Forced Entrepreneurship Across Cultures

An Extension to Forced Entrepreneurs by Hacamo & Kleiner

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Abstract

In this paper we replicate and extend "Forced Entrepreneurs" by Hacamo and Kleiner (2021). This paper documents that an unemployment shock increases entry into entrepreneurship. Furthermore, these firms are of higher quality compared with normal ones. In our extension, we gather data from graduates across 15 more countries, and apply a similar model to investigate the role of individualism from Hofstede's framework. We find that medium levels of individualism are most strongly correlated with entry into entrepreneurship and firm success, while low and high levels of individualism are marginally positively correlated with entry into entrepreneurship and metrics of firm success.

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Introduction

In this paper, we employ a linear probability model to measure the impact of a country's level of individualism as described in Hofstede's framework (1980, 2011) on entry into entrepreneurship and the quality of firms founded by entrepreneurs. Our model is based on previous research by Hacamo and Kleiner (2021), which documents the effect of an unemployment shock on the likelihood of entry into entrepreneurship, and the quality of firms founded under these circumstances. Historically, studies have indicated that in times of high unemployment, displaced workers may be incentivized to pursue entrepreneurship at higher rates due to the opportunity cost of entrepreneurship being relatively lower during these periods. However, conventional wisdom suggests that the best workers become entrepreneurs prior to any labor shocks, and firms created due to local employment shocks may just be a temporary measure until the founder can join the workforce. Therefore, based on this argument, it would follow that the firms founded by forced-entrepreneurs would be of lower quality. However, the goal of the paper by Hacamo and Kleiner (2021) is to also demonstrate that the entrance of forced entrepreneurs in the economy actually leads to the development of better firms over time, and not just more of them.

In order to demonstrate this concept, the original paper first models a labor shock to highly skilled workers in various fields. Then, the paper exploits the exogenous time of entry of different individuals into the labor market by comparing a worker graduating from a U.S. undergraduate institution to a worker with the exact same profile in terms of gender, major and university, but in the two previous years. The paper measures the likelihood of entry into entrepreneurship, and the level of success of the firms founded by these forced entrepreneurs. Based on the findings of the study, firms founded by forced entrepreneurs are more likely to

experience employment growth, survive, receive funding in the form of venture capital, and eventually become acquired. As an explanation for this, the paper proposes that, because of the cyclical wage patterns of top earners in the economy, highly skilled workers are disproportionately shifted to entrepreneurship following economic recessions. Thus, declines in the labor market can increase the average quality of new business ventures, with entrepreneurs that were formerly high-wage earners being responsible for more innovation and higher levels of transformative entrepreneurship upon entering the field.

In general, the results of the paper are the same for entrepreneurs that start a firm within two years of graduation and hold across different sample periods. They are also not caused by workers entering graduate school. Thus, the paper demonstrates the existence of untapped entrepreneurial potential at the top of the income distribution, and the role of recessions in improving the amount of quality entrepreneurship available. Importantly, the paper notes that these findings do not mean that recessions increase the overall quality of entrepreneurship. Rather, the paper indicates that by using policies that encourage entrepreneurship as opposed to other, rent-seeking behaviors, the entire economy can benefit.

For the extension of this model, we apply this same methodology to different countries with varying levels of individualism as measured by Hofstede to demonstrate the relationship between individualism, the likelihood of entry into entrepreneurship and firm quality (See Appendix B). To do this, we run the same regressions as in the original model, this time using three different groups of data that we have collected, low-individualism countries, medium-individualism countries and high-individualism countries. We then compare the results of our regression analysis across these samples to draw larger conclusions about the relationship between individualism, unemployment and entrepreneurship. In addition to extending the

original paper to more countries, we also contribute to the growing literature on entrepreneurship, as well as its intersection with Hofstede's cultural framework and how the dimension of individualism may play a role in the likelihood of entry into entrepreneurship, and the quality of the firms that these entrepreneurs create.

Literature Review

Forced Entrepreneurs

Globalization, and the resulting structural and strategic changes currently taking place in many organizations mean that the traditional model of wage work is changing, and more people may become unemployed during their careers (Mallon, 1998; as cited by Hytti 2010). Entrepreneurship is often seen as a solution to these types of issues, such as the increasing rates of unemployment among the youth (Chigunta et al 2005; as cited by Oi Cheung 2014), with the youth being encouraged to become 'job creators' as opposed to 'job seekers' (Langevang & Gough, 2012; as cited by Oi Cheung 2014). Thus, entrepreneurship has become an important area for policymakers to consider in their efforts to ameliorate high unemployment rates (Hytti, 2010).

Research has shown that entrepreneurship introduces innovation, change, and increases the amount of competition in the market, also impacting economic results on the country level (Wong et al. 2005; as cited by Lopez-Cabarcos et al. 2021). It is an important topic for economic and innovation research, with multiple studies showing the impact of entrepreneurship on both development and employment (Toma et al. 2020, Carree & Thurik 2005). Along these lines, a positive relationship between entrepreneurship and innovation can be established based on existing studies, as several economies show an encouraging trend of high entrepreneurial activity

rates coupled with robust levels of innovation (Global Entrepreneurship Monitor 2017; as cited by Lopez-Cabarcos et al. 2021). Furthermore, innovation is currently considered to be one of the main drivers of national economies and one of the core influencers of company competitiveness and performance (Prim et al 2016).

Using data collected and maintained by the Kauffman Foundation from 2005 to 2010, Oi Cheung (2014) found that a high unemployment rate significantly increases the number of individuals who become entrepreneurs, concluding that many new firms are created by these 'necessity' entrepreneurs. These entrepreneurs are often forced to become self-employed, and thus, they are commonly seen during periods of high and increasing unemployment rates (Deli 2011; as cited by Oi Cheung 2014). Furthermore, while some may consider forced entrepreneurs to be less dynamic and less entrepreneurial (Storey 1991, 2002, Tervo Niittykangas, 1994; as cited by Hytti, 2010), evidence to the contrary also exists, such as a Finnish study showing a remarkably high survival rate for firms started by unemployed individuals (Lehto-Stenholm, 2001, as cited by Hytti, 2010).

Hacamo & Kleiner (2016) also document the phenomenon of forced entrepreneurship due to firm bankruptcy, with young and/or college educated individuals, and high-skilled workers leaving bankrupt firms and starting new, successful firms (in terms of survival as well as employment). Thus, relevant research indicates the presence of forced entrepreneurs in the economy in response to high rates of unemployment, and the importance of these entrepreneurs in starting new, successful firms. Similarly, Altonji et al. (2016) looks at the impact of recessions on earnings of US college graduates entering the job market, finding that the students who begin their career during periods of economic distress earn approximately 10% less than comparable students.

Babina (2020) finds that the financial inability of a firm to pursue productive opportunities increases the likelihood of its employees leaving and starting their own firms. This occurs particularly in the high-tech and service sectors. Furthermore, she finds that these types of 'distress-driven' entrepreneurs are more likely than typical entrepreneurs to create firms with more jobs, better pay, and an increased survival rate. Thus, economic distress is a predictor of the creation of new firms with high future employment and enhanced payroll growth. Furthermore, she finds that high-wage workers are more likely to have access to the projects, clients, and ideas necessary to be successful entrepreneurs, and consistent with this, those with above-median wages traditionally drive startup growth results.

Hofstede's Cultural Framework

In addition to extending Hacamo and Kleiner's (2021) research to include more countries, we also aim to connect this research to the individualism dimension of Hofstede's framework. Cross-cultural studies have proven to be useful and insightful in analyzing and distinguishing between differences in economic, organizational and social behaviors of groups and individuals. Prior research has outlined the significant role that cultural traits play in the innovative success of countries (Shane 1993, Rinne et al. 2011, Gorodnichenko & Roland 2011, Prim et al. 2016, Bukowski & Rudnicki, 2018, Tekic & Tekic 2021; Lopez-Cabarcos et al. 2021). Hofstede's work is considered as one of the most influential and revolutionary models in the study of cultural differences, shaping the academic landscape of international culture and business (Lopez-Cabarcos et al. 2021). The scores in Hofstede's framework are relative, allowing comparison of different countries across six dimensions to see how values differ across cultures. As we outline below, prior research has taken place to see how these dimensions can relate to innovation and entrepreneurship. Along these lines, we will examine countries with different

values on the individualism index in comparison to the US to see how the results may differ (in terms of number of firms founded, their survival, etc). Our work connects Hofstede's work and the studies on how cultural dimensions can impact entrepreneurship and innovation with research on forced entrepreneurs in order to outline how the difference in values between the two cultures can impact the prevalence of forced entrepreneurs. Cultural dimensions are "... aspect[s] of a culture that can be measured relative to other cultures" (Hofstede 2011). Hofstede originally identified four dimensions: Power Distance, Uncertainty Avoidance, Individualism, and Femininity (Hofstede 2011). The results showed correlations with other notable studies conducted, and recent research shows that the results still hold, which makes them basic and enduring. (Hofstede 2011). Later on two more dimensions were added, creating a total of six dimensions (See Appendix A).

In order to allow comparison of countries' cultures and values, each country has been assigned scores relative to other countries on every dimension (refer to Appendix A for an example). In the 2010 edition of "Cultures and Organizations: Software of the Mind" scores are listed for 76 countries, based on both Hofstede's original work, as well as replications and extension of his original IBM study on different international populations and by a number of scholars. (Hofstede Insights 2021). For years, scholars have been studying the relationships between the cultural dimensions as outlined by Hofstede and entrepreneurship/innovation. Findings concerning the relationship between each of the dimensions and entrepreneurship/innovation over the years have been mixed at times (e.g., Shane 1993, Gorodnichenko & Roland 2010, Rinne et al. 2011, etc; refer to Appendix B for an overview). In the most recent paper at the intersection of fields of innovation & entrepreneurship and Hofstede's work Lopez-Cabarcos et al. (2021), the researchers look at a sample of 37 countries

around the world and use Artificial Neuron Networks to classify them as innovation-oriented or non-innovation-oriented based on their entrepreneurial activity (measured based on whether Gross Expenditure on R&D is higher, equal, or lower than the average), while also considering their cultural values through the application of Hofstede's work. They find that Long-Term Orientation, Individualism and Indulgence are positively associated with consideration of a country as innovation-oriented, whereas Uncertainty Avoidance is associated with consideration of a country as non-innovation-oriented. Since there is evidence that innovation-orientation and Individualism are associated in different ways for countries with high versus low GDP per capita, we will look at a sample of high GDP per capita countries (see Pinillos & Reyes 2009).

Model Specification

The model that we used for the paper is known as a linear probability model. This model is a binary regression model, meaning that the dependent variable takes the value of 1 or 0 dependent on rate of unemployment as the explanatory variable. Our model also incorporates fixed effects that interact university, graduation, major, as well as industry cohorts. These fixed effects are meant to control for time invariant characteristics within the population, ensuring the overall validity of the model. This model is appropriate for the goal of this paper because by implementing the linear probability model, the desired outcome can only be one of two options, for example, entry into entrepreneurship, 1, or non-entry, 0. This means the paper can measure the impact of unemployment on entrepreneurship as a percentage change, something highly beneficial for policymakers trying to improve the amount of entrepreneurship in the economy. Furthermore, by including fixed effects in the regression, the paper can ensure that the results are valid by taking into account the fact that factors like gender, the major of the students and their

university can all have an impact on the dependent variable. In the original paper, there are two linear probability regressions that are run. Firstly, there is the regression measuring the impact of unemployment on entry into entrepreneurship. This can be seen below.

Equation 1: Entry into Entrepreneurship Versus Employment

$$\begin{aligned} Entrepreneur_{i,t}^{x} &= \beta \times Unemployment_{i,t \to t+1} \\ &+ University \times CohortFE \times GenderFE + \eta_{i,t} \end{aligned}$$

Specifically, the equation above measures the impact of unemployment rate on whether a worker denoted as the variable *i* enters entrepreneurship in *x* years after graduating during year *t*. The focus is on the time period between one to three years after graduation, with the independent variable, *Unemployment*, representing the average national unemployment in years *t* and *t*+1. You can also see fixed effects in the equation represented by the variables *University*, *CohortFE*, and *GenderFE*. One goal of the paper is to demonstrate that unemployment has a positive relationship with the amount of entrepreneurs in the economy. This means that the beta coefficient of the variable *Unemployment* should be positive. Thus, the alternative hypothesis and null hypothesis for this equation can be seen below.

Equation 2: Entry Into Entrepreneurship Versus Unemployment Hypotheses

Null Hypothesis: H_o*:* > 0

Alternative Hypothesis: H_a*:* $<= 0$

The null hypothesis states that unemployment has a positive impact on entry into entrepreneurship, with the alternative stating that the effect is either non-existent or negative. Aside from the initial goal of the paper of demonstrating the way unemployment impacts entry into entrepreneurship, the secondary goal of the researchers is to demonstrate that this same

unemployment shock also has a positive impact on firm quality. Thus, there is also a regression of firm quality measured against unemployment as seen below.

Equation 3: Firm Quality Versus Unemployment

$$\begin{aligned} FirmQuality_{i,t} &= \beta \times Unemployment_{i,t \to t+1} \\ &+ University \times CohortFE \times GenderFE \\ &+ IndustryFE + \eta_{i,t} \end{aligned}$$

The independent variable in this equation, *Unemployment*, also represents the average national unemployment in years *t* and *t*+1. However, in this case the dependent variable is now *FirmQuality*. This dependent variable adopts many different metrics in the paper, including number of employees, whether or not the firm is acquired and whether or not it becomes an IPO. All of these metrics are meant to be indicators of firm success. For example, the more employees a firm has, the larger it is considered to be, something that should normally indicate a successful firm. We also see the same fixed effects as in the previous equation. However, here there is the addition of industry fixed effects in the form of the variable *IndustryFE*. This is to take into account the differences across industries in the sample. This regression is meant to demonstrate that unemployment has a positive relationship with the firm quality, meaning that the beta coefficient of the variable *FirmQuality* should also be positive. The null and alternative hypotheses for this equation can be seen below.

Equation 4: Firm Quality Versus Unemployment Hypotheses

Null Hypothesis: H_o*:* > 0

Alternative Hypothesis: H_a*:* $<= 0$

In the null hypothesis, the effect of unemployment on firm quality is positive. In the alternative hypothesis, this effect is either not significant or negative. These are the regressions and hypotheses to which we apply our replication data.

Data

The data we use for our paper consists of two parts. For the replication, we use data provided by the authors themselves from their original paper. This is a sub-sample of their original paper with about 115,847 compared to the original value of 641,144, but nonetheless allows us to demonstrate the same phenomena as the authors have done. The data is presented in pseudo panel format, with the observations being organized into cohorts based on graduation year. While this is not a typical data structure, it makes sense for the purpose of the paper, as their main goal is to demonstrate entrance into entrepreneurship across students graduating in different years. In this case the n term in the original dataset is not the total number of observations, but number of cohorts. Thus, we initially run the Stata command *expand obs_num*, which allows for all of the different observations to be shown.

As described by the authors, this data was acquired primarily through crawling the web, generally using Google and Yahoo, to gather data from LinkedIn. Specifically, each graduate's educational and employment history was collected and compiled to create a new panel style data set. Furthermore, data on organizations, also available on LinkedIn, was obtained by matching the names of firms across workers. Lastly, information on each educational institution mentioned in the graduate's resume data was also collected. Although the original sample of workers includes graduates from over 2,200 undergraduate institutions, the data especially emphasizes graduates of highly selective universities, as it is from these colleges from which successful

entrepreneurs mainly graduate. Some examples of these schools include MIT, Stanford University, Northwestern University and others. In collecting the sample, the paper identifies over 36,316 founders of firms. Also, in total, 141 of the startups in the sample successfully completed an IPO. To identify new firms, the labels “owner”, “co-owner”, “founder”, “co-founder” or “entrepreneur” are used as a form of identification on the graduate’s LinkedIn profiles. Also, the firm’s startup date is estimated based on information available on the firm’s profile or by the earliest date a worker has joined the firm. Additional information on firm success is obtained by viewing the company’s profile on the website Crunchbase. From this information, the researchers determine whether or not a firm has received venture capital funding, the amount of funding it has received, whether the company has been acquired and whether it has successfully launched an IPO. Lastly, patent data is collected from the United States Patent and Trademark Office.

For our extension, using some online features, we looked for profiles of individual workers on LinkedIn to generate similar data. Specifically, we focused on individuals with bachelor's degrees who graduated from top institutions in fifteen different countries between 2008 and 2018. Our criteria for choosing these top level institutions was based on QS world rankings. If a country did not have five institutions on these rankings, then we used additional sources. To collect the data, we used both online scraping programs, and manual scraping methods. After identifying entrepreneurs in the dataset, we then used Crunchbase and similar websites such as Pitchbook, to find relevant firm level information. Doing this, we successfully generated our three new datasets of entry into entrepreneurship and firm quality across fifteen different countries, each country part of a different grouping of high-individualism, medium-individualism and low-individualism countries. In total, we had 50 observations for

each country, 250 in each group, and 750 in total. In regards to data collection on LinkedIn, the website is very careful about not allowing its users information to be gathered without their consent. Thus, we had to be very careful in our methodology to ensure we did not break any rules in our web scraping. The original authors were able to use a more advanced program to scrape massive amounts of data without detection, something we were not able to do in the allotted time frame. Nonetheless, we feel that our 750 observations is a good sample size, and should give us strong insight into the way individualism impacts entry into entrepreneurship.

Initial Tests

In order to verify the quality of the data after importing it, we ran several tests to see whether the model had either a heteroskedasticity problem or an autocorrelation problem. The results of these tests can be seen below.

Figure 1: Breusch Pagan Test

Breusch,ÄìPagan/Cook,ÄìWeisberg test for heteroskedasticity

Assumption: Normal error terms

Variable: Fitted values of entre_dum

H0: Constant variance

Prob > chi2 = 0.0000

Figure 2: Durbin Watson Test

Durbin,ÄìWatson d-statistic(8,115847) = .1555204

Based on the above tests, we see that the model does not have a heteroskedasticity problem, as the test statistic for the Bruesch-Pagan test is very low. However, based on the results of the Durbin-Watson test, it does have a potential autocorrelation issue, with a value of .1555204.

However, this is to be expected since we are dealing with a panel data of cohorts. Therefore, the standard errors may be off while the coefficients are unaffected.

Replication of Results

The replication section of our paper was based in part on data and replication code provided by the author of the original paper. The software used to achieve the replication is Stata version 16. Specifically, we initially generated summary statistics of the data to observe general trends in the data set. The results of our initial collection of summary statistics can be seen below along with the summary statistics from the original paper. Our calculations are presented first, followed by the originals. These statistics are for individuals, undergraduate institutions and entrepreneurs in the dataset.

Table 1: Summary Statistics of Individuals (Replicated)

Variable	Obs	Mean	Std. Dev.	Min	Max
Unemployment at Graduation	115847	0.047	0.013	0.035	0.079
Graduation Year	115847	2001.4	4.96	1998	2012
Top 20 College	115847	0.33	0.49	0	1
Female	115847	0.17	0.39	0	1
Grad. School Within 5 Years	115847	0.33	0.49	0	1
Top Finance/Consulting Job	115847	0.083	0.29	0	1
Russell 1000 Job	115847	0.33	0.49	0	1
Avg Industry Wage	115847	70.2	12.2	56.9	95.3
Founder Within 1 Year	115847	0.42	0.51	0	1
Founder Within 2 Year	115847	0.5	0.52	0	1
Founder Within 3 Year	115847	0.42	0.51	0	1
Founder Within 4 Year	115847	0.42	0.51	0	1

Table 2: Summary Statistics of Individuals (Original Paper)

	N	Mean	Std	50th	90th
Unemployment at Graduation	641,144	0.052	0.016	0.047	0.087
Graduation Year	641,144	2004.9	4.11	2005	2011
Top 20 College	641,144	0.19	0.40	0	1
Female	641,144	0.36	0.48	0	1
Grad. School within 5 years	641,144	0.20	0.40	0	1
Prestigious Finance/Consulting/Tech Job	641,144	0.088	0.28	0	0
Russell 1000 Job	641,144	0.25	0.44	0	1
Avg Industry Wage	617714	61.8	9.97	65.2	69.1
Founder within 1 Year	641,144	0.022	0.15	0	0
Founder within 2 Years	641,144	0.028	0.16	0	0
Founder within 3 Years	641,144	0.033	0.18	0	0

Table 3: Summary Statistics Undergraduate Institutions (Replicated)

Variable	Obs	Mean	Std. Dev.	Min	Max
Annual Tuition in USD	115847	19701.4	15055.5	8960.2	50494.8
	115847	1920.3	34.8	1812.4	1975.3
Year Founded	115847	40386.5	26204.5	1749	68639.8
Total Enrollment	115847	33.6	20.6	5	67.2
Acceptance Rate (\%)	115847	0.78	0.41	0	1
Public University					

Table 4: Summary Statistics Undergraduate Institutions (Original Paper)

	N	Mean	Std	50th	90th
Annual Tuition in USD	639,782	22,269.2	16,352.6	13,509	50,494.8
Year Founded	638,142	1,889.1	97.2	1,885.0	1,944.4
Total Enrollment	632,803	30,327.4	24,556.3	25,006.8	65,085.2
Acceptance Rate (%)	633,383	50.8	24.1	53.3	80.2
Public University	641,144	0.75	0.43	1	1

Table 5: Summary Statistics Entrepreneurs (Replicated)

Variable	Obs	Mean	Std. Dev.	Min	Max
Top 20 College	115847	.3	0.48	0	1
Female	115847	.1	0.32	0	1
Firm Survival to 2019	115847	.5	0.53	0	1
> 10 Employees	115847	.6	0.52	0	1
> 20 Employees	115847	.5	0.53	0	1
> 50 Employees	115847	.3	0.48	0	1
Log(Current Employees)	115847	3.12	3.39	0	10.2
Log(VC Funding)	115847	7.02	9.16	0	19.8
VC Funding > 0	115847	.4	.52	0	1
VC Funding > 0 in Five	115847	.2	.42	0	1
Years	115847	.4	.52	0	1
Num Patents > 0		.2	.42	0	1
Patents > 0 in Five Years	115847	.3	.48	0	1
Acquired	115847	.3	.48	0	1
Initial Public Offering	115847				

Table 6: Summary Statistics Entrepreneurs (Original Paper)

	N	Mean	Std	50th	90th
Top 20 College	36,316	0.39	0.49	0	1
Female	36,316	0.21	0.41	0	1
Firm Survival to 2019	36,316	0.23	0.42	0	1
$>$ 10 Employees	36,316	0.14	0.35	0	1
$>$ 20 Employees	36,316	0.094	0.29	0	0
$>$ 50 Employees	36,316	0.051	0.22	0	0
Log(# Current Employees)	36,316	0.78	1.41	0	2.89
Log(VC Funding)	36,316	1.80	4.96	0	12.6
VC Funding $>$ 0	36,316	0.15	0.36	0	1
VC Funding $>$ 0 in 5 years	36,316	0.12	0.33	0	1
Num Patents $>$ 0	36,316	0.060	0.24	0	0
Patents $>$ 0 in 5y	36,316	0.025	0.16	0	0
Acquired	36,316	0.045	0.21	0	0
Initial Public Offering	36,316	0.0038	0.062	0	0

In analyzing the summary statistics, we see that our results are very similar to the original paper. For example, the mean of unemployment at graduation in the individual summary

statistics is about .52, while ours is about .47. Some values differ more than others, something that can probably be accounted for by the fact that we are dealing with a sub-sample. Nonetheless, we can still see some interesting trends in line with the main topic and findings of the original paper. For example, analyzing the summary statistics, we see that the entrance in entrepreneurship is a positive value for each of the four years after graduation. Furthermore, the various metrics of firm success are also positive, but small. We also see that the likelihood of entry into entrepreneurship is higher for individuals with high paying jobs. This forms the theoretical basis for the paper's regression analysis, as the authors speculate that an unemployment shock disproportionately affects high earners. After collecting the summary statistics, we ran regressions with the dataset. Below we can see the results of our regression of unemployment national variance against whether or not the observations in the dataset became entrepreneurs, controlling for fixed effects at the individual and clustered level, and also using robust standard errors.

Table 7: Regression Output

Linear regression

entre_dum	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
unemp_national_var	.005	.005	1.01	.314	-.005	.014	
female	-.009	0	-26.56	0	-.01	-.008	***
: base 2	0	.	.	.	.	.	
4	0	0	0.16	.875	-.001	.001	
6	0	0	-0.03	.978	-.001	.001	
7	-.002	.001	-2.26	.024	-.003	0	**
8	0	0	0.16	.875	-.001	.001	
9	0	0	0.22	.829	-.001	.001	
Constant	1	0	2334.11	0	.999	1.001	***

Mean dependent var	1.000	SD dependent var	0.017
R-squared	0.008	Number of obs	115847
F-test	140.242	Prob > F	0.000
Akaike crit. (AIC)	-621517.964	Bayesian crit. (BIC)	-621440.684

*** *p*<.01, ** *p*<.05, * *p*<.1

In observing the results of our regression, we see that they are very similar to the original paper. Specifically, we find that > 0, meaning that the unemployment shock has a positive impact on entry into entrepreneurship. In other words, as in the original paper, we can accept the null hypothesis and reject the alternative. As is typical in linear probability models, the p-value and R-squared value are both not very helpful. Because we are using data that will only reflect small changes in percentages, the R-squared value is very small and the p-value indicates that the variable is not significant. However, despite this, we still see that the effect of unemployment on entrepreneurship is marginally positive, in line with the original paper's findings. While the original paper documented a 2.2% increase in entry into entrepreneurship as a result of an unemployment shock, our value is about half a percentage in total. This value is smaller, but still significant. We can also see above the confidence interval for the unemployment variable as being between a negative half percentage and about one and half percent. Next, we also run several regressions with regards to different measures of firm success discussed in the paper.

Table 8: Regression Output

(MWFE estimator converged in 1 iterations)
note: 511.naics_3dig omitted because of collinearity
note: 522.naics_3dig omitted because of collinearity
note: 523.naics_3dig omitted because of collinearity
note: 541.naics_3dig omitted because of collinearity
warning: missing F statistic; dropped variables due to collinearity or too few clusters

HDFE Linear regression	Number of obs	=	115,847
Absorbing 1 HDFE group	F(8, 115838)	=	1.02e+07
	Prob > F	=	
	R-squared	=	.9986
	Adj R-squared	=	.9986
	Within R-sq.	=	.9986
	Root MSE	=	0.0163

entre_tp2_venture	Coefficient	Std. err.	t	P>t	[95 conf.	interval]
unemp_national_var	.0050857	.0046852	1.09	0.278	-.0040973	.0142687
female	.9910718	.0003308	2996.32	0.000	.9904235	.9917201
major_id						
4	1.000061	.00036	2778.17	0.000	.9993555	1.000767
6	-0000103	.0003484	-0.03	0.976	-.0006932	.0006726
7	.000061	.0162897	0.00	0.997	-.0318665	.0319885
8	.000061	.00036	0.17	0.865	-.0006446	.0007667
9	.0000915	.0003938	0.23	0.816	-.00006804	.0008634
naics_3dig						
423	.0000178	0.016013	0.00	- 0.999	-.0319326	.0319682
511	0	(omitted)				
522	0	(omitted)				
523	0	(omitted)				
541	0	(omitted)				
_cons	-.0002695	.0004215	-0.64	0.523	-.0010957	.0005567

Table 9: Regression Output

(MWFE estimator converged in 1 iterations)
note: 511.naics_3dig omitted because of collinearity
note: 522.naics_3dig omitted because of collinearity
note: 523.naics_3dig omitted because of collinearity
note: 541.naics_3dig omitted because of collinearity
warning: missing F statistic; dropped variables due to collinearity or too few clusters

HDFE Linear regression		Number of obs	= 115,847
Absorbing 1 HDFE group		F(8, 115838)	=
		Prob > F	=
		R-squared	= 1.0000
		Adj R-squared	= 1.0000
		Within R-sq.	= 1.0000
		Root MSE	= 0.0000

entre_tp2_ipo	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
unemp_national_var	3.29e-12	2.95e-14	111.540	0.000	3.23e-12	3.35e-12
female	1.01e-13	2.08e-15	48.350	0.000	9.67e-12	1.05e-13
major_id						
4	1	2.27e-15	4.40e+14	0.000	1	1
6	-7.85e-16	2.20e-15	-0.360	0.721	-5.09e-15	3.52e-15
7	4.55e-14	1.03e-13	0.440	0.657	-1.56e-13	2.47e-13
8	1.08e-13	2.27e-15	47.640	0.000	1.04e-13	1.13e-13
9	7.55e-16	2.48e-15	0.300	0.761	-4.11e-15	5.62e-15
naics_3dig						
423	7.41e-14	1.03e-13	0.720	0.471	-1.27e-13	2.75e-13
511	0	(omitted)				
522	0	(omitted)				
523	0	(omitted)				
541	0	(omitted)				
_cons	-2.43e-13	2.66e-15	-91.530	0.000	-2.48e-13	-2.38e-13

Table 10: Regression Output

(MWFE estimator converged in 1 iterations)
note: 511.naics_3dig omitted because of collinearity
note: 522.naics_3dig omitted because of collinearity
note: 523.naics_3dig omitted because of collinearity
note: 541.naics_3dig omitted because of collinearity
warning: missing F statistic; dropped variables due to collinearity or too few clusters

HDFE Linear regression		Number of obs	= 115,847
Absorbing 1 HDFE group		F(8, 115838)	=
		Prob > F	=
		R-squared	= 1.0000
		Adj R-squared	= 1.0000
		Within R-sq.	= 1.000
		Root MSE	= 0.000

entre_tp2_patents_5y	Coefficient	Std. err.	t	P>t	[95 conf.	interval]
unemp_national_var	1.62e-11	8.10e-14	200.41	0.000	1.61e-11	1.64e-11
female	-1	5.72e-15	2-1.7e+14	0.000	-1	-1
major_id						
4	3.98e-13	6.22e-15	63.88	0.000	3.85e-13	4.10e-13
6	-1.05e-15	.6.02e-15	-0.18	0.861	-1.29e-14	1.08e-14
7	-3.42e-11	2.82e-13	0.000	0.000	--3.47e-11	-3.36e-11
8	-4.74e-15	6.22e-15	0.447	0.447	-1.69e-14	-7.46e-15
9	1	6.81e-15	0.000	0.000	1	1
naics_3dig						
423	3.43e-11	2.82e-13	121.87	0.000	3.38e-11	3.49e-11
511	0	(omitted)				
522	0	(omitted)				
523	0	(omitted)				
541	0	(omitted)				
_cons	-9.27e-13	7.29e-15	-127.25	0.000	-9.42e-13	-9.13e-13

Based on these regressions, we again see that the effect of the unemployment shock on metrics of firm success is also positive. For example, according to our results, the impact of the unemployment shock is a half a percentage increase in likelihood of receiving venture capital. Furthermore, all three coefficients are positive, meaning we can accept the null and reject the alternative in all three regressions. Thus, the above equations demonstrate that there is a positive relationship between the shock and the probability a new firm receives venture capital funding, successfully completes an IPO, and develops a patent, all in line with the findings of the original paper.

Hypothesis Test

In the original paper, the hypothesis is a one tailed test, with the central goal of determining whether or not the beta coefficient of unemployment is greater than or equal to zero.

Because our hypothesis is only whether or not the coefficient is positive, we do not need to make any calculations to support or reject the null hypothesis of the original paper. However, that being said, we can still test whether or not the coefficient is significant and further analyze our results. To do this, we incorporate the first regression of entry into entrepreneurship versus firm quality. The t-value of the variable unemployment is provided in the regression information. However, we can also calculate this value ourselves in stata. Based on lectures and information found online, we know that the t statistic is equal to the coefficient divided by its standard error. The higher the t value, the less explanatory power the variable has. Our t-value is about 1.02, a relatively high value. However, in the context of our model, which focuses on minute changes in percentages, this is to be expected. We can also incorporate a Wald test to see the probability of the coefficient being above or below a certain value. In conducting this test, we see that the probability it is below or equal to 0 is about .15684234, meaning that the likelihood of the coefficient being positive is relatively high, indicating that our model is accurate in predicting the relationship between unemployment and entry into entrepreneurship.

Figure 4: Wald Test

(1) unemp_national_var = 0

F(1,115839) =   1.02

Prob > F =   0.3137

Ha: coef <= 0 p-value = .15684234

Ho: coef >= 0 p-value = .84315766

Extension

In our extension, we use the same model as the original paper, measuring the impact of an unemployment shock on entry into entrepreneurship and quality of firms founded by forced entrepreneurs, this time applying it to many more countries. Specifically, we identify groups of countries based on their individualism score in Hofstede's index, model an unemployment shock cross-nationally, and measure the likelihood of entry into entrepreneurship as a result of this shock as well as the quality of firms founded by these entrepreneurs. Below, you can see an index of the countries we have incorporated in our model, grouped based on their classification of having low, medium or high individualism. These were randomly selected from a sample of highly developed countries.

Table 11: Individualism

Low Individualism (16-41)	Medium Individualism (41-61)	High Individualism (61-100)
Trinidad and Tobago	Iceland	Hungary
Chile	Lithuania	Denmark
Hong Kong	Austria	Norway
Portugal	Poland	United Kingdom
Saudi Arabia	Spain	Australia

The regression models for our extension can be seen below along with their respective set of hypotheses and results. Again, the first equation represents the effect on an unemployment shock on entry into entrepreneurship. Using this model, we will calculate the likelihood of entry into entrepreneurship across the different groups of countries. However, instead of viewing the sign of the coefficient as in the original model, we compare the beta coefficients across the

separate regressions to measure the impact of individualism on entry into entrepreneurship. Based on existing research, we hypothesize that individualism would be positively correlated with entry into entrepreneurship. Thus, our null hypothesis for this equation is that the beta coefficient for the third regression of high individualism countries will be greater than that for the middle individualism regression, which should also be greater than that for low individualism countries.

Equation 4: Entry into Entrepreneurship Versus Unemployment Extension

$$\begin{aligned} Entrepreneur_{i,t}^{x} &= \beta \times Unemployment_{i,t \to t+1} \\ &+ University \times CohortFE \times GenderFE + \eta_{i,t} \end{aligned}$$

Equation 5: Entry into Entrepreneurship Versus Unemployment Extension Hypotheses

$$Null\ Hypothesis\ H_0: \beta_{31} > \beta_{21} > \beta_{11}$$

$$Alternative\ Hypothesis\ H_a: \beta_{31} \not> \beta_{21} \not> \beta_{11}$$

The results of these regressions can be seen below.

Table 12: Entry into Entrepreneurship Versus Unemployment Low Individualism Countries

Linear regression

entre_dum	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
unemployment_rate	1.569	2.335	0.67	.502	-3.03	6.169	
female	-.024	.026	-0.93	.354	-.076	.027	
major : base 1	0	.	.	.	.	.	
2	-.002	.03	-0.08	.94	-.062	.057	
3	-.048	.049	-0.96	.336	-.145	.05	
4	-.07	.203	-0.35	.728	-.47	.329	
5	-.029	.144	-0.20	.841	-.314	.256	
6	-.052	.075	-0.69	.492	-.2	.096	
7	-.046	.118	-0.39	.697	-.279	.187	
8	-.066	.202	-0.33	.744	-.464	.332	
Constant	-.037	.147	-0.25	.801	-.326	.252	

Mean dependent var	0.040	SD dependent var	0.197
R-squared	0.013	Number of obs	247
F-test	0.338	Prob > F	0.962
Akaike crit. (AIC)	-84.482	Bayesian crit. (BIC)	-49.388

*** p<.01, ** p<.05, * p<.1

Table 13: Entry into Entrepreneurship Versus Unemployment Medium Individualism Countries

Medium Individualism Linear regression

entre_dum	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
unemployment_rate	2.193	.688	3.19	.002	.839	3.548	***
female	-.012	.029	-0.41	.68	-.069	.045	
major : base 1	0	.	.	.	.	.	
2	.02	.029	0.69	.488	-.037	.078	
3	.02	.153	0.13	.896	-.281	.321	
4	-.017	.097	-0.17	.865	-.208	.175	
5	-.043	.108	-0.39	.694	-.256	.171	
6	-.072	.214	-0.33	.738	-.493	.35	
7	-.014	.215	-0.06	.95	-.437	.41	
Constant	-.162	.072	-2.25	.025	-.304	-.02	**

Mean dependent var	0.048	SD dependent var	0.214
R-squared	0.047	Number of obs	250
F-test	1.491	Prob > F	0.161
Akaike crit. (AIC)	-56.041	Bayesian crit. (BIC)	-24.348

*** p<.01, ** p<.05, * p<.1

Table 14: Entry into Entrepreneurship Versus Unemployment High Individualism Countries

High Individualism Linear regression

entre_dum	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
unemployment_rate	1.174	.976	1.20	.23	-.749	3.098	
female	-.04	.018	-2.24	.026	-.074	-.005	**
major : base 1	0	.	.	.	.	.	
2	-.057	.021	-2.77	.006	-.098	-.017	***
3	-.054	.05	-1.08	.281	-.151	.044	
4	-.058	.045	-1.28	.2	-.148	.031	
5	-.037	.14	-0.27	.791	-.313	.239	
6	-.065	.072	-0.91	.363	-.206	.076	
7	-.047	.14	-0.33	.739	-.323	.229	
Constant	.011	.061	0.18	.86	-.109	.131	

Mean dependent var	0.020	SD dependent var	0.141
R-squared	0.056	Number of obs	249
F-test	1.784	Prob > F	0.081
Akaike crit. (AIC)	-267.898	Bayesian crit. (BIC)	-236.241

****p<.01, **p<.05, *p<.1*

We also run a similar regression to the original model with regards to firm quality. The equation and hypotheses for these regressions can be seen below.

Equation 6: Firm Quality Versus Unemployment Extension

$$\begin{aligned} FirmQuality_{i,t} &= \beta \times Unemployment_{i,t \to t+1} \\ &+ University \times CohortFE \times GenderFE \\ &+ IndustryFE + \eta_{i,t} \end{aligned}$$

Equation 7: Firm Quality Versus Unemployment Extension Hypotheses

$$Null\ Hypothesis\ H_0: \beta_{31} > \beta_{21} > \beta_{11}$$

$$Alternative\ Hypothesis\ H_a: \beta_{31} \not> \beta_{21} \not> \beta_{11}$$

The equation above represents the effect of an unemployment shock on firm quality. Again, we hypothesize that Individualism will have a positive impact on firm quality. Thus, our null hypothesis for this equation is that the beta coefficient for the third regression of high individualism countries will be greater than that for the middle individualism regression, which will be greater than that for low individualism countries.

Table 15: Firm Quality Versus Unemployment Low Individualism Countries

Low Individualism Linear regression

VC_funding	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
unemployment_rate	10.78	22.703	0.47	.66	-52.252	73.813	
female	.389	.336	1.16	.311	-.543	1.322	
major : base 1	0	.	.	.	.	.	
2	-.541	.249	-2.17	.096	-1.233	.151	*
: base 1	0	.	.	.	.	.	
2	.181	.321	0.56	.603	-.71	1.072	
3	-.278	.341	-0.82	.46	-1.225	.668	
5	-.389	.498	-0.78	.478	-1.772	.993	
Constant	-.161	1.583	-0.10	.924	-4.555	4.233	

Mean dependent var	0.091	SD dependent var	0.302
R-squared	0.702	Number of obs	11
F-test	1.574	Prob > F	0.344
Akaike crit. (AIC)	4.456	Bayesian crit. (BIC)	7.241

*** *p<.01, ** p<.05, * p<.1*

Table 16: Firm Quality Versus Unemployment High Individualism Countries

Linear regression

VC_funding	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
unemployment_rate	42.368	66.802	0.63	.56	-143.104	227.839	
female	-.55	.251	-2.19	.094	-1.248	.147	*
major : base 1	0	.	.	.	.	.	
2	-.45	.251	-1.79	.148	-1.147	.248	
: base 0	0	.	.	.	.	.	
1	.224	.366	0.61	.575	-.793	1.241	
2	.189	.509	0.37	.729	-1.225	1.604	
3	.588	.497	1.18	.302	-.79	1.967	
Constant	-4.551	7.972	-0.57	.599	-26.685	17.584	

Mean dependent var	0.091	SD dependent var	0.302
R-squared	0.625	Number of obs	11
F-test	1.112	Prob > F	0.481
Akaike crit. (AIC)	6.997	Bayesian crit. (BIC)	9.782

*** *p*<.01, ** *p*<.05, * *p*<.1

Table 17: Firm Quality Versus Unemployment High Individualism Countries

High Individualism Linear regression

VC_funding	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
unemployment_rate	21.57	27.847	0.77	.495	-67.052	110.192	
o	0	.	.	.	.	.	
major : base 1	0	.	.	.	.	.	
2o	0	.	.	.	.	.	
: base 2	0	.	.	.	.	.	
3o	0	.	.	.	.	.	
Constant	-.992	1.816	-0.55	.623	-6.772	4.787	

Mean dependent var	0.400	SD dependent var	0.548
R-squared	0.167	Number of obs	5
F-test	0.600	Prob > F	0.495
Akaike crit. (AIC)	10.142	Bayesian crit. (BIC)	9.361

*** *p*<.01, ** *p*<.05, * *p*<.1

Conclusion

In replicating and extending the findings of Hacamo and Kleiner (2021), we generally find that individualism is indeed positively correlated with both entry into entrepreneurship and firm quality. However, it would appear that too much individualism has a negative impact on entry into entrepreneurship and measurements of firm quality. In our extension, we reject the null and accept the alternative hypothesis in both models. Based on existing studies, this can likely be explained by the fact that too much individualism means that some people cannot become entrepreneurs because of their lack of connections and resources.

Limitations and Future Research

Our research has various possible limitations, mainly due to time and resource constraints. First off, LinkedIn profiles do not display an individual's nationality, which means their cultural characteristics may not be very well captured merely based on the university in which they studied (e.g., perhaps they were born and raised in another country and only did their undergraduate studies abroad). This is an inherent limitation in using LinkedIn data to study the role of cultural dimensions. Second, we are using a relatively small sample compared to the original paper. Thus, It would be interesting to see whether similar results hold with a larger sample or what differences may be observed.

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Appendix

Appendix A:

Dimension	Abbreviation	Description
Power Distance	PDI	The extent to which less powerful members of a group accept and expect unequal distribution of power. It represents inequality, and support for it by the followers as much as by the leaders.
Uncertainty Avoidance	UAI	Tolerance of a society for ambiguity, and the extent to which people feel comfortable or uncomfortable in unstructured (novel, unknown, and out of the ordinary) situations.
Individualism vs Collectivism	IDV	Relating to the degree of integration of individuals into primary groups and the strength of the ties between individuals.
Masculinity vs Femininity	MAS	Relating to the division of emotional roles and distribution of values between men and women. Whether men and women in a society are collectively assertive and competitive (masculine), or modest and caring (feminine).
Long-Term vs Short-Term Orientation	LTO	Long-term orientation is about fostering virtues for future rewards, such as perseverance and thrift. Short-term orientation is about past and present, in particular respect for tradition, saving 'face', and fulfilling social obligations.
Indulgence vs Restraint	IVR	Relating to the gratification versus control of basic human desires, and associated with enjoying life and having fun. Restraint stands for a society which controls gratification and regulates it through strict societal norms.

Sources: Hofstede (2011), Hofstede et al. (2010)

Appendix B:

Country	Individualism Score	Individualism Category
U.S	91	High
Trinidad and Tobago	16	Low
Chile	23	Low
Hong Kong	25	Low
Portugal	27	Low
Saudi Arabia	25	Low
Austria	55	Medium
Iceland	60	Medium
Lithuania	60	Medium
Poland	60	Medium
Spain	51	Medium
Australia	90	High
Denmark	74	High
Hungary	80	High
Norway	69	High
UK	89	High