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Bachelor Thesis (Economics and Business economics)

The relationship between female entrepreneurship and economic performance; a cross country analysis

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Abstract

There is a large gender gap in entrepreneurship all around the world. Women are underrepresented in the entrepreneurial environment, even though existing literature fails to provide hard evidence on their 'lacking' performance. This paper aims to tackle this problem through finding causes of the gap and investigating what the relationship between female entrepreneurship and economic performance is. The main research question answered in this paper is: 'What is the effect of female entrepreneurship on economic performance?'. The analysis is done through random/fixed effects models on a panel dataset including data of 128 countries over the years 2013 until 2021. The results of this paper show that countries with equal laws for men and women and Muslim countries have higher shares of female entrepreneurs. GDP per capita is negatively related to the female share of entrepreneurs. The results on the relation of female entrepreneurs and economic performance show that female entrepreneurs positively affect GDP growth. However, they negatively affect innovation outcomes and positively affect unemployment rates. These findings indicate that the positive relation with GDP growth is not caused by their impact on innovation and unemployment. The results were similar for men, but male entrepreneurs have a worse impact on unemployment rates. The impact of male and female entrepreneurs are not so different after all.

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I.   Introduction

Entrepreneurs in general have been studied extensively. In multiple studies entrepreneurs have a positive effect on economic performance. A long standing theory of Schumpeter (1934) explains that entrepreneurs enhance economic performance through creative destruction. Entrepreneurs outproduce each other by innovative ideas, where only the best businesses survive the competition. Having the best performing businesses makes an economy grow. High growth potential entrepreneurship is found to be the type of entrepreneurship that has the most impact on economic growth as well as new job creation based on data of mostly European countries (Wong, Ho & Autio, 2005). The reason for this is that high growth firms need more workers in order to keep pace with the growth as well as they earn much money through their booming business which stimulates GDP growth. Wennekers & Thurik (1999) found that an increase in entrepreneurial activity tends to result in a higher growth rate of the economy and it decreases unemployment.

Even though literature on entrepreneurship is extensive, only 10% of the research in this field is about female entrepreneurship (Brush & Cooper, 2012). This is not in line with the latest trend on female entrepreneurship since engaging in entrepreneurial activities is becoming more popular among females. The global average female total early-stage entrepreneurial activity (TEA) rate rose from 9.4% in 2019 to 10.4% in 2021 (GEM, 2021). TEA is the percentage of the 18-64 years population that is either a nascent entrepreneur or owner-manager of a new business. Even though it is becoming more popular, the percentage of female entrepreneurs still does not match the percentage of male entrepreneurs. Women often face struggles when starting up a business. They have less starting capital (Verheul & Thurik, 2001) and have to deal with negative stereotypes against them from the male community (Blair, 2002). Women also believe they lack the skills to start a business, which contributes to the gender gap well (Arenius & Minniti, 2005). These factors play a role in the lower share of female entrepreneurship. But what do we actually know about the impact that female entrepreneurs have on economic performance?

Looking at evidence from firms in Eastern Europe, Central Asia, Latin America and Sub-Saharan Africa, it shows that women owned businesses do not have lower overall sales revenue than men owned businesses (Bardasi, Sabarwal & Terrell, 2011). But there are more aspects of entrepreneurship performance indicators than just money related.
Many papers found a positive relationship between innovation levels within a country and its economic performance (Wong, Ho & Autio, 2005; Baumol & Strom, 2007; Audretsch, Keilbach & Lehmann, 2006). Innovation is the process of developing a new idea into a

product. Creativity is the process of creating new ideas which is the first step to innovation. Entrepreneurs that are creative also have higher innovation outcomes (Mylonas, Kyrgidou & Petridou, 2017). In their research on creativity among women in Greece, it is found that females that are creative are more likely to be entrepreneurs. Female entrepreneurs are generally very creative and therefore stimulate innovation which indirectly stimulates economic growth.

Unemployment is another indicator of economic performance. Having low unemployment rates results in a higher GDP since more people are working and making money. Job creation affects unemployment negatively (Mortensen & Pissarides, 1994; Moscarini & Postel-Vinay, 2012). Whenever there is a lot of job creation, there are more jobs for the unemployed to choose from. Female entrepreneurs contribute to job creation whenever they are setting up new businesses (Brush & Cooper, 2012). They create more jobs whenever their business grows. They also contribute to lower unemployment rates by being an entrepreneur instead of unemployed. Again, females are positively related to job creation which results in a higher GDP.

Female entrepreneurs seem to have a positive relationship with the economic performance of a country. However, these papers have only analyzed a specific set of countries. These papers do not represent the world's population and therefore do not have implications for a majority of the countries. Countries around the world have different economies as well as different entrepreneurship levels for both males and females. For instance in 2021, Poland had the lowest female TEA rate of 2.5% whereas the Dominican Republic had the highest with 44% (GEM, 2021). Since these levels have a high variance across the world, it is important to include a large number of countries that are representative for the whole world population. Literature until now has failed to do so and therefore there is a need to investigate the relationship of female entrepreneurs and economic performance with a recent dataset that is representative of the whole world. The main research question therefore is:

What is the relationship between female entrepreneurship and economic performance?

The answer to this research question will be investigated through quantitative analysis. In order to find an answer, the research question has to be broken down to smaller sub questions. The first question of interest is where: does the gender gap in entrepreneurship share come from? This will be analyzed by regressing multiple determinants of female entrepreneurship on the share of female entrepreneurship, based on prior literature. The determinants included in the regression are gender equality in laws, state size, GDP per capita and if a country has a majority of muslim inhabitants. Female labor force share is

added as a control variable. In the second part, the main research question will be analyzed. This will be done by answering three questions; What is the relationship between female entrepreneurship and GDP growth, innovation and unemployment? These three questions will be answered by doing a regression analysis for each question separately where GDP growth, innovation outcomes and unemployment will be the dependent variables respectively. The percentage of female entrepreneurs out of the total female labor force will be the independent variable in all three regressions. For each regression, appropriate control variables are added which follow from prior literature. The dataset contains 128 countries with data over the years 2013 until 2021. The dataset mostly contains data of the World Bank and the Global Innovation Index. The merging of these datasets and the limited data availability within both datasets resulted in the final selection of time frame and countries. Since it is a panel dataset, the best methods to use for such a wide range of countries are random and fixed effects. The appropriate model is found by doing a hausman test. Finally, the results will be discussed and a conclusion will be given.

A brief overview of all sections will be given: The next section describes the underlying theory out of which the hypotheses will arise. Section III explains the dataset and how it is constructed. Section IV describes the methods used for obtaining the results. Section V presents the results of the analysis. Section VI discusses the paper by giving implications of the results and explaining limitations. Section VII gives a conclusion.

II.   Theoretical framework

Understanding what the effects of entrepreneurship could be for an economy is an interesting research topic since it can be studied in multiple ways. Entrepreneurs can be studied through their characteristics, their effects on business level or how they influence economic performance indicators with their businesses. The literature on entrepreneurship as a whole therefore is significantly large. In the next part of this paper, an overview of the most important literature related to the main research question. The literature will mostly cover economically related studies and less firm specific and behavioral studies. The reason for this is that the aim of this paper is to find a relation between female entrepreneurs and economic performance on a country level. Economic performance is a term that covers all economically related factors that enhance the economy of a country, such as innovation, unemployment rates, GDP, export and import, inflation etc. Characteristics of an entrepreneur are not related to economic performance and therefore it covers only a small portion of the literature review.

Causes of the gender gap in entrepreneurship

Characteristics

One approach on identifying the reason for the gender gap in share of entrepreneurs is by looking at personal trait differences between male and female entrepreneurs. Male and female differ from each other biologically. This could be of influence on the performance of entrepreneurs since there are certain traits that characterize a typical entrepreneur. Bönte and Piegler (2013) for instance found that individuals who like to be in a competitive environment are more likely to start their own business. According to their study, women are less competitively inclined and show more risk aversion which results in less females starting their own business than men. This contributes significantly to the gender gap. Caliendo, Fossen, Kritikos and Wetter (2015) also found evidence showing that risk aversion is one of the most important traits that is causing the gender gap to be large. Entrepreneurs function in high risk high reward circumstances which could bring stress and pressure in uncertain times. Being an entrepreneur requires you to have the skill of being able to perform under this pressure and the willingness to undertake the risks that comes with decision making. The entrepreneurial intention of a person, which means how eager someone is to become an entrepreneur, is greatly influenced by this skill. Women are more risk averse in general (Bönte & Piegler, 2013), on average they will have less entrepreneurial intentions since less women have the skill to handle risky decisions and the stress that comes with being an entrepreneur compared to men. This makes women less likely to become entrepreneurs. This is one of the causes of the gender gap which is related to individual differences, the next part of this literature review will cover more societal and institutional factors.

Equality

Another approach is by looking at the social aspect of the stimulation of becoming an entrepreneur. Noguera, Alvarez and Urbano (2013) analyzed socio-cultural factors and found that factors such as gender roles and norms play an important role in the decision of women on becoming an entrepreneur. Fear of failure and perceived capabilities have the biggest effect on female entrepreneurs. Women often have perceived capability, thinking they do not have the skills to be an entrepreneur and therefore do not take the risk to become one. Marlow and McAdam (2013) investigated the socio-economic position between males and females. Their paper is built on the assertion that women are under-performing. Women owned businesses often face constrained performing, meaning that their business often stays classified as a small business. However, this is a problem for many small businesses and not gender specific. The authors state that there are ingrained gender

biases which make women seem under-performing entrepreneurs despite hard evidence. According to Markussen and Røed (2017), peers of the same gender have a greater peer effect on each other. Men look up to other men and women look up to other women. They found that half of the gender gap in early entrepreneurship intentions is explained by the differences between male and female peer groups. Male entrepreneurship share is higher than that of women, which means that men have more entrepreneurs as role models that they are influenced by. Their entrepreneurial intentions will therefore be higher through peer effects than their female counterparts which have less entrepreneurs as role models. Therefore it is likely that within countries that have a low share of female entrepreneurs, it will stay low since the men will be stimulated in becoming an entrepreneur more through the peer effects of other male entrepreneurs. Women have fewer entrepreneurs they will compare themselves with and therefore the gap does not close.

Minniti and Naudé (2010) analyzed determinants of female entrepreneurship and their findings also show the importance of socio-cultural factors. They also emphasize the impact that cultural attitudes towards women entrepreneurs can have on the amount of female entrepreneurs in a country. Developing countries typically have long standing traditions and cultural values, which results in a non-supportive environment for women with entrepreneurial intentions. These traditions often are represented in the laws of a country, such as laws on freedom to move outside without a husband or decision making within the household. Rules and regulations differ across countries and some countries have a less favorable environment to live in. This can be across different sectors such as workplace, pension, wages, entrepreneurship, gaining assets etc. The differences on how males and females are treated have an influence on the share of entrepreneurship. Vracheva and Stoyneva (2020) show a positive relationship between equality in economic participation and the share of female entrepreneurship. These results are based on a 89 country panel data set of countries from the Global Entrepreneurship Monitor (GEM) survey and the Global Gender Gap report between 2013 and 2016. Women are more likely to become an entrepreneur if they have equal rights in terms of setting up a business, getting support from the government or going to school. Women that have less rights than men are less likely to become an entrepreneur since they sometimes do not have the right to make decisions for themselves. This leads to the following hypothesis:

H1: Countries that have equal rights for men and women have a higher share of female entrepreneurs

State size

Institutions have a big role in the decision of becoming an entrepreneur (Urbano, Aparicio and Audretsch, 2019). Both formal and informal institutions have an impact on entrepreneurial intentions. Informal institutions are not written rules or laws, it is the culture, social rules and norms within a country which people tend to learn as they become older. They are country specific, some countries for example are very welcoming and people would share food with anybody, other countries are very stingy and people tend to care for themselves only. These cultures originated many decades ago and cannot be influenced by the government like formal institutions. This is because informal institutions do not change as fast as formal institutions since it is related to social norms and tradition which has to be changed by how people think and act in society. In certain cultures, it is socially accepted that the man has to have a job and the woman does the householding tasks. These social norms are not changeable very easily by institutions. However, formal institutions such as the government can affect society by implementing new rules or being very active to support minorities etc. Estrin and Tomasz (2011) found that the size of the state sector has a negative impact on entry for both men and women, but even more negative for women. Women are less likely to start doing entrepreneurial activities whenever the state sector is larger, even though the laws do not have gender-specific effects.This indicates that women would less likely start a business whenever the government is large within a country. According to Estrin and Tomasz (2011), a woman's entrepreneurial intentions are affected harder by large government than those of men. The reason for this is that females are more responsive to giving up their outside involvement for domestic work than males. When the state sector is small, women respond stronger to the incentive to gain additional income in order to provide services such as healthcare and education. When the state sector is large, those services are provided by the state and therefore less females feel the need to become an entrepreneur for extra income. Hereby the following hypothesis is formed, namely:

H2: Countries with a large state sector have a lower share of female entrepreneurs

Muslim countries

In certain countries, women are oppressed by people that follow cultural beliefs that are shaped by religion. Audretsch, Boente & Tamvada (2007) found that the Islam is conducive to entrepreneurship. Indicating that it is accepted in the muslim community and that people are supportive to entrepreneurs. Another remarkable aspect of the Islam is position of women within the Muslim community. According to surveys in Egypt, Palestine, Israel and Tunisia by Douki et al. (2003), at least one third of the women are beaten by her husband at

home. Often the justification for this is that the men follow God's commandments. However, the Koran does not justify these actions, which means that it is a result of culture rather than religion. Women are oppressed and have less rights than men in such countries and they deal with negative attitudes towards them. Multiple studies on muslim countries show negative attitudes towards women engaging in entrepreneurship. Holmen, Min & Saarelainen (2011) show that gender-specific problems for entrepreneurs in Afghanistan included limited market, mobility constraints, negative attitudes and lack of social acceptance for female entrepreneurs. Afghanistan is a country in which they follow the Muslim extremists rules in which women have almost no rights and freedom. Naguib & Jamali (2015) analyzed female entrepreneurship in the United Arab Emirates, another muslim country that has stricter rules for women. Although their findings seem to find a positive change in favor of women over the past time, there are still various traces of stereotypes and patriarchy which constrain the free expression of female entrepreneurs. El Harbi, Anderson & Mansour (2009) found that perceived social norms make females follow a more traditional path rather than becoming an entrepreneur. This evidence is from Tunisia, another muslim country. So even though it was found that the Islam is conducive to entrepreneurship, evidence of muslim countries show a different attitude towards female entrepreneurs. This would suggest that female entrepreneurship levels are lower in muslim countries. This leads to the following hypothesis.

H3: Countries with a majority of muslim inhabitants have a lower share of female entrepreneurs

GDP per capita

Minniti (2010) studied female entrepreneurship and found a relationship with GDP per capita. Low-income countries have the most entrepreneurs per 100 adults, which means that there are more female entrepreneurs in countries with low GDP per capita. Middle and lower income countries have the largest gender gap. High-income countries have a smaller gender gap. A potential explanation is that women in lower income countries are necessity driven entrepreneurs, which means that they engage in entrepreneurial activities because they need income to survive. Higher income countries often have more equal chances to become an entrepreneur for men and women. Also there are other jobs available that would provide enough wealth to survive which make entrepreneurship levels lower in high income countries. According to the results of Minniti (2010) women seem more prone to having low income and therefore engaging in entrepreneurial activities more than men. Brush & Cooper (2012) confirm the different types of entrepreneurs. Women in developed countries are more

likely to start a business out of opportunity motivation. Women in less developed countries are motivated by necessity. Women are triggered more than men by this necessity which results in more females becoming entrepreneurs relative to men. Hence, the gap in entrepreneurship is smaller for countries with low GDP per capita and larger for countries with high GDP per capita. The next hypothesis is:

H4: Countries with higher GDP per capita have a lower share of female entrepreneurs

(Female) Entrepreneurship and economic performance

GDP growth

Entrepreneurs in general have a big role in the economy of a country. Typically they thrive to have the best economic performance for their business which on itself fosters economic growth as a whole. A study by Minniti (2010) shows that the gender gap has a significant impact on the GDP growth of a country. GDP growth is an indicator for economic welfare. Whenever GDP growth is positive, it is assumed that a country is doing good economically. Brush and Brush (2006) state that women make significant contributions to wealth creation in all economies in the world. This can be partly explained by their positive impact on innovation outcomes and their negative relationship with unemployment rates. Both are indicators of economic performance and enhance GDP growth (Carree & Thurik, 2010; Wong, Ho & Autio, 2005; Mortensen and Pissarides, 1994; Moscarini and Postel-Vinay, 2012). These two indicators will be deeply discussed in the next two sections. A long standing theory on 'creative destruction' by Schumpeter (1934) states that economic growth is determined by competing businesses that outperform each other. Only the best performing businesses will survive the competition, which stimulates the GDP growth of a country. High competition is good for the economy, but there need to be enough competitors within a certain industry. Female and male entrepreneurs often focus on different sectors. Female entrepreneurs focus more on education and human health and social work activities with an average of 72% and 80% female participation rate, respectively. Male dominated sectors are manufacturing and construction with only 29% and 10% average female participation rate, respectively (Mroczek-Dąbrowska & Gaweł, 2020). Since women have lower shares of entrepreneurship, it is expected that in general there is less competition in sectors that are dominated by women then those dominated by men. Since both men and women often remain employed in sectors that are dominated by their own sex (Sappleton, 2009), having more female entrepreneurs will increase competition within female dominated sectors. This will make businesses try harder to outperform each other which results in a higher GDP.

Therefore it is expected that a higher percentage of female entrepreneurs will result in higher GDP growth through their impact on innovation, unemployment and their focus on different sectors than the sectors that are saturated by male entrepreneurs:.

H5: Countries with a higher percentage of female entrepreneurs of total labor force have higher GDP growth rates

Innovation

Economic performance is determined by multiple factors. Some of which are significantly affected by the input of entrepreneurs and the level of entrepreneurial activity in a country. Carree and Thurik (2010) for instance, found that entrepreneurs have a positive impact on economic performance and that this effect is the biggest for industries that are innovation driven. Innovation is also one of the main indicators of economic growth according to Wong, Ho and Autio (2005). Baumol and Strom (2007) also found that entrepreneurs who focus on innovation play a key role in economic growth. Innovation is becoming a bigger determinant as time goes by since the demand for innovative products is rising. Currently, every sector is searching for ways to optimize their processes and therefore the need for innovative ideas is as large. Innovation is a process of creating new things. The start of this process is having a creative way to solve a certain problem or optimizing your firm. Being creative enhances innovation outcomes (Mylonas, Kyrgidou & Petridou, 2017). Females are more likely to become entrepreneurs whenever they are creative. Since creativity is the start of innovation, it positively impacts the innovation outcomes of female entrepreneurs whenever they are creative. Creativity alone is not enough to be successful in the technology business. Entrepreneurs need to be educated as well in order to compete within the industry of innovation. According to Cai, Ma and Chen (2020), higher education is an 'engine' for innovation outcomes. Female entrepreneurs are often well educated and experienced (Maysami & Goby, 1999). Being creative and well educated enhances problem solving skills which is one of the key skills to have when operating in an innovative industry (Griffin & Guez, 2014).

Not only do entrepreneurs influence their own innovative idea, the ideas and knowledge they generate affects other entrepreneurs as well due to spillover effects (Aghion & Jaravel, 2015). Knowledge spillovers within a country widen the total innovation levels of a country since other firms cite each other patents. According to Lychagin, Pinkse, Slade and Reenen (2016), spillover effects are bigger when firms are located near each other. When entrepreneurship levels are high, innovation markets get denser and spillover effects will rise. Entrepreneurs who focus mainly on innovation are therefore very important. Brush and

Cooper (2012) also found that female entrepreneurs are indeed highly innovative. Thus whenever female entrepreneurship levels rise, the innovation outcomes of a country are positively affected:

H6: Countries with a higher percentage of female entrepreneurs have higher innovation outcomes

Unemployment

Lastly, job creation is very important for an economy. A fairly recent study by Audretsch, Keilbach and Lehmann (2006) finds positive effects of job creation on economic development. However, older research has already made ground for this evidence. Wennekers and Thurik (1999) found that job creation contributes to economic growth because when more people have a job, the GDP of a country grows. Job creation is highly affected by the level of entrepreneurial activities since entrepreneurs make new businesses which need new workers. Job creation is associated with unemployment. Both older and more recent studies of Mortensen and Pissarides (1994) and Moscarini and Postel-Vinay (2012) show that net job creation is negatively correlated with unemployment. Whenever job creation rates are lower than job destruction rates, higher unemployment levels will be the result. Unemployment is bad for an economy since whenever there is high unemployment rates in a country, this means that a big part of the workforce is not working and therefore lowering GDP. The theory of Okun's law predicts that 1% increase in unemployment generally results in a 2% drop of GDP. Several studies have investigated this phenomenon within different countries, such as Mohseni and Jouzaryan (2016), Akeju and Olanipekun (2014), Abdul-Khaliq, Soufan and Shihab (2014) all show a negative relationship between unemployment and economic growth. When entrepreneurs set up new businesses which create a lot of jobs, there will be less unemployment which stimulates economic growth. According to evidence from Brush and cooper (2012) and The GEM women's report by Allen, Elam, Langowitz and Dean (2007), Women make significant contributions to economies in terms of jobs because the more female entrepreneurs there are, the more businesses there are that create new jobs. This results in less unemployment so therefore female entrepreneurs should negatively affect unemployment. Also the direct effect of having more female entrepreneurs is that there are less women that are unemployed which contributes to lower unemployment rates. This results in the next hypothesis:

H7: Countries with a higher percentage of female entrepreneurs have lower unemployment rates

III.   Data

This paper aims to find out how female entrepreneurs affect economic performance on a country level. Countries differ a lot on rules and regulations, cultural values and institutions. Therefore female entrepreneurship levels differ a lot across countries since these factors play a role in the level of female entrepreneurship. Countries that are within the same region often have similar economies in comparison to countries that are on the other side of the world. For instance, European countries have certain rules that count for every country of the European Union. It is therefore chosen to analyze as many countries as the data availability allows in order to see how female entrepreneurs operate in these different countries. A panel dataset is made by merging two datasets of the world bank and the Global Innovation Index. Most data was retrieved from the world bank which has a lot of data that is publicly available. The variables that come from the World Bank are GDP growth, GDP per capita, self-employment levels, labor force participation rates, equality, unemployment, government effectiveness and the state size. This dataset is merged with data from the Global Innovation Index, which provides much data on innovation inputs and outputs. Examples of innovation inputs within a country are education, R&D expenditures or political environment. Innovation outputs include variables such as knowledge creation and tech export levels. Variables in the dataset that come from the Global Innovation index are the innovation outcome score and the R&D expenditure score. A last source is Wisevoter, which provides data on the percentage of muslim inhabitants within a country.

Countries differ a lot on rules and regulations, cultural values and institutions. These factors affect the way entrepreneurs function within an economy and share of female and male entrepreneurs. Countries within the same region are more similar to each other in comparison to countries that are on the other side of the world. For instance, European countries have certain rules that count for every country of the European Union. The aim was to have as many countries in the dataset and a recent time frame in order to see how female entrepreneurs operate in these different countries. The dataset contains 128 countries from all around the world. The time frame is 2013 until 2021. The variables from the world bank had data on almost every country and every year until 2021. The Global Innovation Index only had data on a select group of countries starting from 2013 onwards. The merging of these two dataset resulted in the final selection of countries and time frame.

Dependent variables

The dependent variable for testing hypothesis 1, 2, 3 and 4 is a measurement of the share of female entrepreneurs. The share of female entrepreneurs is measured by *the share of female self-employed:* It is the share of total self-employed workers within a country that is female, it is the measurement of entrepreneurs.

The dependent variable for testing hypothesis 5 is the *GDP growth:* It is the annual change in GDP since the previous year. It is the best measurement for economic performance since there is no need to control for any differences in economies between rich and poor countries.

The dependent variable for testing hypothesis 6 is the *Innovation output index:* It combines the score of a country on multiple different variables that all measure innovation outputs. Examples of innovation outputs that are measured are the amount of patents, technology exports, creation of new products. The score can range from 1 to 100, with 100 being the best.

The dependent variable for testing hypothesis 7 is the *unemployment rate:* It is the share of the labor force that has no job but is available and seeking employment.

Independent variables

Hypothesis 1: *Equality* is the score a country gets based on how equal the rights are for men and women. It is a weighted average score of multiple indicators on the sectors mobility, workplace, pay, marriage, parenthood, entrepreneurship, assets and pension. The scale is 1-100 with 100 meaning all rights are equal and a score below zero means that women have less rights than men.

Hypothesis 2: *State size* is measured by the total expenditures of the government as a percentage of GDP of a country.

Hypothesis 3: *Muslim* is a dummy variable for which 0 is countries that do not have a majority (under 50%) of muslim inhabitants and 1 for countries that do have a majority of muslim inhabitants (over 50%).

Hypothesis 4: *Log GDP per capita* is the logarithm of GDP per capita. GDP per capita is the GDP of a country divided by the number of people within that country. The log is taken to

account for skewness since GDP per capita differs a lot between rich and poor countries. Taking the log brings these values to a comparable scale.

Hypothesis 5, 6 & 7: *The percentage of female self-employed* is the percentage of the total female labor force that is self-employed instead of wage workers.

Control variables

Female labor force participation rate
Labor force participation is an important factor of the share of female entrepreneurship. Georgellis & Wall (2005) found that self-employment is a closer substitute for labor-market inactivity for women than for men. Therefore it should have an impact on the share of female entrepreneurs. A higher labor force participation reduces unemployment since more people are employed when the labor force participation is higher. Studies by Mohseni and Jouzaryan (2016), Akeju and Olanipekun (2014), Abdul-Khaliq, Soufan and Shihab (2014) all show that unemployment has a negative effect on economic performance. GDP per capita is a direct indicator of economic performance and it is expected to have a positive effect on the share of female entrepreneurs. Therefore, female labor force participation will be used as a control variable for in the analysis of hypothesis 4. It affects both the share of female entrepreneurs and the GDP per capita, which is one of the independent variables. It is measured as the females that are participating in the labor force as a percentage of total labor force.

Innovation & unemployment
Innovation outcomes and unemployment rates affect the GDP growth of a country. This is deeply discussed in the theoretical framework. GDP growth is the most rough indicator of economic performance and therefore these two variables need to be controlled for when estimating the relationship between female entrepreneurs and GDP growth for hypothesis 5.

Growth Competitiveness Index (GCI)
Every country differs on political structures, institutions and policies that foster economic growth. The World Economic Forum sets up a yearly Global Competitiveness Report (GCR) in which the objective is to combine these pillars and analyze them to see if a nation's economy is capable of being productive and is growing (McArthur & Sachs, 2002). The scores on these features are combined to a score that is called the Growth Competitiveness Index (GCI). It ranks the economies of countries by competitiveness and is based on the policies, institutions and factors that determine the level of productivity within a country. The

GCI shows how favorable an economy is to operate in since it shows which countries have institutions and policies that focus on economic growth, which is beneficial for entrepreneurs. The GCR measures productivity through efficient labor division, capital accumulation and technological advance (Stel, Carree & Thurik, 2005). The GCI is a good control variable when doing a regression on GDP growth and innovation outcomes which are tested in hypothesis 5 and 6. The GCR publishes the scores ranging from 1-7 but in this data the scores are multiplied so that the highest score is 100 to make the results comparable with indicators that have the same range to make interpreting the results easier.

R&D expenditures
Innovation is expensive and therefore it is needed to invest in research and development, also known as R&D. Bilbao-Osorio & Rodríguez-Pose (2004) found a positive association between R&D expenditures with innovation outcomes. Bogliacino & Pianta (2013) found that R&D expenditures stimulate innovation and profits in European industries. R&D expenditures therefore are a big determinant of innovation outcomes and will be controlled for in the regression of hypothesis 6. It is measured by a score

State size & Government effectiveness
Unemployment can partly be explained by the government. Government expenditures as measurement of the scope of the state sector has a positive effect on unemployment levels according to data from Egypt (Abouelfarag & Qutb, 2021). This is counterintuitive since one would expect that government expenditures are done to improve economic growth but an increase in unemployment generally is bad for economic growth. However, more studies by Nepram, Singh & Jaman (2021) and Feldmann (2010) done on this topic find similar results. Namely that every type of government expenditure, e.g. education or healthcare, results in higher unemployment results. Therefore there is a need to control for variables measure the size of the state and how efficiently this state uses their expenditures. This is done in the regression on unemployment when testing hypothesis 7. State size is measured by the total expenditures of the government as a percentage of GDP of a country. Government effectiveness is a score on the quality of policy making, implementation and commitment to such policies, on a scale of 1-100 where 100 is the highest.

Other variables
Although the goal of this paper is to analyze the relationship of female entrepreneurs with economic performance, the relationship of males with economic performance will also be included in the analysis to compare both genders. There are two ways in which women will be compared to men. The first is doing the same regression done to test hypothesis 5, 6 and

7 but then for the percentage of male self-employed instead of female. The second is by doing the same regression again but then for the female share of total self-employed, which is the relative measure of self-employed between the two genders. Therefore these variables are added:

The percentage of male self-employed: The percentage of the total male labor force that is self-employed instead of wage workers.

The share of female self-employed: The percentage of total self-employed workers within a country that is female.

Descriptive statistics

Table 3.1 shows descriptive statistics of the panel data set. The mean of the share of female self-employed is 37% which means that on average there are less female than male entrepreneurs. Unemployment levels range from 0.1 to 29 which means that there is quite a difference between some countries. Out of all the countries in this dataset, 23% has a majority of muslim inhabitants. Overall the variables are normally distributed since the mean and median are almost similar for each variable except for the percentage of female self-employed.

Table 3.1 Descriptive statistics

Variables	Mean	Median	Min	Max
Share of female self-employed (of total self-employment)	37.12	37.83	1.26	62.10
GDP growth	2.58	2.96	-9.94	9.97
Innovation	28.88	26.6	5.6	68.6
Unemployment	7.19	5.63	0.1	29.14
Equality score	78.00	81.25	26.25	100
State	16.28	16.24	4.40	36.14
Muslim	0.23	0	0	1
Log GDP per capita	8.89	8.83	5.38	11.80
Percentage female self-employed (of total female labor force)	37.12	26.47	0.03	98.23

Notes: The unit of measure for all variables is percentages, except for the log GDP per capita.

IV. Methodology

To analyze the panel data set, a fixed/random effects model will be used. These models will take into account all the variables that are unobserved for each country when doing a regression. As can be seen from the descriptive statistics, the countries can vary a lot on certain variables. A fixed/random effect model is capable of controlling for variables that are either observed or unobserved. This means that it is not needed to control for every variable that would affect the dependent variable in order to reduce omitted variable bias. For every hypothesis, the dependent, independent and control variables will be explained as well as which model is appropriate. The results of hypothesis 5, 6 and 7 will be compared to the relationship of male entrepreneurs with the dependent variables GDP growth, innovation and unemployment in order to see which gender has a better impact. This will be done by using the same model used for each hypothesis, but using male self-employment instead of female self-employment. Another regression is done but then using the female share of total self-employed to see if it is better for economic performance to have a high share of female or high share of male self-employed.

Hausman test

To decide which of the two models is appropriate to use for a certain regression, a hausman test is done. A hausman test compares the fixed and random effects model and gives a test statistic on which one fits better for the regression. The test does it by comparing the consistency and efficiency of the coefficients that are estimated by the fixed and random effects model. Consistent means that the coefficients of a model are getting preciser when the sample size increases. Efficient means that the coefficients of a model have minimum variance in comparison to the other model, which minimizes the differences between the estimated and the true value of a prediction. In order to gain the test statistic, a hypothesis is needed to see which model is optimal. The null and alternative hypotheses are:

H_0: *Both estimates are consistent, but Random Effects estimates are efficient*
H_a: *Fixed Effects estimates are consistent, but Random effects are not*

These hypotheses have to be tested for every regression that uses a fixed or random effects model. Appendix table A2 shows the test statistics and the appropriate model for each regression that will be done. When the test statistic is smaller than 0.05, the null hypothesis gets rejected which means that the fixed effects model is appropriate to use. If the test

statistic is less than 0.05, the null hypothesis cannot be rejected which means that the random effect model is appropriate.

Regression models

Hypothesis 1, 2, 3 and 4

In order to test hypothesis 1, 2, 3 and 4, a regression is done with the share of self-employed as the dependent variable. Gender equality, state size, muslim and log GDP per capita are the independent variables, respectively. Female share of labor force (LF) is added as a control variable as mentioned in the data. Year dummies are also added with 2013 as the reference year. The random effects model is as follows, where u is the country random effects:

Table 5.1   Female share of self-employed = $ß_0$ + $ß_1$*Equality + $ß_2$*State size + $ß_3$*Muslim +$ß_4$* Log GDP per capita + $ß_5$*Female share LF + $ß_6$*Year 2014 … $ß_{13}$*Year 2021 + u + ε

Hypothesis 5

For testing hypothesis 5, a regression is done where GDP growth is the dependent variable. The dependent variable is percentage female self-employed (SE) and innovation, unemployment and GCI are added as control variables. Year dummies are also added where 2013 is the reference year. The appropriate model for this regression is a random effects model. The model is as follows, where u is the country random effects:

Table 5.2(1)   GDP growth = $ß_0$ + $ß_1$*SE female + $ß_2$*Innovation + $ß_3$*Unemployment + $ß_4$*GCI + $ß_5$*Year 2014 … $ß_{12}$*Year 2021 + u + ε

The same regression is also done with the percentage of male self-employed and the share of female self-employed as independent variables instead of female self-employed to compare the relationship of both genders with GDP growth. The appropriate model for both regressions is the random effects model. The models are as follows, where u is the country random effects:

Table 5.2(2)   GDP growth = $ß_0$ + $ß_1$*SE male + $ß_2$*Innovation + $ß_3$*Unemployment + $ß_4$*GCI + $ß_5$*Year 2014 … $ß_{12}$*Year 2021 + u + ε

Table 5.2(3)   GDP growth = $ß_0$ + $ß_1$*Female share SE + $ß_2$*Innovation + $ß_3$*Unemployment + $ß_4$*GCI + $ß_5$*Year 2014 … $ß_{12}$*Year 2021 + u + ε

In order to test hypothesis 6, a regression is done where innovation outcomes is the dependent variable. The independent variable is female self-employed and the control variables added are R&D and GCI scores. Year dummies are also added with 2013 as the reference year. The appropriate model is random effects. The model is as follows, where u is the country random effects:

Table 5.3(1)   *Innovation = $ß_0$ + $ß_1$*SE female + $ß_2$*R&D + $ß_3$*GCI + $ß_4$*Year 2014 …*
$ß_{11}$*Year 2021 + u + ε

The same regression is also done with the percentage male self-employed and the share of female self-employed as independent variables instead of female self-employed to compare the relationship of both genders with GDP growth. The appropriate model for both regressions is the random effects model. The models are as follows, where u is the country random effects:

Table 5.3(2)   *Innovation = $ß_0$ + $ß_1$*SE male + $ß_2$*R&D + $ß_3$*GCI + $ß_4$*Year 2014 … $ß_{11}$*Year*
2021 + u + ε

Table 5.3(3)   *Innovation = $ß_0$ + $ß_1$*Female share SE+ $ß_2$*R&D + $ß_3$*GCI + $ß_4$*Year 2014 …*
$ß_{11}$*Year 2021 + u + ε

Hypothesis 7

For testing hypothesis 7, a regression is done where unemployment is the dependent variable. The independent variable is female self-employed and the control variables added are state size and government effectiveness. Year dummies are also added with 2013 as the reference year. The appropriate model is fixed effects model, where α is the country fixed effects:

Table 5.4(1)   *Unemployment = $ß_0$ + $ß_1$*SE female + $ß_2$*Sate + $ß_3$*Government + $ß_4$*Year*
2014 … $ß_{11}$*Year 2021+ α + ε

The same regression is also done with the percentage male self-employed and the share of female self-employed as independent variables instead of female self-employed to compare the relationship of both genders with GDP growth. A fixed effects model is appropriate for the model where male self-employed is the independent variable. A random effects model is appropriate for the model where female share of self-employed is the independent variable. The models are as follows, where α is the country fixed effects and u the country random effects:

Table 5.4(2)   *Unemployment = ß$_0$ + ß$_1$*SE male + ß$_2$*Sate + ß$_3$*Government + ß$_4$*Year 2014 … ß$_{11}$*Year 2021+ α + ε*

Table 5.4(3)   *Unemployment = ß$_0$ + ß$_1$*Female share SE + ß$_2$*Sate + ß$_3$*Government + ß$_4$*Year 2014 … ß$_{11}$*Year 2021+ u + ε*

V.   Results

The share of female entrepreneurs

Table 5.1 shows the results of the regression of the random effects model with the share of self-employed as the dependent variable. According to the R², this model can explain 68% of the variance in the data.
Hypothesis 1 states that countries with equal rights have a higher share of female entrepreneurs. As shown in table 5.1, the share of female self-employed goes up by 0.18% whenever the score on equality goes up by one. The more equal women are treated as men, the higher the female entrepreneur share. This effect is significant on the 5% level and therefore hypothesis 1 is accepted.

Hypothesis 2 states that countries with a large state sector have lower shares of female entrepreneurs. When looking at the results, the state size has a negative effect on the share of female entrepreneurs. However, the effect is not significant and therefore hypothesis 2 cannot be accepted. State size does not influence the share of female entrepreneurs.

According to hypothesis 3, countries that have a high percentage of muslim inhabitants should have a lower share of female entrepreneurs. The results show that countries with a majority of muslim inhabitants have a positive effect on the share of female entrepreneurs. Muslim countries have a 6.35% higher share of female entrepreneurs than countries that do not have a majority of muslim inhabitants. This effect is highly significant on the 1% level. Hypothesis 3 therefore is rejected, countries with a majority of muslim inhabitants have a higher share of female entrepreneurs.

The last hypothesis that is tested with this regression is hypothesis 4, which states that countries with a higher GDP per capita have a lower share of female entrepreneurs. The results show a negative association with the share of female entrepreneurs. Since it is a logarithmic variable of GDP per capita, it shows that a 1% increase in GDP per capita results in a 2.79 decrease of the share of female entrepreneurs. This means that a higher GDP per capita is associated with lower levels of female entrepreneurship. This effect is also highly

significant, which means that hypothesis 4 is accepted. GDP per capita has a negative effect on the share of female entrepreneurs.

Female labor force share has a positive relation with the share of female entrepreneurs. When the female labor force share goes up by one percent, the share of female entrepreneurs goes up by 0.92%. This effect is significant.

Table 5.1 Regression results on share of self-employed

Variable	Share of self-employed
	Female
Gender equality	0.18***
	(0.01)
State	-0.06
	(0.04)
Muslim	6.35***
	(1.40)
Log GDP per capita	-2.79***
	(0.27)
Female labor force share	0.92***
	(0.05)
Year	
2014	-0.22
	(0.21)
2015	-0.51**
	(0.22)
2016	-0.73***
	(0.22)
2017	-0.50**
	(0.22)
2018	-0.44**
	(0.22)
2019	-0.62***
	(0.22)
2020	-0.97***
	(0.23)
2021	-1.01***
	(0.23)
Constant	10.17***
	(3.50)
Country random effects	YES
Observations	1,152
R^2	0.68

*Notes: Standard deviations are in parentheses. Significance level indicated by ** for $p < 0.05$ and *** for $p < 0.01$.*

GDP growth

Table 5.2 shows the regression results of the random effects model with GDP growth as the dependent variable. Column 1 shows the effect of female entrepreneurship levels on GDP growth, column 2 shows that of their male counterparts and column 3 shows the effect of female share of total entrepreneurs. The R² shows that the models can explain 37%, 36% and 35% of the variance in the data respectively.

Hypothesis 5 states that countries with a higher percentage of female entrepreneurs have higher GDP growth rates. According to column one, the higher the percentage of female entrepreneurs, the higher the GDP growth. Female entrepreneurs have a significant positive effect on GDP growth. Therefore we can accept hypothesis five.

According to column 2, the percentage of male entrepreneurs has the same effect on GDP growth. However, column 3 shows that a higher share of female entrepreneurs positively affects GDP growth. Even though the percentage of both male and female entrepreneurs have positive effects on the GDP growth rate individually, A country with a higher share of female entrepreneurs on average has a higher GDP growth rate.

Furthermore, innovation outcomes and the GCI score do not have a significant effect on GDP growth. Unemployment levels have a significant negative effect on GDP growth in all three of the regression models. The year 2020 has a noticeable negative effect on the GDP growth and the year after corrects for it with a big positive effect on GDP growth. Both effects are significant on the one percent level in all three models.

Table 5.2 Regression results on GDP growth

Variable	GDP growth		
	(1)	(2)	(3)
Self-employed female %	0.03*** (0.01)		
Self-employed male %		0.03*** (0.01)	
Female share self-employed			0.03** (0.01)
Innovation	0.02 (0.02)	0.014 (0.02)	0.01 (0.02)
Unemployment	-0.08*** (0.02)	-0.09*** (0.02)	-0.11*** (0.02)
GCI	0.01 (0.02)	0.00 (0.02)	-0.03 (0.02)
Year			
2014	0.90** (0.35)	0.88** (0.35)	0.86** (0.35)
2015	0.49 (0.35)	0.46 (0.35)	0.42 (0.35)
2016	0.11 (0.36)	0.06 (0.35)	0.01 (0.35)
2017	0.71** (0.36)	0.65* (0.36)	0.57 (0.36)
2018	0.69* (0.36)	0.61* (0.36)	0.51 (0.36)
2019	0.14 (0.37)	0.05 (0.37)	-0.07 (0.37)
2020	-5.71*** (0.38)	-5.81*** (0.38)	-5.91*** (0.38)
2021	1.32*** (0.37)	1.23*** (0.37)	1.12*** (0.37)
Constant	1.02 (1.43)	1.86 (1.49)	4.52*** (1.32)
Country random effects	YES	YES	YES
Observations	1,152	1,152	1,152
R^2	0.37	0.36	0.35

Notes: Standard deviations are in parentheses. Significance level indicated by * for $p < 0.1$, ** for $p < 0.05$ and *** for $p < 0.01$.

Innovation outcomes

Table 5.3 shows the regression results of the random effects models with innovation outcomes as the dependent variable. Column 1, 2 and 3 show the effect of female entrepreneurship levels, male entrepreneurship levels and the female share of total entrepreneurs on innovation outcomes respectively. The R^2 is 0.74 for model 1 and 0.73 for model 2 and 3.

Hypothesis 6 states that countries with a higher percentage of female entrepreneurs have higher innovation outcomes. Column 1 shows that an increase of one percent of female entrepreneurs results in a decrease of 0.08 on the score of innovation outcomes. This effect is highly significant and therefore hypothesis 6 is rejected. Female entrepreneurs have a negative effect on innovation outcomes.

Their male counterparts however have similar negative significant effects on innovation outcomes, which can be seen in column 2. The share of female entrepreneurs does not have a significant effect on innovation outcomes according to column three. Both the R&D expenditure and GCI score positively affect innovation outcomes, as expected from prior literature. These effects are significant in all three of the models.

Table 5.3 Regression results on innovation outcomes

Variable	Innovation outcomes		
	(1)	(2)	(3)
Self-employed female %	-0.08*** (0.02)		
Self-employed male %		-0.08*** (0.03)	
Female share self-employed			-0.03 (0.03)
R&D	0.05** (0.02)	0.04** (0.02)	0.04* (0.02)
GCI	0.67*** (0.07)	0.72*** (0.07)	0.82*** (0.82)
Year			
2014	-1.56*** (0.35)	-1.54*** (0.35)	-1.52*** (0.35)
2015	-1.96*** (0.35)	-1.94*** (0.35)	-1.90*** (0.35)
2016	-3.93*** (0.35)	-3.89*** (0.35)	-3.84*** (0.35)
2017	-4.62*** (0.35)	-4.59*** (0.35)	-4.51*** (0.35)
2018	-5.46*** (0.35)	-5.42*** (0.35)	-5.32*** (0.35)
2019	-6.32*** (0.36)	-6.28*** (0.36)	-6.15*** (0.36)
2020	-9.04*** (0.36)	-8.99*** (0.36)	-8.90*** (0.36)
2021	-8.12*** (0.36)	-8.06*** (0.36)	-7.94*** (0.36)
Constant	-14.20*** (5.15	-17.82*** (5.32	-27.24*** (4.34)
Country random effects	YES	YES	YES
Observations	1,152	1,152	1,152
R^2	0.74	0.73	0.73

*Notes: Standard deviations are in parentheses. Significance level indicated by * for $p < 0.1$, ** for $p < 0.05$ and *** for $p < 0.01$.*

Unemployment rates

Table 5.4 shows the results of the regression results with unemployment as the dependent variable. The R^2 is 0.03 for model 1 and 2 and 0.06 for model 3, which means that this model has a low explaining power.

According to hypothesis 7, the higher the percentage of female entrepreneurs, the lower the unemployment levels are. Column 1 shows that this is not true. Whenever the percentage of female entrepreneurs goes up by one, the unemployment rate goes up by 0.11. This effect is significant on the 1% level and therefore hypothesis 7 is rejected. Female entrepreneurs have a positive effect on unemployment rates.

The male effect on unemployment rates can be seen in column 2. Males have a significant positive effect on unemployment rates as well, but with a larger scope. Whenever the percentage of male entrepreneurs goes up by 1, the unemployment rate goes up by 0.27. The share of female entrepreneurs of total entrepreneurs does not have a significant effect on unemployment.

The size of the state sector has a positive effect on unemployment in all three of the models. The larger the state sector, the higher the unemployment rates. Government effectiveness only has a positive effect on unemployment rates in model 2.

Table 5.4 Regression results on unemployment rates

Variable	Unemployment rates		
	(1)	(2)	(3)
Self-employed female %	0.11*** (0.02)		
Self-employed male %		0.27*** (0.03)	
Female share self-employed			0.00 (0.02)
State	0.10** (0.04)	0.10*** (0.04)	0.13*** (0.04)
Government effectiveness	0.01 (0.01)	0.02* (0.01)	0.00 (0.01)
Year			
2014	-0.13 (0.20)	-0.10 (0.20)	-0.19 (0.21)
2015	-0.24 (0.21)	-0.17 (0.20)	-0.34 (0.21)
2016	-0.38* (0.21)	-0.30 (0.20)	-0.51** (0.21)
2017	-0.72*** (0.21)	-0.61*** (0.20)	-0.86*** (0.21)
2018	-1.03*** (0.21)	-0.86*** (0.20)	-1.22*** (0.21)
2019	-1.21*** (0.21)	-1.00*** (0.20)	-1.44*** (0.21)
2020	-0.27 (0.22)	-0.14 (0.21)	-0.53** (0.21)
2021	-0.50** (0.21)	-0.30 (0.21)	-0.79*** (0.21)
Constant	1.60 (1.30)	-5.20*** (1.44)	5.48*** (1.21)
Country fixed effects	YES	YES	NO
Country random effects	NO	NO	YES
Observations	1,152	1,152	1,152
R^2	0.03	0.03	0.06

*Notes: Standard deviations are in parentheses. Significance level indicated by * for $p < 0.1$, ** for $p < 0.05$ and *** for $p < 0.01$.*

VI.   Discussion

Hypotheses results

The results showed that hypothesis 1 was accepted, meaning that equal rights for both genders results in a higher female share of entrepreneurship. As expected by the findings of Vracheva and Stoyneva (2020) which stated that equality in economic participation is positively related to the share of female entrepreneurs. Having equal rules makes it so that females have the same opportunities as men and that therefore females do not start engaging in entrepreneurial activities with a disadvantage to men.

Hypothesis 2 however was rejected. The findings of Urbano, Aparicio and Audretsch (2019) and Estrin and Tomasz (2011) suggested that a larger state sector was negatively associated with the share of female entrepreneurs. The effects measured were not significant and therefore this hypothesis could not be accepted. State sector does not affect the share of female entrepreneurs.

Hypothesis 3 stated that muslim countries have a lower share of female entrepreneurs. This was based on evidence of different Muslim countries from research by Holmen, Min & Saarelainen (2011), Naguib & Jamali (2015) and El Harbi, Anderson & Mansour (2009). Even though multiple papers found a negative effect of Muslim countries on the female share of entrepreneurs, the regression shows opposite results. Muslim countries have a higher share of female entrepreneurs on average than non Muslim countries. It was expected that the findings of Audretsch, Boente and Tamvada (2007), which stated that the Islam is conducive to entrepreneurship, would only apply to men because of the negative attitudes towards women. But the opposite is true, they are also conducive to female entrepreneurs.

Hypothesis 4 was accepted. It stated that countries with a higher GDP per capita have a higher share of female entrepreneurs, which was based on evidence from Minniti (2010). Countries that have a higher GDP per capita often have more jobs available that would earn enough to live. Countries with lower GDP per capita have less earning jobs and therefore women get triggered to become an entrepreneur. Since women are more reactive to having low income (Minniti, 2010), more women will become an entrepreneur in low-income countries relative to men.

Hypothesis 5 stated that female entrepreneurs have a positive relationship with GDP growth. The results showed are in line with the expectations thus the hypothesis was accepted. It is

not clear what the exact reason for this positive relationship is between female entrepreneurs and GDP growth. Female entrepreneurs have a negative relation with innovation outcomes and a positive relation with unemployment. These relationships reduce economic growth so therefore these determinants cannot be the reason. A possible explanation for this relationship is that females focus on different sectors than men (Mroczek-Dąbrowska & Gaweł, 2020) which increases competition in female dominated sectors. Increased competition leads to higher GDP growth because firms will operate at their best.

Hypothesis 6 was rejected since the results showed that female entrepreneurs have a negative impact on innovation outcomes. Therefore this could not be one of the reasons for the positive association of female entrepreneurs with GDP growth. The findings were not in line with those of Baumol and Stom (2007) and Mylonas, Kyrgidou & Petridou (2017). Innovation outcomes did not show any significant relationship with GDP growth either when it was used as a control variable.

Lastly hypothesis 7 was also rejected since female entrepreneurs had a positive relation with unemployment rates. Previous research found a positive relationship between female entrepreneurs and job creation (Brush & Cooper, 2012; Allen, Elam, Langowitz & Dean, 2007), which reduces unemployment (Mortensen & Pissarides, 1994; Moscarini & Postel-Vinay, 2012). The results were opposite to the expectations. Therefore this could also not be one of the reasons for the positive relationship between female entrepreneurs and GDP growth according to this data.

Other results

When looking at the effects of male entrepreneurship levels, it can be seen that there are similar results. Males have the same effect on GDP growth as females. However, when looking at the share of females of total self-employed the results show that a higher share of female self-employed results in a higher GDP growth. This suggests that the marginal benefits of a female entrepreneur is higher than that of a male. Since having more female entrepreneurs increases GDP growth on average and having more male entrepreneurs would be the opposite.
Innovation outcomes are also affected the same way for both male and female entrepreneurs. There was no significant effect found on the relative measure, the share of females of total entrepreneurs.
Male entrepreneurs do have a positive relation with unemployment like females do, however the scope is more than twice the scope of that of females. The bigger the scope the worse it

is for economic growth since having high unemployment rates is bad for economic performance. Males therefore perform worse than females on unemployment rates.

Another remarkable result was that of the year 2020 on GDP growth. This year had a very negative impact on GDP growth since it was highly significant. A very plausible explanation for this is the COVID-19 pandemic which started in this year. This resulted in the closing of many stores which made the economy of almost every country in the world shrink. The year after showed significant positive results since the economy started recovering again.

Limitations

Since this paper investigates the gender gap in entrepreneurship worldwide, it is needed to have a dataset that represents countries from all over the world. This dataset has 128 countries which is over more than half of all the countries in the world. Even though a lot of countries could not be included in the dataset due to a lack of data availability, it is safe to say that all types of economies are represented in the dataset. Although the dataset is valid in representing the entire world, this also brings problems. As mentioned earlier, some variables in the data have a very wide range. The female self-employment rates range from almost 0 to almost 100 which makes countries very different on this particular statistic. Unemployment rates also differed a lot, with a range of 0.1 to 29. This could potentially make the results less reliable. The mean and median were in the middle of this range so the data is not skewed.

Another limitation is the amount of years that could be investigated. The limiting factor was the global innovation index database. This database only had scores for the years 2013 until 2022. The dataset included nine years, but preferably there could be more years added to strengthen the results. Economies have changed a lot over the years in terms of growth pace, the growth of technology and the participation of females. Adding more years probably could have shown stronger relations between the dependent and independent variables.

Future research

Even though this paper was meant to provide evidence on female entrepreneurship worldwide, future research could investigate the same topic in smaller subgroups. Based on the limitations, economies that are similar would probably give a more representative result since the range of some variables is very large. This is reduced when dividing the sample in smaller similar groups. The same data and methods could be used, but then using sub-groups based on the dependent variables. Separating the data based on GDP would

still give trustworthy results since the data covers such a wide variety of countries but when doing this, you can compare countries that have similar GDP.

Future research could also try to find more determinants of economic performance since female entrepreneurs do have a positive relationship with GDP growth, but this is not through their impact on innovation outcomes or unemployment rates. Therefore there must be other determinants of GDP growth that are positively affected by female entrepreneurs. An example is; How are exports and imports influenced by female entrepreneurs or how efficiently do female entrepreneurs use human resources?

VII.   Conclusion

The aim of this paper was to find how female entrepreneurs influence the economic performance of a country. This was done by investigating what causes there are for the lower share of female entrepreneurs and by looking at the relationship between female entrepreneurs and three indicators of economic performance, namely GDP growth, innovation outcomes and unemployment rates. The paper focused on these two aspects of female entrepreneurship in order to answer the main research question: 'What is the relationship between female entrepreneurship and economic performance?'.

The expectations on the causes of the gender gap were partly in line with the theory. Gender equality in laws positively affects the share of female entrepreneurs, which was expected based on the literature. The relationship of GDP per capita and share of female entrepreneurs was negative, which was also in line with the theory. Muslim countries showed opposite impacts on the share of female entrepreneurs, since it positively affected female entrepreneurs where the expectation was a negative relation. Lastly, state size did not have any significant effect on the share of female entrepreneurs.

The relation of female entrepreneurship and the economic performance indicators were interesting. Female entrepreneurs do have a positive relation with GDP growth. However, this cannot be explained by their relation with innovation outcomes and unemployment rates. Female entrepreneurs have a negative relationship with innovation outcomes and a positive relation with unemployment rates. Both relations negatively affect GDP growth according to previous theory. There must be another determinant of economic growth that is affected by female entrepreneurs which results in higher GDP growth. This could be investigated in future research.

Lastly, male entrepreneurs affect GDP growth and innovation the same way female entrepreneurs do. Unemployment rates are affected the same way but with a bigger scope, which means that males perform worse on unemployment rates. Negative perceptions on the performance of female entrepreneurs as stated in the introduction are invalid, according to the results. The answer to the main research question is that females have a positive relationship with GDP growth, however it is still unsure which determinants of GDP growth are positively affected by female entrepreneurs.

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Appendix

Table A1. Countries in alphabetical order

Albania	Czechia	Kyrgyzstan	Portugal
Algeria	Denmark	Latvia	Qatar
Angola	Dominican Republic	Lebanon	Romania
Argentina	Ecuador	Lithuania	Rwanda
Armenia	Egypt	Luxembourg	Saudi Arabia
Australia	El Salvador	Madagascar	Senegal
Austria	Estonia	Malawi	Serbia
Azerbaijan	Ethiopia	Malaysia	Singapore
Bahrain	Finland	Mali	Slovakia
Bangladesh	France	Malta	Slovenia
Belarus	Georgia	Mauritius	South Africa
Belgium	Germany	Mexico	Spain
Benin	Ghana	Moldova	Sri Lanka
Bolivia	Greece	Mongolia	Sweden
Bosnia and Herzegovina	Guatemala	Montenegro	Switzerland
Botswana	Guinea	Morocco	Tajikistan
Brazil	Honduras	Mozambique	Tanzania
Brunei Darussalam	Hungary	Namibia	Thailand
Bulgaria	Iceland	Nepal	Togo
Burkina Faso	India	Netherlands	Trinidad and Tobago
Burundi	Indonesia	New Zealand	Tunisia
Cabo Verde	Iran	Niger	Turkiye
Cambodia	Ireland	Nigeria	Uganda
Cameroon	Israël	North Macedonia	Ukraine
Canada	Italy	Norway	United Arab Emirates
Chile	Jamaica	Oman	United Kingdom
China	Japan	Pakistan	United States of

			America
Colombia	Jordan	Panama	Uruguay
Costa Rica	Kazakhstan	Paraguay	Vietnam
Côte d'Ivoire	Kenya	Peru	Yemen
Croatia	Korea	Philippines	Zambia
Cyprus	Kuwait	Poland	Zimbabwe

Table A2. Results for the hausman test on the appropriate model

Regression	Test statistics (Prob>chi2)	Appropriate model
Female SE share	0.0982	Random effects
GDP growth (1)	0.4568	Random effects
GDP growth (2)	0.1450	Random effects
GDP growth (3)	0.4641	Random effects
Innovation (1)	0.1127	Random effects
Innovation (2)	0.1236	Random effects
Innovation (3)	0.4533	Random effects
Unemployment (1)	0.0003	Fixed effects
Unemployment (2)	0.0000	Fixed effects
Unemployment (3)	0.8509	Random effects