinforced by referring back to the
summary statistics in Table 1. Notice that the negative outlier group has the
highest affirmative response for both a medium increase in remote favorability
and also to a large increase in remote favorability. On the other hand, the normal
range has the highest response rate for a small increase to remote favorability.
170 A relatively small improvement for most respondents makes sense, given that
the median response is already near the maximum response.

Coronavirus-induced favorability to online education is distinct from a plain
measure of favorability to online education. The latter is labeled Favor Online
Education within Table 2, and it is one of the two unique controls discussed in

175 the Methodology. This factor was most significant when modeled as a quadratic term. A quadratic term captures marginal effects. The coefficient for this term is positive, indicating a positive marginal effect. Favorability to online education and coronavirus-induced favorability to online education are moderately correlated (Pearson's $r = 0.303$). This demonstrates internal consistency among
180 responses, and it also adds weight to the explanation from exposure.

The other unique control is expected conventionality. This factor is also significant, robust to specification, and important. Expected conventionality and favorability to online education correlate moderately (Pearson's $r = 0.445$). Expected conventionality is uncorrelated to coronavirus-induced favorability to
185 online education. Respondents do not form an expectation that alternative credentials will be conventional in the future after being exposed to coronavirus-induced remote activities.

Table 3 is a table of factors for a robust linear model (RLM). Robust regression is useful in addressing samples in which outliers exist, so the robust model
190 includes the whole sample. Because RLM treats factors linearly, the coefficients are comparable to OLS coefficients. This makes the model in Table 3 useful for factor analysis as well. Specifically, the model in this table is a simple respecification of Model 4 from Table 2 into RLM. The main result in this table is that none of the effects of interest are importantly different between RLM and OLS
195 specification.

The other control variables also exhibit some interesting effects. Caucasians disproportionately attend and graduate from college, leading some scholars to argue that higher education is an instrument of white supremacy[14, 15]. Other scholars note that alternative learning providers support a higher rate of minor-
200 ity graduation. As a result, support for alternative credentials is considered a workforce diversity strategy[16, 17, 18]. Given such prior research, it is intuitive to expect a negative association between caucasian ethnicity and support for alternative credentials. Opposite expectation, caucasian ethnic identification presents a significant positive coefficient in this study.

205 Information technology is a well-known stronghold of support for alternative

Table 3: Table of Factors for Robust Linear Model

	coef	std err	z	P> z	[0.025	0.975]
Favor Online Education²	0.1083	0.033	3.289	0.001	0.044	0.173
Expected Conventionality	0.4566	0.042	10.855	0.000	0.374	0.539
Large Change to Remote Activity	0.6981	0.192	3.637	0.000	0.322	1.074
Small Increase to Remote Favorability	-0.6117	0.236	-2.595	0.009	-1.074	-0.150
Medium Increase to Remote Favorability	-0.7676	0.228	-3.362	0.001	-1.215	-0.320
Large Increase to Remote Favorability	-0.8345	0.290	-2.874	0.004	-1.404	-0.265
Industry, Health	0.5969	0.271	2.205	0.027	0.066	1.128
Industry, Information Technology	0.4016	0.180	2.237	0.025	0.050	0.754
Industry, Manufacturing	0.7399	0.277	2.672	0.008	0.197	1.282
Ethnicity, Caucasian	0.3168	0.161	1.963	0.050	0.001	0.633
Ethnicity, Other	1.7074	0.724	2.359	0.018	0.289	3.126
State, Georgia	1.0604	0.479	2.212	0.027	0.121	2.000
State, Ohio	-1.0150	0.601	-1.690	0.091	-2.192	0.162
State, Pennsylvania	-0.8238	0.441	-1.867	0.062	-1.688	0.041
Intercept	3.5185	0.401	8.785	0.000	2.734	4.303
N	350					

education, including coding bootcamps. Key skills in information technology are easily digitized and taught over the web. This industry demands flexible instruction because it is associated with a uniquely high rate of technical ob-

210 It is surprising that it comes in third place among four industries with positive and significant favorability.

Health is an industry that has historically been difficult to digitize. The positive health industry effect found in this study agrees with external research that considers current digital health education to be satisfactory. One paper on
215 digital education in health declares that health simulations using virtual reality became useful with the rise of the Oculus Rift after the year 2010[19].

There are various political and cultural reasons for which favorability might vary by state, but the current analysis does not provide strong evidence toward any particular explanation. Employment status was largely insignificant, but
220 Model 1 hints at a weak positive effect among hiring managers. Other controls are notably insignificant. Gender, age, and level of education had no bearing

on favorability. The insignificance of age and education level provides weak evidence against the hypotheses that older individuals or individuals who do have traditional degrees have a disproportionate opposition to alternative credentials.

225 4. Conclusions

Results indicate that coronavirus as a historical event has significantly improved American favorability to alternative credentials. The effect is not well-explained by the direct impact of coronavirus on an individual. The effect is well-explained as a positive exposure effect that results from coronavirus-
230 induced remote activities. The largest gains in favorability accrue to individuals that began and ended with less than average favorability.

The introduction provided three explanations for improved favorability, but this study most directly examined an explanation from exposure. If the exposure effect had been weak and favorability improved anyway, the other hypotheses
235 would have become more important. Given the effectiveness of the exposure-based explanation, the other two explanations are not considered independently important. Arguments from organizational agility and normal strangeness may remain endogenously important. For example, exposure to certain services might improve consumer favorability precisely because organizational agility
240 has enabled the development of quality products.

As is a cross-sectional analysis, this study provides little ability to make confident forecasts about whether the favorability increase is transient or permanent. With that caveat, there are three reasons to expect average favorability to remain near a score of eight out of ten. With that caveat, there are three
245 reasons to expect average favorability to remain near a score of eight out of ten. The first reason is that this was the average score found in the analysis. Barring contrary evidence, this point-estimate remains preferred.

The second reason is that there are reasons to expect favorability to increase and to decrease. Without evidence on a significant difference in the magnitudes
250 of effects in either direction, a net expectation of stability results. Mean regres-

sion is a reason to expect a favorability decrease. Continuity of trend is a reason to expect an increase.

The third and strongest reason to expect favorability to remain near the present level is that society has shifted and developed new norms in response to the pandemic. Once society establishes new norms, there are numerous ways in which those norms reinforce themselves. Status-quo bias and anchoring bias are relevant psychological forces. Economic effects include the endowment effect and ordinary switching costs. For example, an endowment effect might apply to a worker who is now remote and prefers not to return to a physical office.

This study indicates that the population supports alternative credentials. Policy recommendations that facilitate this preference include improvements to federal recognition and social access. Much of this work is already underway. Many colleges now award credit for professional experience or nontraditional education. Institutions like the American Council on Education (ACE) have facilitated this effort through programs like the current ACE Apprenticeship Pathways project and the now-defunct Alternative Credit Project (ACP)[20]. Renewal of the ACP is an example of a public-private partnership that is feasible and would improve recognition of alternative credentials.

In 2012, The Heritage Foundation called for certain radical policy changes that would level the playing field between traditional and alternative educators. While they did not go as far as to suggest eliminating accreditation altogether, they did advocate for removing accreditation agencies and suggested the government should directly accredit courses rather than organizations. They also called for a decoupling of accreditation and federal funding.

Those suggestions have yet to be implemented, but accreditation difficulty was reduced by Department of Education rule changes that took effect in July of 2020[21]. Further accreditation reform can incentivize competition in the university space, essentially causing universities to compete with alternative providers on price and quality to a greater extent. This would not drive support for alternative credentials directly, but improving competition and removing barriers to entry in higher education seem to be beneficial for the market as a

whole.

Removal of federal subsidy for higher education would do much to reduce college prices, but this is another unpopular reform. A second-best solution
285 would be to open the subsidy to alternative providers. Section 127 of the Internal Revenue Code allows for employer educational assistance. Previously, such assistance consisted of paying for new accredited education. Under the CARES Act, this assistance was expanded to include paying down student loans that currently exist from accredited prior education. One small move that would
290 improve access to alternative education would be to modify the definition of educational assistance to include unaccredited learning.

In addition to public policy changes, industry and firm policy changes facilitate the adoption of alternative credentials. Several high-value corporations have dropped the requirement of a college degree. Other companies allow partic-
295 ular unaccredited credentials to fulfill a college degree requirement. Alternative education providers have also begun providing a payment option using an income sharing agreement (ISA) rather than loans. The income sharing agreement improves access by eliminating the need for student payment until employment involving a minimum level of income is obtained.

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