



Erasmus School of Economics

Bachelor Thesis International Bachelor Economics and Business Economics

DETERMINANTS OF ENTREPRENEURSHIP ACROSS DIFFERENT AGE GROUPS

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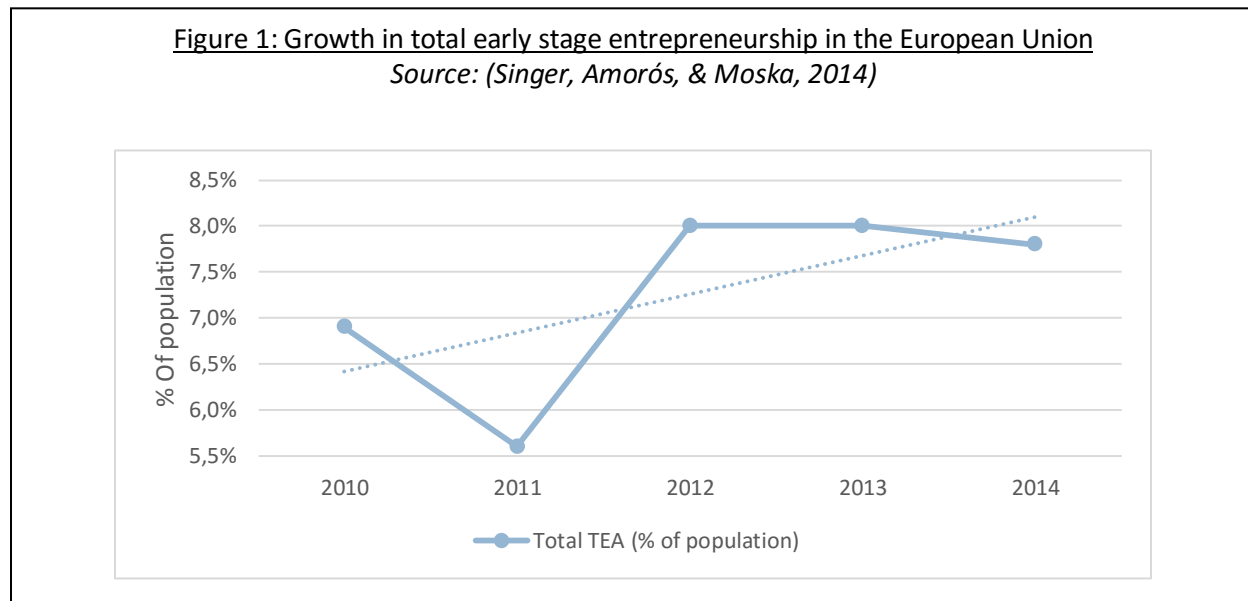
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2. Introduction

2.1 TOPIC INTRODUCTION

Entrepreneurship has never been as popular as it currently is. In 2013 around 150.000 people started a new business in just the Netherlands alone, this is an increase of 13 percent as compared to 2012 (Dutch Chamber of Commerce, 2014). The Dutch Chamber of Commerce explains this trend with the fact that many people become unemployed due to businesses declaring bankruptcy caused by the current economic crisis. Due to this tight situation in the economic labor market, many people are struggling to find a replacement for their lost job. For many people, a solution is to become self-employed. This form of entrepreneurship is referred to as necessity-based entrepreneurship (Hessels, van Gelderen, & Thurik, 2008). Evidence for the increase in entrepreneurial activity can be seen in figure 1. The graph shows the total amount of early stage entrepreneurship over the last 5 years. It can be seen that the total number of early stage entrepreneurs in the European Union have significantly increased over the years 2010-2014. Early stage entrepreneurship can be defined as the group of individuals between the age of 18 and 64 that are actively trying to start a business or that already own or manage a business which is younger than 3.5 years. Entrepreneurs who are actively trying to start a business are referred to as nascent entrepreneurs in economic literature (Wennekers, van Stel, Thurik, & Reynolds, 2005).



In order to find an explanation for this phenomenon, researchers have started to investigate the determinants of entrepreneurship. There have been studies on three levels of analyses: macro, meso and micro level (Grilo & Thurik, 2004). On the macro level studies are mostly concerned about the variations between different countries. Studies have showed that factors such as economic development, technological innovation, governmental regulation and cultural aversion towards entrepreneurship affect the level of entrepreneurship in a country (Hofstede, et al., 2004; Wennekers, Thurik, & van Stel, Uncertainty Avoidance and the Rate of Business Ownership Across 21 OECD Countries, 1976-2004, 2006;

Uhlaner & Thurik, 2005). The meso level focusses on exit and entry based on profit maximization on an industry level (Audretsch, Thurik, Verheul, & Wennekers, 2002).

On the micro level, research is primarily focused on the differences in entrepreneurial determinants between different individuals. Researchers have classified individuals in groups according to personal factors such as age, personal traits, financial status, knowledge and (working) experience (Bosma, Praag, & Wit, 1997; Wit & Winden, 1991).

This thesis will focus on the latter level, the micro level. The determinants of entrepreneurship of the individuals will be analyzed. Previous research suggests the existence of an inversely U-shaped correlation between entrepreneurial activity and age (Lévesque & Minniti, 2011; Lamotte & Colovc, 2013). Due to the fact that the probability of being engaged in entrepreneurship differs with age, it can be expected that the determinants of entrepreneurship also differ by an individual's age. This is exactly the topic of the current thesis. The individuals from the data set are classified by their age, and it is investigated in which way the determinants of being involved in total early-stage entrepreneurship differ across these age groups.

2.2 THESIS OUTLINE

The presented thesis focuses on the micro-level determinants of the entrepreneurial engagement. The thesis devotes special attention to an individual's age. The analysis uses data from the Global Entrepreneurship Monitor of 2011, including data for 55 countries. The research question is as follows:

To what extent do individual-level determinants of entrepreneurs differ across age groups?

Section 3 will use a theoretical framework to introduce the hypotheses to be tested. Section 4 will discuss the data used in the analysis. Section 5 will introduce a binary logistic regression model and describe the methodology used to analyze the data. Section 6 will present the results of two binary logistic regressions with total early-stage entrepreneurial activity as dependent variable. Section 7 will draw a conclusion from the results and will additionally list the limitations of this research and section 8 will suggest improvements for further research.

2.3 SOCIAL & SCIENTIFIC RELEVANCE

We see an increase in new businesses founded over the years, most economists agree that this yields positive effects to a country's economy (Caree & Thurik, 2010, pp. 564-567; Koellinger & Thurik, 2012). As a result many countries are implementing different types of strategies to stimulate entrepreneurship in their economy (European Commission, 2013). Because of this interest in entrepreneurship in policy circles, it seems relevant to investigate the determinants of entrepreneurial activity. Previous research revealed that the probability to become an entrepreneur are significantly different for different ages (Bönte, Falck, & Heblich, 2009; Levesque & Minniti, 2006). Hence, in order to optimally stimulate entrepreneurial activity, it is important to analyze the determinants of entrepreneurial activity for the different groups. The social relevance of this thesis comes from the fact that it gives an answer to whether certain age

groups have different determinants and should thus be stimulated differently. Policy makers can use the results of the analysis to their advantage in order to create the best fitting policy in their country.

Even though many researchers analyzed the determinants of individual entrepreneurship and suggested how they should be addressed by policy makers (Bosma, Praag, & Wit, 1997; Wit & Winden, 1991; Sobel & King, 2007), very few researchers have looked at the differential effect of age. As mentioned in section 2.1, there has been research done on the inverted U-shaped relationship between age and the probability of one becoming an entrepreneur (Lévesque & Minniti, 2011; Lamotte & Colovc, 2013). Investigating the determinants of entrepreneurship across different groups is not new, for example the differences in determinants for male and female entrepreneurs have been frequently analyzed (Harris & Harris, 1989; Verheul, Van Stel, & Thurik, 2006). However the differences in determinants for entrepreneurs in different age groups have not been studied before.

This thesis acquires scientific relevance because it investigates a link that has not been analyzed before. While previous research analyzed either the determinants of entrepreneurship or the correlation between age and entrepreneurial activity, this thesis analysis the effect of age on the determinants of entrepreneurship by investigating the determinants of entrepreneurship for various age groups.

3. Theoretical Framework

3.1 OPERATIONALIZATION OF ENTREPRENEURSHIP

In economic literature there have been many attempts to proxy entrepreneurship. In order to avoid any confusion, this paper follows the definition of the Global Entrepreneurship Monitor (GEM) report (Van Stel, Span , & Hessels, 2014). The GEM is a research program which obtains comparative data on entrepreneurial activity worldwide. The GEM uses the term Total early-stage Entrepreneurial Activity (TEA) when talking about new entrepreneurship in a country. The TEA-rate in a country is defined as the percentage of 18-64 years old who are actively starting (nascent entrepreneurship) or own a business which is younger than 3.5 years old. The advantage of TEA as a proxy for entrepreneurship over established entrepreneurs is that the age of the business is close to point of the establishment. This allows for better analysis of determinants of entrepreneurial activity. The GEM report and data further divides the TEA-rate in the following two sub-categories:

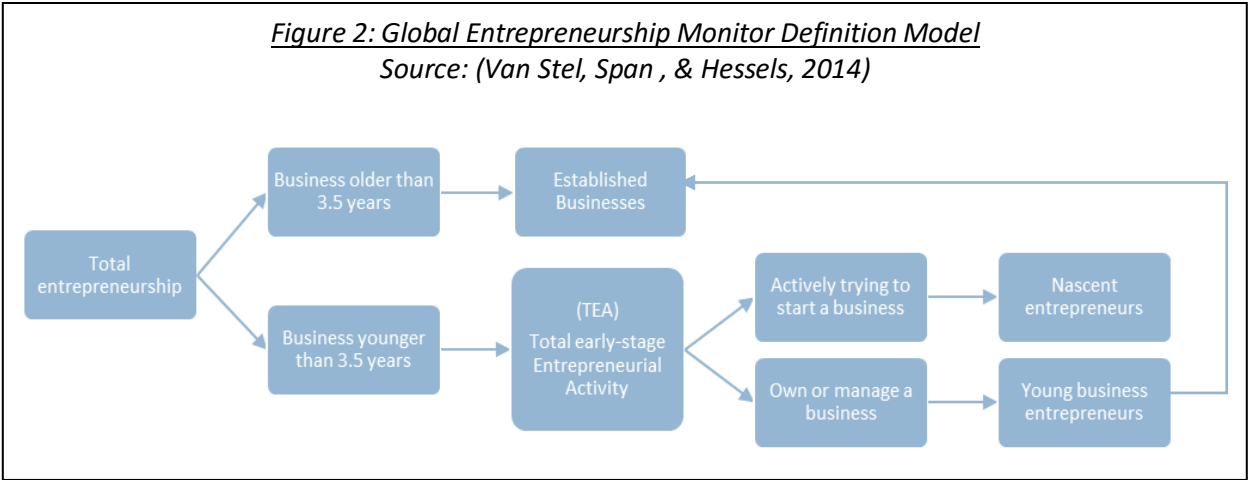
3.1.1 NASCENT ENTREPRENEURSHIP

Nascent entrepreneurship is the percentage of people aged 18-64 which are actively involved in the founding of a business which they will either own or co-own. This (pre)-business should not have paid any wages or salaries to the business owners for more than 3 months (Singer, Amorós, & Moska, 2014).

3.1.2 YOUNG BUSINESS ENTREPRENEURSHIP

Young business entrepreneurship is the percentage of people aged 18-64 in a particular geographical area that currently own, co-own or manage a business that has paid wages or salaries for more than 3 months, but for no more than 3 and a half years. After these 42 months the business turns into a business that is categorized by the established business ownership rate (Singer, Amorós, & Moska, 2014).

Figure 2 below summarizes the model definitions used in both this thesis and by the GEM report. This thesis will only focus on total early-stage entrepreneurship, which includes nascent and young business entrepreneurs.



3.2 DETERMINANTS OF ENTREPRENEURSHIP

As with any other economic market, the 'entrepreneurship market' is classified by demand and supply functions. The abstract entrepreneurship market however is much harder to properly define. Firstly, there is no true accepted definition of entrepreneurship (van Praag M. C., 1999). Secondly, the functions of entrepreneurship are defined using theories from diverse economic disciplines, such as micro-, macro-, labor- and behavioral economics.

3.2.1 PRODUCT-MARKET VIEW ON THE DEMAND OF ENTREPRENEURSHIP

The demand side of entrepreneurship represents the opportunities to be captured by entrepreneurs. These opportunities are shaped by macro-level factors. The following macro-level determinant factors have an effect on the amount of opportunities (Grilo & Thurik, 2004):

- Technological inventions and maturations
- Economic development
- Government regulation
- Globalization
- Consumer demands
- Economic structure of a country

However, given that the opportunities are available does not necessarily mean that entrepreneurs act upon them. According to Kirzner, the entrepreneurial market is a market with imperfect information, information asymmetries and uncertainty. A central concept in the framework as posed by Kirzner (1973) is *Entrepreneurial alertness*. In the framework, entrepreneurs (re)engage with existing markets and open new markets. By doing this the entrepreneur seeks profit as a result of their alertness to the opportunities overlooked by other people (Kirzner, 1973).

3.2.2 LABOR-MARKET VIEWS ON SUPPLY OF ENTREPRENEURSHIP

The supply side of entrepreneurial is largely discussed by economic scholars. Classic views on entrepreneurs describe entrepreneurs as functional arbitragers (Parker, 2009, p. 32). Jean-Baptiste Say was first to write that there is a limited supply of capable people that have "it" to become an entrepreneur and thus indirectly states that entrepreneurship cannot be learned and that the supply of entrepreneurship in a country is fixed (Say, 1971, p. 332).

On the other hand, more recent occupational choice theories state that the supply side of the entrepreneurial equilibrium is dominated by the population and their characteristics. These theories capture the decision of whether to become an entrepreneur or become wage-employed. They state that in making this decision, individuals assess the financial and non-financial rewards of entrepreneurship based on opportunities and their characteristics. When the projected derived utility from being an entrepreneur exceeds the derived utility from wage-work the individual will choose to become an entrepreneur (Parker, 2009, pp. 36-39).

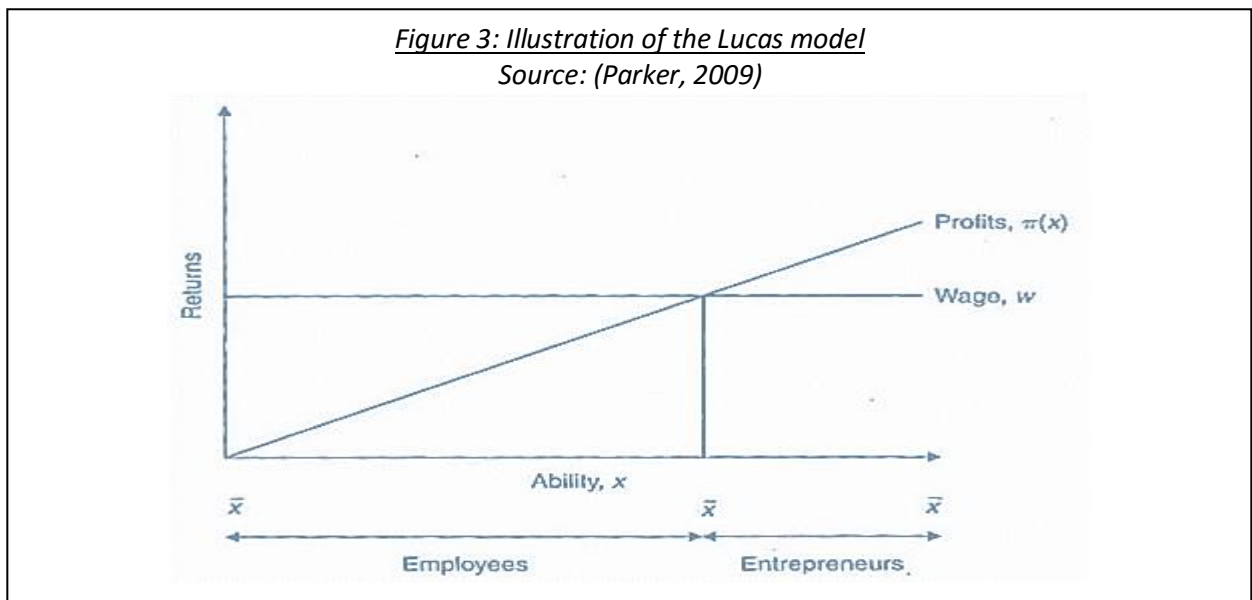
Different models of occupational choice theory exist, but a combination of the above mentioned theories is captured in for example the Lucas model (Parker, 2009, pp. 41-44). This model captures the effect of occupational choice theory, however it allows for heterogeneous entrepreneurial ability (x). It assumes that entrepreneurs with a higher ability produce more (q) with equal costs (c). The profit for these entrepreneurs is captured by the following equation:

$$(1) \quad \pi(x) = xq - c$$

The entrepreneur is still a utility maximizing agent, so it chooses to become an entrepreneur when the following condition holds:

$$(2) \quad \pi(x) > w$$

Figure 3 below illustrates the supply of entrepreneurs using the Lucas model.



3.2.3 EVIDENCE FOR DETERMINANTS

As previously mentioned in section 3.2.2, many different models of occupational choice theory exist. Most of which have proposed different individual-level determinants for entrepreneurship. Figure 4 below shows a list of different individual-level determinants which have previously been tested. The table is taken from a paper by Heinrichs & Walter (Heinrichs & Walter, 2015). The determinants have been sorted from highest percentage of tests supporting the effect to lowest percentage supporting the effect. As can be seen from figure 4, the proposed effect of age is unclear. This result could indicate that age has a positive effect on entrepreneurial activity in lower ages and a negative effect in higher ages. Which would be coherent with other studies which found that age had an inverse U-shaped correlation with the probability of entrepreneurial activity (Lévesque & Minniti, 2011; Lamotte & Colovc, 2013). As age will be analyzed in this thesis, the following section will discuss the findings of the age-effect on entrepreneurial activity.

Figure 4: Determinant summary

Source: Table 3 Empirical findings (Heinrichs & Walter, 2015, pp. 232-233)

Determinant	Proposed effect	No. of tests	% supporting effect
Age	±	43	-
Marital status (married)	±	38	-
Children	±	19	-
Tolerance of ambiguity	+	3	100
Type-A behavior	+	2	100
Risk perception	-	3	100
Representativeness	+	2	100
Perceived behavioral control	+	10	100
Attitude towards the behavior	+	8	100
Perceived desirability	+	4	100
Perceived feasibility	+	4	100
Propensity to act	+	3	100
Performance of role models	+	2	100
Personal wealth	+	14	100
Real estate	+	8	100
Parents' wealth	+	4	100
Business idea	+	2	100
Income	-	15	87
Creativity	+	7	86
Risk-taking propensity	+	35	80
Self-efficacy	+	10	80
Management experience	+	5	80
Innovativeness	+	9	78
Need for achievement	+	29	76
Existence of role models	+	34	76
Gender (female)	-	41	76
Need for independence	+	19	74
Internal locus of control	+	18	72
Vocational qualification	+	7	71
Overconfidence	+	3	67
Subjective norm	+	6	67
Unemployment	+	18	67
Entrepreneurial experience	+	15	67
Work experience	+	17	65
Agreeableness	-	4	50
Proactive behavior	+	2	50
Windfall gains	+	8	38
Education	+	55	35
Extraversion	+	6	33
Openness to experience	+	3	33
Neuroticism	-	3	0
Conscientiousness	+	2	0
Working time	-	4	0

3.3 DIFFERENCES IN DETERMINANTS ACROSS DIFFERENT AGE GROUPS

Even though some economist argue whether entrepreneurship is an ability that you are born with or whether it is a skill that has to be acquired throughout life (Nicolaou & Shane, 2008; Heinonen & Poikkijoki, 2005). Most economist agree that being an entrepreneur requires a certain level of skill or ability, at which some people are better than others. Literature on entrepreneurial determinants shows that the following determinants are important to the engagement in entrepreneurial activity.

- Social capital, or network. This network may include people whom may have more experience with a certain problem the entrepreneur is facing, which makes it more likely the enterprise will survive (Parker, 2009, pp. 119-121; Davidsson & Honig, 2003).
- Human capital, the level of knowledge or total expertise of the working force of a business. A higher level of human capital will make the business more likely to survive (Walter & Heinrichs, 2015; Davidsson & Honig, 2003).
- Financial capital, the total stock of resources used in the business operations (Walter & Heinrichs, 2015).

Generally, older people have gained more knowledge and experience over the years than younger people. Older people also have had more time to build and maintain their network, In addition, older people generally have more accumulated wealth (Parker, 2009). These three statements might let one presume that older people have a higher probability to become entrepreneurs. However, counter arguments also exist. On average, older people are more risk-averse than their younger counterparts (Parker, 2009). Here for older people will be less likely to engage in risky entrepreneurial activities. A second counter argument comes from the fact that younger entrepreneurs have more time to receive and benefit from their returns on (entry) investments. Having less time to benefit from the higher returns, makes older entrepreneurs less willing to enter and invest in risky entrepreneurial activity (Parker, 2009).

When considering all arguments, it is possible to assume entrepreneurial activity is positively correlated with age up to a certain age. After this threshold, which is believed to be between 35 and 45 (Parker, 2009), the probability of entrepreneurial activity of the individual marginally drops (Levesque & Minniti, 2006). The effect of age on entrepreneurial activity is thus believed to be of a concave parabolic shape (Lévesque & Minniti, 2011) .

The performance of the entrepreneur also depends on these different types of capital (Markman & Baron, 2000; Honig, 1998; Cooper, Woo, & Gimeno-Gascon, 1994). It is believed that young entrepreneurs have less social, financial and human capital (Lorrain & Raymond, 1991; van Praag M. , 2003). For young entrepreneurs to make the decision to become entrepreneurs other factors need to be more significantly present. The perception of business opportunities could be more important for young entrepreneurs (Reynolds & Curtin, 2011, p. 134).

In order to investigate this further, this thesis will use 4 perception determinants to check for differences across age groups. Because the determinants are perception based, they can be used as measures for social capital. Knowing another entrepreneur (*knowent*) will be used as a proxy for social capital. Knowing another entrepreneur has been used in other studies before (Arenius & Minniti, 2005). The perception of business opportunities (*opport*) will be used as second determinant. The perception of business opportunities has also been used in other researches before (Arenius & Minniti, 2005; Linan, 2008). The

third determinant is the perception of one's entrepreneurial knowledge (*suskill*), which will be used as a proxy for human capital. The perception fear of business failure (*fearfail*) is the fourth determinant added in the analysis, which has also been used in the research by Arenius and Minniti.

The analysis in this thesis is of an exploratory nature. The expected outcome of the analysis is that the *knowent*, *opport*, *fearfail* and *suskill* determinants will have a significant effect on the Early-stage entrepreneurial activity of an individual. However this thesis will explore deeper on this effect by analyzing the determinants for different age groups. The expected outcome is that the impact of the different determinant effects will decrease with age. As it is believed that perceptions are more important for younger entrepreneurs than for their older counterparts.

4. Data

4.1 DESCRIPTIVE INTRODUCTION OF THE DATA

The data used in the analysis of this thesis were retrieved from the GEM Consortium website. The GEM annually collects data on entrepreneurial activity and intentions. The data retrieved is from the year 2011, as this is the latest data set available on the website. The data is globally collected data with a total of 162.724 individual respondents from 55 different economies across the globe (Kelley, Singer, & Herrington, 2011). A full frequency list per country can be found in appendix table 1. After eliminating all of the missing or blank variables in the dataset, 81435 useable individual responses were included in the analysis.

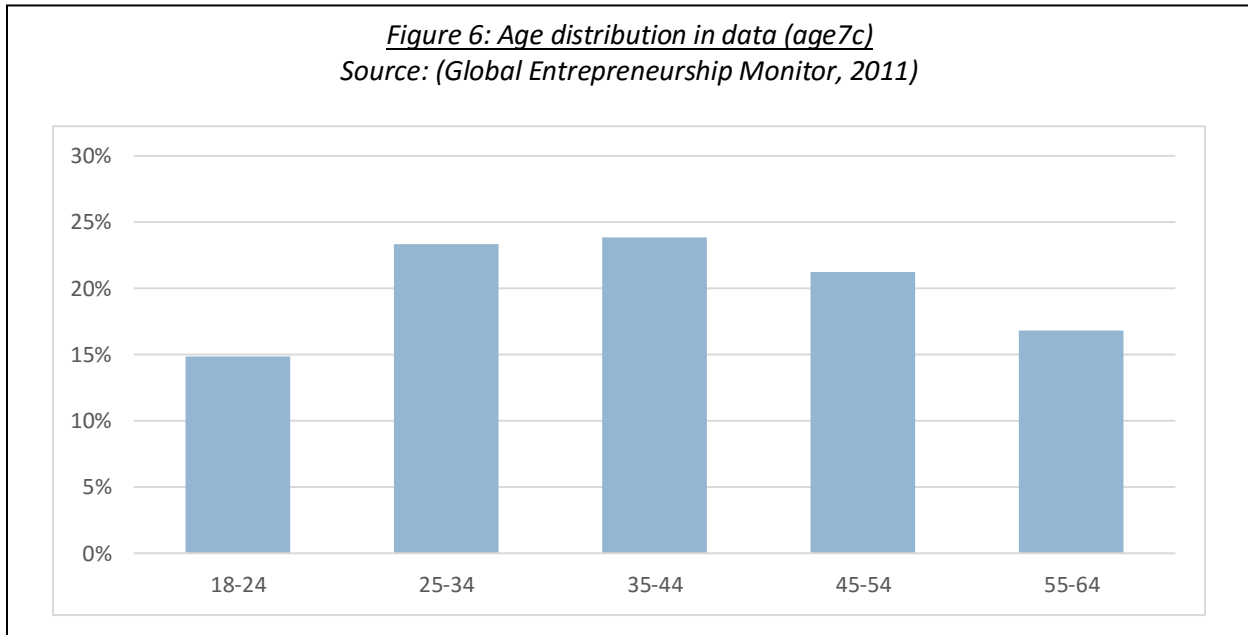
Table 5 below shows all the variables and their coding included in the analysis. First the dependent variable, TEA is shown. Subsequently, the 4 determinants *knowent*, *opport*, *fearfail* and *suskill* are shown. *Age* is the variable used for the age group classification of the individuals. The last 3 variables are used as control variables in the analysis. A coding overview for the countries can be found in appendix table 1.

Table 5: Included variables in analysis
Source: (Global Entrepreneurship Monitor, 2011)

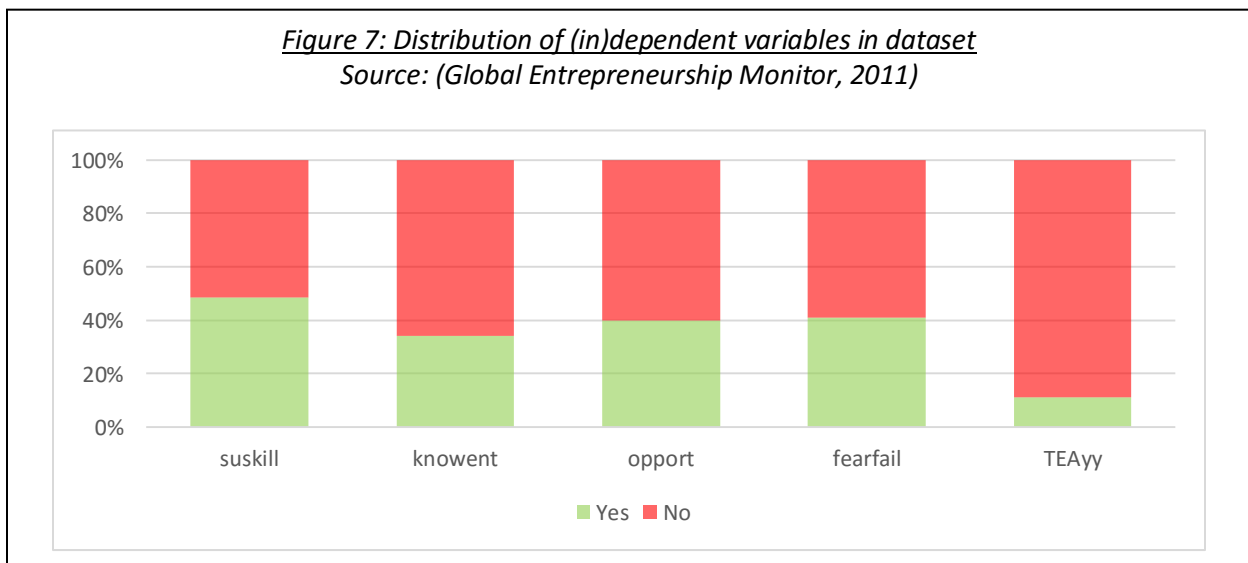
Variable code	Values				
<i>TEA</i>	[Yes] (1)		[No] (0)		
<i>knowent</i>	[Yes] (1)		[No] (0)		
<i>opport</i>	[Yes] (1)		[No] (0)		
<i>fearfail</i>	[Yes] (1)		[No] (0)		
<i>suskill</i>	[Yes] (1)		[No] (0)		
<i>age</i>	[18-24] (2)	[25-34] (3)	[35-44] (4)	[45-54] (5)	[55-64] (6)
<i>country</i>	See appendix figure 1 for coding overview				
<i>gemeduc</i>	[None] (1)	[Some secondary] (111)	[Secondary degree] (1212)	[Post-secondary] (1316)	[Grad Exp] (1720)
<i>gender</i>	[Male] (1)		[Female] (2)		

4.2 VARIABLE DISTRIBUTIONS IN THE DATASET

The analysis in this thesis is mostly dependent on the distribution of the different age groups in the dataset. Figure 6 below shows the distribution of the age categories as a percentage of the total population in the data set.

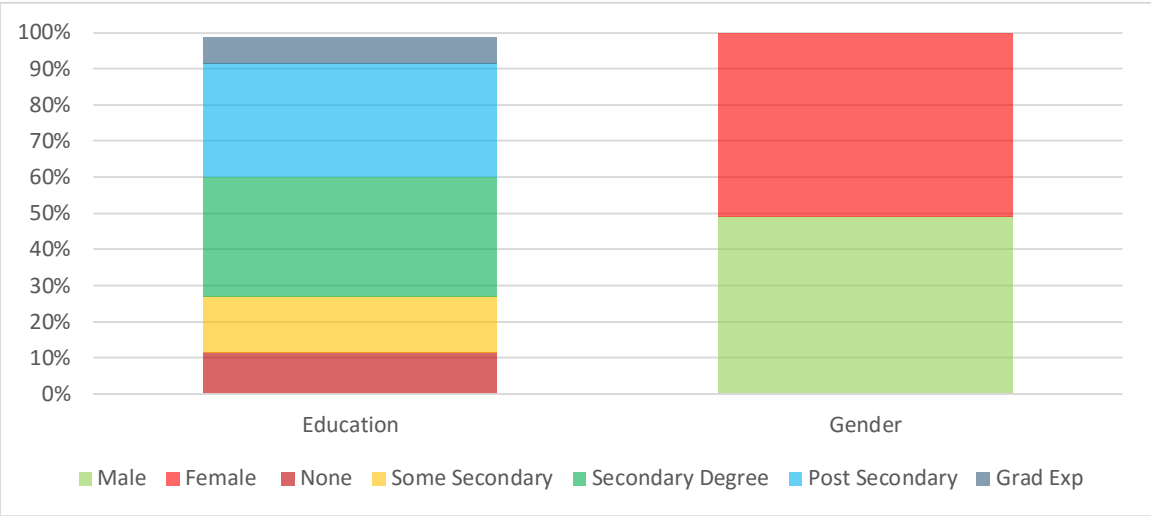


In figure 7 an overview of all responses on the different included variables is given in a single figure. The respondents that have one or more blank and or missing variables will be excluded in the analysis. In the dataset, 11% of the respondents have answered yes to the question whether they were active in Early-stage entrepreneurship. By categorizing them by age and running logistic regressions with the other response variables, conclusions can be drawn on the differences in the determinants of these entrepreneurs across the different age groups.



In figure 8 an overview of the distribution of the control variables is given. It can be seen that male and female are evenly represented. 49% of the data population is male, 51% is female. Most of the respondents (33%) in the data set have a secondary degree. However 31% of the population also has a post-secondary degree. 7% of the data set population has graduate experience.

Figure 8: Distribution of the control variables in dataset
Source: (Global Entrepreneurship Monitor, 2011)



5. Methodology

5.1 MODEL INTRODUCTION

TEA is the dependent variable in the analysis. *knowent*, *opport*, *fearfail* and *suskill* are the variables of interest, they will be used as independent variables in the regression. Age will be used to define the different age categories in the data set. The education, country and gender variables will be used as control variables. The country variable controls for country-specific influences on TEA. The education variable will be used in order to control for the effect that different levels of education have on TEA. The gender variable will be used in order to control for the differences in the level of entrepreneurial activity between men and women.

Due to the dichotomous¹ nature of the dependent variable, a binary logit regression of the following form will be used in the analysis:

$$(1) \text{ Logit } (P) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots \beta_k X_k$$

5.2 ESTIMATION STRATEGY

The general form of the logistic regression has been adjusted such that it can be used in our analysis. First, the dataset will be divided across the 5 different age groups. The following binary logit regression will be run for the 5 different age groups independently in order to clearly see the differences in the coefficients for the different groups:

$$(2) \text{ Logit } (P) = \alpha + \beta_1 \text{knowent} + \beta_2 \text{opport} + \beta_3 \text{fearfail} + \beta_4 \text{suskill} + \sum_{i=2}^{i=55} \omega_i \text{country}_i + \gamma_2 \text{gender} + \sum_{j=2}^{j=5} \varphi_j \text{gemeduc}_j$$

$$(2.1) \text{ country}_i = \begin{cases} i = 2 \text{ for Russia}^2 \\ \dots \\ i = 55 \text{ for UAE} \end{cases} \text{ with the US as reference}$$

$$(2.2) \text{ gemeduc}_j = \begin{cases} j = 2 \text{ for Some secondary} \\ j = 3 \text{ for Secondary degree} \\ j = 4 \text{ for Post secondary} \\ j = 5 \text{ for Grad exp} \end{cases} \text{ with none as reference}$$

¹ Variable with only two possible outcomes.

² For full list see appendix figure 1

After those 5 regressions have been run, a more formal model will be used. This model will allow for age differences in the population by introducing two-way interaction terms. The interaction terms will be included in the age category variable and in the 4 different determinant variables.

In order to better interpret the result of the regressions, the determinants will be graphically drawn with age on the horizontal axis. By doing this, the age effect on or difference between age categories can be easily seen and compared.

6. Results

6.1 BINARY LOGISTIC REGRESSION OUTPUT PER AGE GROUP

First a regression will be run for the entire dataset, it includes all individuals aging 18-64. In this regression the age variable will be added as categorical factor variable. Afterwards the 5 different binary regressions will be run for the 5 different age groups in the data set. Missing and blank responses have been eliminated from the analysis. The coefficients and their standard deviations of the 5 different regressions can be found on the next page in table 9. The standard errors have been given between parentheses.

The results of the 5 regressions will be discussed afterwards. A discussion and interpretation of each variable will be given. A marginal probability percentage calculated from the linear combination of coefficients and variables will also be stated for each variable. This marginal percentage indicates the change in the probability of an individual being an entrepreneur when the determinant is present. The marginal probabilities have been calculated using the following formula (Williams, 2015, p. 8):

$$(3) \text{ marginal effect} = \beta_k * \bar{x} * (1 - \bar{x})$$

$$(3.1) \beta_k = \text{coefficient of variable of interest}$$

$$(3.2) \bar{x} = P(Y = 1)$$

Where \bar{x} is the sample average of the dependent variable. This is the actual number of "1's" for TEA in the dataset. In this analysis the number is approximately 11%, see section 4.2.

Finally, a comparison will be drawn between the different age groups to see if there are differences between the effects of the independent variables on the dependent variable. In appendix figure 2, the independent variables are graphically plotted against age for a clearer interpretation.

Figure 9: Logit regression beta coefficients per age category
Using: formula 2

	18-64	18-24	25-34	35-44	45-54	55-64
Threshold	-3.294 (0.456)	-1.827 (1.399)	-3.022 (0.171)	-3.494 (1.091)	-3.399 (0.806)	-3.887 (0.797)
knowent	0.871*** (0.026)	0.946*** (0.073)	0.879*** (0.050)	0.867*** (0.050)	0.803*** (0.060)	0.920*** (0.085)
opport	0.442*** (0.027)	0.383*** (0.073)	0.483*** (0.050)	0.480*** (0.051)	0.395*** (0.062)	0.358*** (0.088)
fearfail	-0.380*** (0.028)	-0.373*** (0.079)	-0.473*** (0.052)	-0.385*** (0.052)	-0.353*** (0.063)	-0.192** (0.090)
suskill	1.415*** (0.032)	1.541*** (0.082)	1.346*** (0.060)	1.351*** (0.061)	1.448*** (0.075)	1.486*** (0.104)
Age7c (18-24)	Reference category					
Age7c (25-34)	0.343*** (0.042)					
Age7c (35-44)	0.284*** (0.042)					
Age7c (45-54)	0.056 (0.045)					
Age7c (54-64)	-0.349*** (0.054)					
gender (male)	Reference category					
gender (female)	-0.226*** (0.026)	-0.311*** (0.071)	-0.309*** (0.048)	-0.221*** (0.048)	-0.074 (0.058)	-0.177** (0.084)
GEMEDUC (none)	Reference category					
GEMEDUC (Some Secondary)	-0.114* (0.059)	-1.131 (0.227)	-0.353*** (0.124)	0.097 (0.118)	-0.133 (0.118)	-0.164 (0.153)
GEMEDUC (Secondary degree)	-0.088 (0.054)	-0.215 (0.214)	-0.352*** (0.115)	0.102 (0.109)	0.003 (0.107)	-0.002 (0.134)
GEMEDUC (Post-Secondary)	0.018 (0.054)	0.044 (0.221)	-0.252** (0.115)	0.153 (0.109)	0.112 (0.108)	0.172 (0.134)
GEMEDUC (Grad Exp)	0.027 (0.070)	0.058 (0.299)	-0.259* (0.138)	0.126 (0.133)	0.254* (0.145)	0.118 (0.202)
country	See appendix figure 1					
Nagelkerke R²	0.234	0.245	0.244	0.221	0.213	0.224
No. observations	81435	12191	19243	19579	17103	13319

*** Significant at 1%, **Significant at 5%, *Significant at 10%

6.1.1 THRESHOLD (α)

The constant can be interpreted as the general predilection or aversion towards participation in the total early-stage entrepreneurial activity. The overall effect is significantly negative which is coherent with other research studies on this topic (Global Entrepreneurship Monitor, 2011, p. 17). Another interesting finding is that on average the 18-24 age group is without considering the other variables relatively the most likely to be entrepreneurially active, which is again coherent with what the GEM study found (Global Entrepreneurship Monitor, 2011).

6.1.2 KNOWENT (β_1).

The question asked in the survey to obtain responses for this variable is the following: Do you know someone personally who started a business in the past 2 years? For individuals that answered yes, a 1 was recorded. For individuals that answered no, a 0 was recorded.

The variable *Knowent* has a very significant positive correlation with the dependent variable. On average it increases the probability of one being an entrepreneur by 8 percentage points ($\beta = 0.871$) *ceteris paribus*. This seems coherent with other studies that show that having a good entrepreneurial networking can benefit entrepreneurial intentions and success (Honig, 1998; Davidsson & Honig, 2003). It seems that the effect is decreasing with age, apart from the last category. This will be more thoroughly tested in the regression with interaction terms. All coefficients are significant at the 1% level.

6.1.3 OPPORT (β_2)

The question asked in the survey to obtain responses for this variable is the following: In the next six months, will there be good opportunities for starting a business in the area where you live? For individuals that answered yes, a 1 was recorded. For individuals that answered no, a 0 was recorded.

All of the outcomes were significant at a 1% level. The variable showed positive influence on the probability of being engaged in TEA by 4 to 5 percentage points across the different age categories ($0.358 < \beta < 0.483$) *ceteris paribus*. The effect seems to be particularly present in the third and fourth (25-44) age group.

6.1.4 FEARFAIL (β_3)

The question asked in the survey to obtain responses for this variable is the following: Would fear of failure prevent you from starting a business? For individuals that answered yes, a 1 was recorded. For individuals that answered no, a 0 was recorded.

Fearfail has a clear and significant negative effect on the dependent variable. All of the outcomes are significant at the 1% level. The probability effect varies between -2 and -5 percentage points ($-0.473 < \beta < -0.192$). Older people seem to be less affected by the fear of failure when deciding whether or not to become entrepreneurially active. Middle aged individuals seem to be the most affected by the fear of failure effect.

6.1.5 SUSKILL (β_4)

The question asked in the survey to obtain responses for this variable is the following: Do you have the knowledge, skill and experience required to start a new business? For individuals that answered yes, a 1 was recorded. For individuals that answered no, a 0 was recorded.

The variable *Suskill* is positively associated with the dependent variable and the effect seems to be constant with age. This yields that having the knowledge, skill and experience required for starting a new business has a positive effect on one becoming an entrepreneur. The effect is especially large on the youngest group, 18-24. Here the effect of having knowledge, skill and experience increases the probability of being an entrepreneur by 15 percentage points ($\beta = 1.541$) *ceteris paribus*. All of the outcomes are significant at a 1% level.

6.2 INTERACTION EFFECT

In order to more formally test for the differences in the determinants across the age groups, a second type of logit regression will be run. This regression is a more official test for significant differences across the age groups. The coefficient output of the binary logistic regression with the interaction terms between age and the relevant independent variables can be seen in table 10 on the next page.

In the logistic regression with interaction effect, the coefficients of all determinants are significant for the youngest age category. The directions of the determinant effects on the independent variable remained unchanged as compared to the previous regression without interaction. The reference category is the youngest age category. From the betas of the interaction terms, the difference between the particular age group and the youngest group can be observed. However from table 10, it can be seen that there are no significant differences between the interactions terms of each age category and the determinants.

6.3 OTHER VARIABLES

The same regression has also been run for a dependent variable which contrasts paid employment to TEA. The variable used does not consider any other types of employment. This regression gave the same results as when TEA was used as dependent variable. Age has also been analyzed as a continuous variable, rather than a categorical variable. In this particular regression the interaction terms turned out to be insignificant, coherent with the results in table 10.

Table 10: Logit regression beta coefficients with interaction effect
Using: formula 2

		18-64	
Threshold	-3.344 (0.461)	<i>fearfail * Age7c</i> (18-24)	Reference category
<i>knowent</i>	0.943*** (0.071)	<i>fearfail * Age7c</i> (25-34)	-0.055 (0.091)
<i>opport</i>	0.347*** (0.070)	<i>fearfail * Age7c</i> (35-44)	0.011 (0.092)
<i>fearfail</i>	-0.387*** (0.077)	<i>fearfail * Age7c</i> (45-54)	0.016 (0.098)
<i>suskill</i>	1.510*** (0.079)	<i>fearfail * Age7c</i> (55-64)	0.156 (0.116)
<i>Age7c</i> (18-24)	Reference category	<i>suskill * Age7c</i> (18-24)	Reference category
<i>Age7c</i> (25-34)	0.421*** (0.105)	<i>suskill * Age7c</i> (25-34)	-0.123 (0.098)
<i>Age7c</i> (35-44)	0.378*** (0.105)	<i>suskill * Age7c</i> (35-44)	-0.143 (0.099)
<i>Age7c</i> (45-54)	0.150 (0.113)	<i>suskill * Age7c</i> (45-54)	-0.106 (0.107)
<i>Age7c</i> (55-64)	-0.440*** (0.133)	<i>suskill * Age7c</i> (55-64)	-0.012 (0.128)
<i>Knowent * Age7c</i> (18-24)	Reference category	<i>gender</i> (male)	Reference category
<i>Knowent * Age7c</i> (25-34)	-0.084 (0.085)	<i>gender</i> (female)	-0.226 (0.026)
<i>Knowent * Age7c</i> (35-44)	-0.069 (0.086)	GEMEDUC (none)	Reference category
<i>Knowent * Age7c</i> (45-54)	-0.136 (0.091)	GEMEDUC (Some Secondary)	-0.111*** (0.059)
<i>Knowent * Age7c</i> (55-64)	-0.013 (0.108)	GEMEDUC (Secondary degree)	-0.086* (0.054)
<i>opport * Age7c</i> (18-24)	Reference category	GEMEDUC (Post-Secondary)	0.019 (0.054)
<i>opport * Age7c</i> (25-34)	0.143* (0.085)	GEMEDUC (Grad Exp)	0.031 (0.070)
<i>opport * Age7c</i> (35-44)	0.089 (0.085)	country	See appendix figure 1
<i>opport * Age7c</i> (45-54)	0.098 (0.091)		
<i>opport * Age7c</i> (55-64)	0.107 (0.108)		
Nagelkerke R²	0.234		
No. observations	81435		

*** Significant at 1%, **Significant at 5%, *Significant at 10%

7. Conclusion

7.1 CONCLUSION ON DETERMINANT EFFECTS

The dependent variable in the analysis used is TEA, this variable takes the value “1” when an individual is active in total early-stage entrepreneurship. The variable takes the value “0” in all other cases, for example: unemployed, wage-work, student, unable to work. This differs from models that use the occupational choice theory. These models generally compare entrepreneurs to wage-workers.

The general conclusion to this thesis can be given by the fact that all four of the determinants posed in this thesis have been found to be of significant influence on the dependent variable in the two logit regressions. Figure 11 shows the marginal age-independent probabilities of the four determinants. These probabilities were calculated using the betas found in the more formal regression using formula 4.

Figure 11: Marginal (age-independent) probability effects

<i>knowent</i>	<i>opport</i>	<i>fearfail</i>	<i>suskill</i>
8%	4%	-2%	15%

This thesis was however not only interested in the age-independent effect of the four determinants posed, but moreover interested in the age-dependent effects. After running individual regressions for each of the 5 age groups, a more formal analysis was done on the age-dependent determinant effects. All age-effects were found to be insignificant, which differs from the pre-analysis expectations. It was expected that both the age-dependent as the age-independent effect would be significant.

The main purpose of this thesis was to check for differences in the determinants of entrepreneurship for different age groups or ages. In order to do this, a research question was posed. The answer to this research question of *to what extent do individual determinants of entrepreneurs differ across age groups?* Neither of the four determinants posed in the thesis have an age-dependent probability effect. The answer to the research question posed, thus is that the individual determinants of entrepreneurs do not differ significantly.

8. Limitations & Future research

8.1 LIMITATIONS OF THE RESEARCH

This research found significant correlations between certain determinants and the level of activity in early-stage entrepreneurship. However, it cannot simply be stated that the level of activity follows from these significant determinants. This is due to a potential time order problem. It cannot be said with certainty that the determinants pre-follow the dependent variable. Maybe one knows another individual that has started a business less than 2 years ago only after one has started a business him or herself. This causes a potential time order problem, which limits the ability to draw causal conclusions (Reiss, 2013).

This research controlled for the effect that gender, education level and country of origin have on early-stage entrepreneurial activity. However, it might be the case that there are other variables that play a role in the effects of the determinants on the dependent variable. If such variables exist, it should be controlled for by means of control variables in the binary logistic regression.

8.2 RECOMMENDATIONS FOR FUTURE RESEARCH

This research has only focused on four determinants. However, research on age differences in entrepreneurial determinants can be expanded. This can be done by increasing the amount of different determinants and testing whether these new determinants have significant effects. When doing this, one should check whether insignificant (age-dependent) determinant effects found in this analysis remain insignificant in the newly created regressions. An example could be to look at financial capital or motivation of entrepreneurs (opportunity vs necessity) (Honig, 1998; Singer, Amorós, & Moska, 2014).

Another recommendation for future research is to look at a different measure of the dependent variable. This thesis used early-stage entrepreneurial involvement, which is defined by actively starting or owning a business which is younger than 3.5 years old. However, there are multiple proxies used for entrepreneurship. One could for example look at business owners and managers in general or make a selection based on the size of the company.

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10. Appendix

10.1 APPENDIX FIGURE 1: COUNTRY DATA

Country	Descriptive		Without interaction						Interaction	
	Frequency	Percent	18-64	18-24	25-34	35-44	45-54	55-64	18-64	
1. United States	5863	3,6	Reference category							
2. Russia	7500	4,6	-,605	-2,156	-18,180	-,336	-,979	-1,439	,673	
3. South Africa	3178	2,0	,181	-1,524	-,202	,586	-,137	-,026	-,109	
4. Greece	2000	1,2	,128	-1,585	,303	,566	-,631	,179	,641	
5. Netherlands	3500	2,2	-,950	-20,463	,368	-18,502	-1,032	-18,610	,617	
6. Belgium	1852	1,1	-,285	-2,111	-,225	,054	-,647	-,782	-,521	
7. France	2009	1,2	-,477	-2,241	,293	-,294	-,804	-,932	,217	
8. Spain	17500	10,8	-,326	-1,815	,042	,003	-,065	-,857	,035	
9. Hungary	2002	1,2	-,037	-1,396	,017	,250	-20,094	-,627	,163	
10. Romania	2028	1,2	-19,011	-1,080	-,036	-,414	-,043	-16,963	,460	
11. Switzerland	2000	1,2	-,205	-1,472	-18,727	,122	-,530	-,287	-18,501	
12. United Kingdom	2000	1,2	-,164	-1,938	-,253	-,256	-,830	-,335	,297	
13. Denmark	2015	1,2	-,595	-2,140	,208	-,439	-,709	-,915	,368	
14. Sweden	3101	1,9	-,550	-2,802	-,411	,050	-,411	-,317	-,072	
15. Norway	2001	1,2	-,277	-1,207	-,526	-,007	-18,829	-,148	,005	
16. Poland	2000	1,2	-19,304	-,742	-,172	,435	-,444	-,595	,240	
17. Germany	4260	2,6	-,212	-2,009	-19,745	,121	,173	-19,199	-18,931	
18. Peru	2010	1,2	,153	-,762	,087	,993	-,437	-,295	,324	
19. Mexico	2511	1,5	-,187	-,618	,325	-20,068	,736	,991	,700	
20. Argentina	2000	1,2	,899	-2,235	,013	1,175	-19,612	1,081	,286	
21. Brazil	2000	1,2	-19,728	-1,252	1,152	-,250	,771	-,393	1,395	
22. Chile	7195	4,4	1,070	-,485	1,390	,796	-,664	,885	-19,310	
23. Colombia	10374	6,4	-,517	-3,198	-,533	-,045	-19,256	-,699	1,549	
24. Malaysia	2053	1,3	-,029	-,475	-18,490	1,180	,056	,946	-,049	
25. Australia	2000	1,2	,196	-1,441	,651	-17,220	1,031	-16,959	,545	
26. Singapore	2000	1,2	1,152	,274	1,491	,684	-18,012	,827	,648	
27. Thailand	2000	1,2	-17,535	-1,486	-17,718	1,223	,361	1,073	1,630	
28. Japan	2004	1,2	,379	-2,178	,300	,560	,798	-,323	-17,039	
29. South Korea	2001	1,2	1,078	-21,656	1,287	2,118	,325	-16,961	,854	
30. China	3690	2,3	,471	-2,302	,767	1,117	-18,661	-18,629	1,558	
31. Turkey	2401	1,5	1,594	-1,109	-18,489	-,058	-,542	-,590	,896	

Country	Descriptive		Without interaction						Interaction
	Frequency	Percent	18-64	18-24	25-34	35-44	45-54	55-64	18-64
32. Pakistan	2002	1,2	,099	-1,974	,432	,704	,844	22,509	2,026
33. Iran	3352	2,1	-,088	-,171	,363	-,138	-,560	-,103	,603
34. Algeria	3427	2,1	,920	-,735	1,207	,253	-,332	,212	,332
35. Nigeria	2080	1,3	-,310	-1,234	,048	-,045	-,409	-,756	1,239
36. Barbados	2928	1,8	,208	-2,158	,506	,536	,125	-,096	,189
37. Portugal	2011	1,2	-,295	-1,139	,065	,565	-,028	,050	,665
38. Ireland	2002	1,2	-,295	-,495	1,039	,193	-,498	,050	1,115
39. Finland	2011	1,2	,617	-,782	1,060	-,810	-1,510	-1,081	1,028
40. Lithuania	2003	1,2	,531	-,819	,362	,475	1,781	-18,504	,473
41. Latvia	2000	1,2	-,044	-1,800	-,698	-19,464	-18,048	-18,930	-,498
42. Croatia	2000	1,2	-1,008	-1,184	-19,006	2,264	-,270	-19,725	1,065
43. Slovenia	2009	1,2	,526	-2,422	-18,666	,697	,402	,884	-18,537
44. Bosnia and Herzegovina	2277	1,4	-19,137	-2,241	,344	,608	,143	,369	1,141
45. Czech Republic	2005	1,2	,727	-1,815	,777	,721	,202	,862	1,190
46. Slovakia	2000	1,2	,716	-1,396	1,185	,343	-,051	-,299	1,113
47. Guatemala	2398	1,5	,623	-1,080	,395	,195	-,084	,085	,998
48. Panama	2001	1,2	,537	-1,472	,355	-,528	-,759	-,258	,537
49. Venezuela	2000	1,2	,050	-1,938	,335	-,256	-,664	,885	,627
50. Uruguay	2074	1,3	,132	-2,140	-,253	-,439	-19,256	-,699	-,105
51. Trinidad and Tobago	2008	1,2	-,418	-2,802	,208	,050	,056	,946	,644
52. Jamaica	2047	1,3	-,517	-1,207	-,411	-,007	1,031	-16,959	,612
53. Bangladesh	2000	1,2	-,029	-,742	-,526	,122	-18,012	,827	-,521
54. Taiwan	2012	1,2	,196	-2,009	-,172	-,256	-,664	1,073	,213
55. United Arab Emirates	3029	1,9	1,152	-,762	-,253	-,439	-,409	1,031	,163
Total	162724	100							

10.2 APPENDIX FIGURE 2: VARIABLES OF BINARY LOGISTIC REGRESSION PLOTTED AGAINST AGE

