ERASMUS UNIVERSITY ROTTERDAM

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Gendered entrepreneurship and economic growth:

The influence of institutionally well-integrated entrepreneurial activity on economic growth.

Abstract

This paper examines the influence of institutionally well-integrated entrepreneurship on economic growth. A comparison is made between total, female, and male entrepreneurship to scrutinise whether certain institutions have a stronger impact on female entrepreneurship than on male entrepreneurship. To empirically investigate this relationship, a 3SLS simultaneous equations model is used to simultaneously estimate the effect of institutions on entrepreneurship and the effect of entrepreneurship on economic growth. The results indicate that a favourable cultural-cognitive institutional dimension is essential for entrepreneurship. Furthermore, institutionally well-integrated entrepreneurship has a positive impact on economic growth. However, the effect of institutionally well-integrated female entrepreneurship on economic growth is not significantly different from the effect of institutionally well-integrated male entrepreneurship on economic growth.

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1. Introduction

Female entrepreneurship is seen as a vital factor for economic development. However, the global female total entrepreneurial activity (TEA) rate, representing the percentage of the female adult population that is either a nascent or a very new entrepreneur, is only 10.2 per cent on average (Elam et al., 2019). This amount is equal to three-quarters of the TEA rate for men. The gender gap in entrepreneurship is even more prominent in high-income countries, where the female TEA rate is only equal to less than two-thirds of the male TEA rate. The overall existing gender inequality in the labour market is a very high debated topic worldwide, as it harms the economy and society of a country. Improving the gender balance in entrepreneurship specifically, enhances economic growth. A boost in the number of female entrepreneurs increases the total female labour participation, and it adds to the diversity of entrepreneurship in the economic process (Verheul & Thurik, 2001). Furthermore, an increasing gender balance in entrepreneurship gives women the possibility to climb to higher-paid and higher-skilled occupations (ILO, 2019). All three factors are valuable for the economic development of a country. Accordingly, it is worthwhile to investigate which factors stimulate female entrepreneurship in a way that it adds to the economic development in a country. Baumol (1990) indicated that 'the rules of the game', especially formal institutions, are the factors that designate the relative payoffs of different entrepreneurial activities. Hence, institutions influence whether a certain entrepreneurial activity is executed in a productive or unproductive way. This direction of entrepreneurial activity has a great impact on the growth of the economy. Therefore, researchers recently introduced the concept of an entrepreneurial ecosystem, where institutions are recognised as the framework conditions that lead to productive entrepreneurship (Stam, 2015). The ultimate goal of this ecosystem is to create value for society via economic growth (Stam & Spigel, 2016).

A couple of researchers have tried to examine this entrepreneurial ecosystem empirically. However, this is a very complicated task, as the entrepreneurial ecosystem is theoretically understandable, it is harder to examine the interdependence of institutions, entrepreneurship, and economic growth empirically in one model. Therefore, other studies decided to scrutinise the various relationships separately. Most studies were successful in investigating institutions that potentially influence (female) entrepreneurship (e.g. Chowdhury & Audretsch, 2014; Elam & Terjesen, 2010; Estrin & Mickiewicz, 2011). Nevertheless, the papers that aimed to examine the link between entrepreneurship and economic growth suffer from endogeneity problems and provide very little evidence (Bjørnskov & Foss 2016). Therefore, Aparicio, Urbano, & Audretsch (2016) and Bosma, Content, Sanders, & Stam (2018) introduced a different empirical strategy to combine the three relevant variables into one empirical model. Both papers used a three-stage least-squares (3SLS) simultaneous equations model to simultaneously estimate the effect of institutions on entrepreneurship and the effect of

entrepreneurship on economic growth. In that way, they capture the part of entrepreneurship that is institutionally well-integrated, which is considered to be productive entrepreneurship and as having the largest impact on economic growth (Acs, Estrin, Mickiewicz, & Szerb, 2018). Aparicio et al. (2016) specifically focused on opportunity entrepreneurship, while Bosma et al. (2018) paid attention to total entrepreneurial activity in general.

This paper aims to add to the existing body of literature on female entrepreneurship by examining the influence of institutionally well-integrated female entrepreneurship on economic growth in Organisation for Economic Co-operation and Development (OECD) member countries. This group of countries is chosen to have a complete and diverse data set of developed countries that also includes non-European states. To conduct this research, the empirical model of Bosma et al. (2018) is closely followed. A wide range of institutions are analysed that cover the regulative, the normative, and the cultural-cognitive dimension. To be more precise, two institutions per dimension are examined that are selected based on previous literature. In this study, a comparison is made between total, male, and female entrepreneurial activity to investigate whether certain institutions have a stronger effect on female entrepreneurship than on male entrepreneurship. Subsequently, it gives the possibility to scrutinise whether institutionally well-integrated female entrepreneurship has a more considerable impact on economic growth compared to institutionally well-integrated male entrepreneurship. This paper contributes to the current literature as it is a continuation of the paper of Bosma et al. (2018). However, a substantial expansion is introduced with the division between female and male entrepreneurship, and the inclusion of institutions that are expected to affect productive female entrepreneurship positively. Furthermore, the study is also relevant for public policies, as it provides guidance especially for strategies that focus on gender diversity in relation to the creation of new sustainable businesses that have a positive influence on the economic performance of a country.

First, the results of this study indicate that broad total, female, and male entrepreneurial activity are not significantly associated with economic growth. Broad entrepreneurship is an extensive definition of entrepreneurship that includes all types of entrepreneurship, such as productive entrepreneurship, unproductive entrepreneurship, and even destructive entrepreneurship. Accordingly, broad entrepreneurship captures more than only institutionally well-integrated entrepreneurship. Secondly, the results show that a favourable cultural-cognitive impacts total, female, and male entrepreneurship positively. However, a favourable cultural-cognitive dimension is not more important for female entrepreneurs than for male entrepreneurs. Lastly, institutionally well-integrated entrepreneurship has a positive impact on economic growth, while a distinction cannot be made between the effect of institutionally well-integrated female entrepreneurship on economic growth and the effect of institutionally well-integrated male entrepreneurship on economic growth.

This paper proceeds by providing information on the existing literature on entrepreneurship, institutions, and economic growth in chapter two. The focus is specifically on the female entrepreneurial ecosystem in this section. After that, the empirical strategy and data sources are highlighted in chapter three. Chapter four gives a presentation and discussion of the baseline and robustness results, after which chapter five provides a conclusion.

2. Theoretical framework and literature review

Several studies have investigated the effects of the institutional environment on entrepreneurship and its subsequent effect on economic growth separately. They concluded that institutions, directly and indirectly, influence the demand and supply of entrepreneurs (Acs, Desai, & Hessels, 2008). Secondly, researchers stated that entrepreneurship is an essential component for economic growth (e.g. Acs & Szerb, 2007; Audretsch & Keilbach, 2004; Urbano, Aparicio, & Audretsch 2019; Van Stel, Carree, & Thurik, 2005) since entrepreneurs alter knowledge into growth (Acs, Audretsch, Braunerhjelm, & Carlsson, 2012). However, the institutional environment is a very complex environment with interdependence and interaction between institutions and entrepreneurs that influence economic growth jointly. Therefore, in the 1990s, studies in the entrepreneurship field started to shift the attention from an individualistic approach to a broader view that incorporated social, cultural, and economic forces into the entrepreneurship process (Dodd & Anderson, 2007). This concept later gained the name of an entrepreneurial ecosystem, where social, political, cultural, and economic factors within a country or region contribute to the development of innovative start-ups and stimulate nascent entrepreneurs to start high-risk new companies (Spigel, 2017). The informal and formal institutions within an entrepreneurial ecosystem are the framework conditions that lead to entrepreneurial activity (Stam, 2015). This entrepreneurial activity is seen as an output of the ecosystem since the ultimate outcome of the ecosystem is the value creation for society (Stam & Spigel, 2016).

The ecosystem approach already gives one clear example why institutions might influence potential female entrepreneurs differently in comparison with male entrepreneurs. Namely, the fact that metaphors influence the way individuals think and learn about entrepreneurs (Nicholson & Anderson, 2005). The masculinity of the entrepreneurship myth is a popular image in family firms that portraits male entrepreneurs as heroic individuals that are owners or managers, and portraits females as invisible women (Hamilton, 2006; Hamilton & Smith, 2003). This myth structures social narratives following power and identity, while it might be conflicting with the real division of power and identity in an entrepreneurial venture. Therefore, it is essential to know which institutions create a context within the ecosystem where productive entrepreneurship can flourish, and how entrepreneurship influences economic growth. For that reason, the existing literature on entrepreneurship, especially the literature on female entrepreneurship, and economic growth are highlighted first. Thereafter the studies on institutions and entrepreneurship, specifically the studies on female entrepreneurship, are mentioned. The chapter ends with a concluding paragraph about the ecosystem of female entrepreneurship and economic growth, which is the basis for further analysis in this paper.

2.1. Entrepreneurship and economic growth

2.1.1. Schumpeterian theory of creative destruction

One of the first authors studying the importance of entrepreneurship for economic growth was Schumpeter (1947). Schumpeter (1947) noted that throughout the literature, multiple variables were used to explain economic growth, such as technology, institutions, tangible atmosphere, and the social organisation. However, still a great deal of the economic growth process remained unexplained. Therefore, Schumpeter highlighted the importance of entrepreneurship as one of the main factors to increase economic growth. The entrepreneurs are the individuals that can combine different, already existing resources in a new approach or for a new aim. Schumpeter called this process "creative destruction", whereby entrepreneurs destruct existing markets by establishing new markets (Schumpeter, 1942). This creative destruction process is the pre-eminent origin of economic growth, according to Schumpeter (1942).

Despite the Schumpeterian theory, entrepreneurship is not prominently featured in the theories about economic growth (Acs & Sanders, 2013; Bjornskov & Floss, 2016). For example, in the highly cited paper of Temple (1999), the empirical literature on economic growth is surveyed. The author does not refer to entrepreneurship or an entrepreneurial ecosystem at any moment in the paper. Although more recent papers take entrepreneurship into account (e.g. Acs et al., 2012; Van Stel, Carree, & Thurik, 2005), it is still not part of the mainstream literature on economic growth.

2.1.2. Empirical evidence on the relationship between entrepreneurship and economic growth

Multiple studies investigating the link between entrepreneurship and economic growth identified entrepreneurship as a vital determinant for the development of economic growth (e.g. Acs & Szerb, 2007; Audretsch & Keilbach, 2004; Urbano et al., 2019; Van Stel et al., 2005). In these studies, entrepreneurship is seen as an instrument that modifies knowledge into growth. This argument is based on two mechanisms. First, researchers of incumbent companies engage in research and development that generates knowledge (Acs et al., 2012). However, those incumbent firms are not able to commercialise all the new knowledge which leaves room for entrepreneurs to use that information to start a new business. This spillover of knowledge to entrepreneurs can be seen as the second mechanism in which knowledge is commercialised (Acs, Audretsch, Braunerhjelm, & Carlsson, 2004), which eventually influences growth (Block, Thurik, & Zhou, 2009; De Clerq, Hessels, & Van Stel, 2007). The new insight can be looked at as a recently discovered type of tangible capital or business model that can be adopted in the production of final goods (Acs et al., 2012), which might not be exploited without entrepreneurs. For that reason, empirical evidence demonstrates that countries

with more entrepreneurial activity also have higher levels of economic growth. Moreover, some academics even present proof that economies with lower levels of entrepreneurial activity also display diminished levels of economic growth (Audretsch, Carree, Van Stel, & Thurik, 2002).

Although most studies present a positive link between entrepreneurship and growth, the results are multi-interpretable (Bruns, Bosma, Sanders, & Schramm, 2017). These different interpretations mainly exist due to the measurement problem of entrepreneurship. Dissimilar studies use different proxies for entrepreneurship. The impact on economic growth is not identical for every type of entrepreneurship. Moreover, the connection between entrepreneurship and economic growth is very complex, as it is context-dependent and involves different lags (Carree & Thurik, 2008; Stam & Van Stel, 2011). The entrepreneurial ecosystem approach claims that only high-growth start-ups and scale-ups are seen as entrepreneurship since these forms have an impact on innovation, productivity growth, and employment (World Economic Reform 2003; Brown & Mason, 2014). Strictly speaking, it means that high-growth start-ups and scale-ups provide directly or indirectly a net contribution to the economy and/or the ability to create an extra output (Baumol, 1993). This feature makes it productive entrepreneurship, according to Baumol (1990). On the contrary, unproductive entrepreneurship is often in de form of rent-seeking activities, such as litigation, acquisitions, tax evasion, and tax fraud (Baumol, 1990). Destructive entrepreneurship even includes illegal and criminal activity. Therefore, Acs et al. (2018) indicated that productive entrepreneurship has the most impact on economic growth.

Following the reasoning in the entrepreneurial ecosystem literature, it can be concluded that the different entrepreneurship measures in the empirical literature potentially create the heterogeneity in the results. For the reason that not all studies primarily focus on productive entrepreneurship, some researchers also include part of the unproductive or destructive entrepreneurship in their measures. Researchers of other papers even estimate entrepreneurship with the number of business owners (e.g. Carree & Thurik, 2008; Carree, van Stel, Thurik, & Wennekers, 2002) or the self-employment rate (e.g. Blanchflower, 2000). These two more static indicators of entrepreneurship capture both new and incumbent firms, while dynamic indicators only focus on the net or gross change of the number of entrepreneurs. Dynamic indicators are, for example, variables that take into account the number of nascent entrepreneurs or new business start-ups. This distinction between dynamic and static indicators of entrepreneurship might indicate a second reason for the heterogeneity in the results.

Many policy makers in developed countries base their public policies on the assumption that a higher business ownership rate is associated with a boost in the economic value creation in a country (van Praag & Van Stel, 2013). However, Van Praag & Van Stel (2013) used a static entrepreneurship indicator and provided robust evidence for an optimal business ownership rate in a country. This outcome

indicates that more business ownership is not always beneficial for the economy of a country when both new and incumbent businesses are considered. For policy purposes, this result demonstrates that some countries are better off with the implementation of policy programs that stimulate business ownership while other countries should use policy initiatives that encourage wage employment. When a dynamic indicator is used to measure entrepreneurship the results are a bit different. Wennekers, Van Stel, Thurik, & Reynolds (2015) supplied results that indicate that the optimal level of entrepreneurship is related to the economic development of a country. For high developed countries fostering new business ownership is beneficial for the economy, while developing countries are better off improving the qualities and knowledge of existing managers instead of in the encouragement of new firms. This outcome is also supported by other papers. For example, Van Stel et al. (2005) displayed that the influence of new entrepreneurial activity on economic growth is smaller for developing countries compared to highly developed countries. In this current research a dynamic indicator is used to measure entrepreneurship, as the entrepreneurship variable measures the percentage of nascent entrepreneurs and owners of very young businesses in a country. Furthermore, the study uses a country sample that consists of developed OECD member countries. Therefore, based on previous theory, the type of entrepreneurship variable considered, and the data sample used in this study, the following first hypothesis is formulated:

H1: Entrepreneurial activity positively impacts economic growth in OECD member countries.

2.1.3. Female entrepreneurship and economic growth

Female entrepreneurs are acknowledged as a crucial factor for economic development (Verheul et al., 2006), for that reason higher levels of female entrepreneurs are linked to economic growth (Terjesen & Amorós, 2010). Women especially add to the diversity in entrepreneurial activity and in economic performance (Popescu, 2012; Verheul et al., 2006). Even though diverse entrepreneurial activity concerning gender is beneficial for economic growth, both female entrepreneurs and male entrepreneurs have dissimilar effects on the economic performance of a country. This difference exists as female and male entrepreneurs both have unique characteristics in the way that they do business. They establish different kinds of companies in various sectors (Popescu, 2012). For example, women entrepreneurs are very noticeable in retail and service sectors (Robinson & Watson, 2001), while they are underrepresented in manufacturing sectors (Du Rietz & Henrekson, 2000). Furthermore, females tend to focus more on niche markets with different kinds of products. Lastly, women and men may have different motives for why they become an entrepreneur, which may result in different goals for both groups (Robinson & Watson, 2011). For example, Terjesen & Elam (2012) indicated that women carry lower growth expectations, establish slightly smaller enterprises, pay less attention to competition, and tend to focus more on generating a higher level of benefit for consumers. Therefore,

female entrepreneurs on average have a lower performance compared to male entrepreneurs with respect to firm size, innovation and growth (Cliff, 1998; Rosa, Carter, & Hamilton, 1996; Watson, 2002). In the existing literature this concept is referred to as the "the female underperformance hypothesis" (Du Rietz & Henrekson, 2000). Even though this concept is mainly tested at the firm level, it is likely that the same hypothesis holds at the country level as female entrepreneurs in general tend to underperform with respect to growth and innovation compared to male entrepreneurs. Consequently, the following second hypothesis is formulated:

H2: The positive impact of entrepreneurial activity on economic growth is stronger for male entrepreneurship than for female entrepreneurship.

2.2. Institutional economics and entrepreneurship

The dominant theories in institutional economics are those of North (1990, 2005), Williamson (1985, 2000), and Scott (1995, 2008). According to North (1990), institutions are the "rules of the game in a society, or more formally, the constraints that shape human interaction" (North, 1990, p. 3). North (1990, 2005) makes a distinction in institutions based on formality in his papers. There are formal institutions, such as laws, regulations, and contracts that decrease the transactions costs of entrepreneurs. On the contrary, belief systems, culture/social norms, and cognitive aspects are classified as informal institutions that remain for an extended period of time. These institutions reduce the uncertainty created by the decisions of groups and individuals (North, 2005). Williamson (1985, 2000) categorises institutions based on the frequency of change. For example, the norms and traditions in countries stay roughly the same for centuries, while the adjustment in prices and quantities in neoclassical economics change continuously. Furthermore, formal rules, the institutional environment, the bureaucratic functions of the government, and the institutions of governance change quicker than norms and traditions, but slower than prices and quantities. Moreover, according to Williamson (2000), informal institutions can moderate the effect of formal institutions.

Lastly, Scott (1995, 2008) stated that all organisations are influenced by three different institutions pillars at all stages, namely a regulative dimension, a normative dimension, and a cultural-cognitive dimension. The regulative dimension is the most formal one of the three pillars (Bruton & Ahlstrom, 2003). It, therefore, fits into the formal institutions' definition of North (1990, 2005), as it also consists of laws, rules, and government policies (Alvarez & Urbano, 2012). Furthermore, it is also the dimension where rules are enforced, and sanctions are assigned. In that way, favourable behaviour is stimulated and negative attitudes discouraged. The normative and cultural-cognitive dimensions are considered as more informal institutions—the former points to the collective sense, and the latter to the individual perception. More specifically, the normative dimensions capture the norms, values, beliefs, and the

general opinion about the nature and behaviour of humans that is socially accepted by individuals of a particular country. The cultural-cognitive dimension is focused on the knowledge and skills that are commonly feasible by entrepreneurs in a country.

Hereafter, the existing empirical literature on institutions and (female) entrepreneurship is highlighted and considered following the three institutional pillars of Scott (1995, 2008). Here, the regulative dimension consists of formal institutions that change faster over time, and the normative and cultural-cognitive dimensions contain informal institutions that change slowly over time. The focus is on the three dimensions of Scott (1995, 2008) instead of the institutional theory of North (1990, 2005) and Williamson (1985, 2000), because researchers in the entrepreneurial ecosystem field also make a division in three categories that support entrepreneurial activity (Spigel, 2017). These three categories in the entrepreneurial ecosystem field are cultural, social, and material attributes. The material attributes take into account policy and governance, which fits into the regulative dimension. The cultural attributes look at the supportive culture and history of entrepreneurship in a country which is comparable with the normative dimension. Lastly, the social attributes consist of networks and the talent of the individual, which is equivalent to the cultural-cognitive dimension. The upcoming paragraphs of the literature review mainly focus on the two institutions per dimension that are used in the analysis later on. These specific institutions are chosen as these are likely to have an stronger impact on the presence of female entrepreneurial activity compared to the presence of male entrepreneurial activity, according to existing literature.

2.2.1. The regulative dimension

Macroeconomic policies and procedures, a well-established legal system, and an institutional framework that consists of laws and rules are essential for the opportunity to enterprise (Gnyawali & Fogel, 1994). These institutions reduce the barriers for new business start-ups and accommodate the exploitation of opportunities, as the framework increases the efficiency of markets. Correspondingly, there is a greater likelihood of individuals becoming an entrepreneur when the regulative institutions are in place. More specifically Stenholm, Acs, Wuebker (2013) found that regulations that are established to support entrepreneurs are more important than any other institutions such as culture, norms, and values to increase the entrepreneurial activity.

Formal regulative institutions come in many forms. For example, Urbano & Alvarez (2014) tested multiple regulative institutional variables and they only found support for one of them. Namely, their results indicated that fewer procedures before starting a business increases the likelihood of becoming an entrepreneur. On the contrary, Djankov, La Porta, Lopez-de-Silanes & Shleifer (2002) were not able to find an explicit association between business regulations for firm entry and entrepreneurial activity.

Aidis, Estrin, Mickiewicz (2012) linked this lack of clear evidence to the large number of regulatory dimensions available at the bottom of the institutional hierarchy. If there are a lot of small regulatory measures it is harder to find individual effects. However, this outcome does not indicate that the joint effects of these regulatory dimensions are irrelevant. Therefore, the authors proposed the idea to use a critical dimension that exists in all those regulatory indicators and influences entrepreneurship, namely the size of the government. Aidis et al. (2012) found that a larger government size is associated with less firm entry. This link was significant and robust to alternative specifications. Bosma et al. (2018) found similar results. A larger government means more safety nets, more involvement in economic activities from the state, and increased government expenditures and taxes. This provision of safety nets discourages people from starting their own business (Bosma et al., 2018; Verheul, van Stel, & Thurik, 2006; Verheul, Wennekers, Audretsch, & Thurik, 2001).

Another, more specific, regulative institution that might be important for entrepreneurship is the public provision of childcare. The presence of children influences the employment rates of individuals (Verheul et al. 2016). Self-employment specifically gives individuals the possibility to be more flexible and to adjust their working schedule to the needs of the family. This flexibility in working hours might further increase due to the government provision of daycare for children. The provision of childcare allows entrepreneurs to devote more time to starting and growing their own business, instead of staying at home and taking care of their kids (Terjesen, Bosma, & Stam, 2016). When both arguments are taken together, it is expected that an increase in public childcare provision and a smaller government is associated with an increase in entrepreneurial activity. Therefore, the third set of hypotheses can be formulated in the following way:

H3A: A favourable regulative dimension, in the form of smaller government size, positively affects the presence of entrepreneurial activity.

H3B: A favourable regulative dimension, in the form more public provision of childcare, positively affects the presence of entrepreneurial activity.

The upcoming two paragraphs highlight literature that indicates whether the two institutions that cover the favourable regulative dimension are more important for female entrepreneurship or male entrepreneurship to flourish. The size of the government seems to have a more massive negative effect for women who want to become an entrepreneur in comparison with their male counterparts (Estrin & Mickiewicz, 2011). This argument is based on two main facts. First of all, the occupational choice of women is often made within the social context of the household. Accordingly, women in general, are more conscious about the decision to do domestic work or to work outside their home, and this makes their choice more sensitive to other contextual factors. On the contrary, men may just have the first

goal to provide income for their household via employment or self-employment. Secondly, the activity rates of women are mostly lower than those of men because of more engagement into domestic labour. Both points taken together make that the perceived opportunity costs are higher for women. A large government, therefore, demotivates women to start their own business for two reasons. First, a larger state provides social security, for example, in the form of the provision of disability insurance and pensions at old age. This provision of social security reduces the incentives for women to acquire extra income through self-employment. Secondly, due to these social security services, income taxes are higher, which reduces the relative rewards of labour. A smaller government provides less social security which incentivizes women more to become economically active. This argument does not only hold for female entrepreneurship in general, but also for high aspiration female entrepreneurship (Estrin & Mickiewicz, 2011).

Traditionally, in most societies females rather than males are responsible for childcare and household work (de Beauvoir, 1952; Williams & Best, 1990). Although the overall female employment rates are higher in countries where there is a form of public childcare provision (Chang, 2004; Van der Lippe, & Van Dijk, 2002), the effect of public expenditure in childcare on the likelihood of female entrepreneurship specifically is ambiguous. On the one hand, there is an indirect negative effect of public childcare expenditure through a decrease in awareness of profitable business opportunities by women, as public expenditure on childcare can be seen as a proxy for social security and welfare (Elam & Terjesen, 2010). This argument suggests that the public provision of childcare moderates the relationship between the idea of seeing an opportunity for a start-up and the actual formation of that start-up. However, the magnitude and the direction of this moderation effect differs across countries. Elam & Terjesen (2010) indicated that for the majority of the countries in their sample the gender gap concerning the probability of starting a business decreased. This finding is more consistent with the other view in the literature. Namely, public provision of childcare gives women more free time, and therefore more room for starting up their own company according to Terjesen et al. (2016) and Terjesen & Elam (2012). Lastly, childcare provision is particularly important for females since women tend to start their own business at a later age in life, generally between the age of 35 and 40, after childbirth (Bosma, 2013). Overall, the positive effect of a smaller government and more public childcare provision is stronger for the presence of female entrepreneurship than the presence of male entrepreneurship. Consequently, the following fourth set of hypotheses is formulated:

H4A: The positive effect of a favourable regulative dimension, in the form of smaller government size, on the presence of entrepreneurial activity tends to be stronger for female entrepreneurs compared to male entrepreneurs.

H4B: The positive effect of a favourable regulative dimension, in the form more public provision of childcare, on the presence of entrepreneurial activity tends to be stronger for female entrepreneurs compared to male entrepreneurs.

2.2.2. The normative dimension

Aforementioned, the normative and cultural-cognitive dimensions contain more informal institutions than the regulative dimension. Urbano, Aparicio, & Audretsch (2019) stated in their review paper that different quantitative and qualitative studies present evidence that informal institutions have a more significant positive impact on entrepreneurship than formal institutions. The normative dimension in the entrepreneurship literature displays the opinion that citizens of a country have about entrepreneurial exercise and innovative reasoning. Furthermore, it also expresses the amount of value those same citizens assign to entrepreneurial exercise and innovative reasoning (Busenitz, Gomez, & Spencer, 2000). For example, there are likely to be more experienced entrepreneurs and role models available in a country when the citizens identify entrepreneurial values and entrepreneurial behaviour as important objectives (Gnyawali & Fogel, 1994). This boost in the number of entrepreneurial role models correspondingly increases the social appreciation of the performance of entrepreneurs, which at the end increases the likelihood of an individual becoming an entrepreneur (Bosma, 2013; Gnyawali & Fogel, 1994). A factor that influences the view of society is the amount of media attention for certain topics. Hence, the probability that someone becomes an entrepreneur increases, if there is a lot of media attention for new firms in a country (Urbano & Alvarez, 2014). Other determinants in the national culture that boost entrepreneurial activity are, for example, events and conferences with the entrepreneurial community, and a government promoter for entrepreneurship (Terjesen et al., 2016). Thus, the following fifth set of hypotheses is formulated:

H5A: A favourable normative dimension, in the form of more media attention for entrepreneurs, positively affects the presence of entrepreneurial activity.

H5B: A favourable normative dimension, in the form of more value for entrepreneurial exercise, positively affects the presence of entrepreneurial activity.

The next paragraphs provide information on existing literature whether the two institutions that are part of the normative dimension are more essential for the presence of female or male entrepreneurial activity. For women, especially the view of society might be more critical for the prospect of entrepreneurship because of fewer female role models. Albeit more and more companies have a better gender balance among their employees, there is still an imbalance among management positions. This inequality in the representation of women is the worst at the highest management layer (ILO, 2019). If there are more female business leaders, there are more contributions from those same

women to the marketplace (Elam & Terjesen, 2010). These female managers can be seen as cultural figures that impact the cultural environment (Chamlee-Wright, 1997), and therefore influence the view of society. The number of female managers is a good representation of the overall acceptance of female leadership and that women make decisions in general in a country. The existence of female business ownership does not only positively moderate the relationship between business opportunities and female business creation, but also the link between gender and female business creation (Elam & Terjesen, 2010). This moderation effect makes the impact of female role models on business creation mostly indirect.

This same mechanism does not seem to hold for female labour participation in general. One could expect that an increase in female labour participation, and therefore an increase in the female and overall supply of workers in the labour market, would positively change the view of society towards female entrepreneurship. Hence, this increase in female labour participation could make room for entrepreneurial activity for some women. However, Chowdhury & Audretsch (2014) found the opposite that an increase in the number of women in the labour force had a significant negative influence on female self-employment. Elam & Terjesen (2010) linked this negative significant effect to the kinds of sectors women work. Namely, women are mostly employed in the service sectors as these jobs are seen as feminine. In these service sectors, women do not develop the necessary knowledge and management skills to start with entrepreneurial activity, according to the authors. Overall, the encouragement from society is more important for women to start an entrepreneurial task that engages risk and uncertainty (Chowdhury & Audretsch, 2014), as there are fewer female role models and only a couple of women entrepreneurs catch the attention of the media (Hattab, 2012). Consequently, the following sixth set of hypotheses is formulated:

H6A: The positive effect of a favourable normative dimension, in the form of more media attention for entrepreneurs, on the presence of entrepreneurial activity tends to be stronger for female entrepreneurs compared to male entrepreneurs.

H6B: The positive effect of a favourable normative dimension, in the form of more value for entrepreneurial exercise, on the presence of entrepreneurial activity tends to be stronger for female entrepreneurs compared to male entrepreneurs.

2.2.3. The cultural-cognitive dimension

The cultural-dimension is the most informal of all three pillars (Bruton & Ahlstrom, 2003). This pillar is mainly about the ability to enterprise: the more technical and business training available, the greater the capability that somebody is going to be a successful entrepreneur that can be in charge of a

business (Gnyawali & Fogel, 1994). Very motivated entrepreneurs can even avoid starting their own business due to their lack of business skills and technical knowledge (Davidsson, 1991). Education and training specifically for entrepreneurship can therefore have a positive impact on the likelihood of entrepreneurship. For example, Martínez, Levie, Kelley, Sæmundsson, & Schøtt (2010) indicated that, in the wealthiest economies of the world, a boost in entrepreneurial training and education was associated with a significant increase in the total entrepreneurial rates in sixty per cent of the countries in 2008. However, it is important that the entrepreneurship training comes after a strong base of elementary, high school and college education (Baumol, Litan, Schramm, & Strom, 2011), to increase the knowledge necessary for successful entrepreneurship. Moreover, this training should not only focus on the identification of opportunities for entrepreneurship, but also on how to actually start the business. Lastly, entrepreneurial training should provide business support services to the entrepreneur (Terjesen et al., 2016). For example, in the form of advisory meetings, webinars, and networking.

Attained entrepreneurial education itself is not only important, but also the subjective perceptions and beliefs individuals have about their skills and knowledge significantly impact entrepreneurial activity (Arenius & Minniti, 2005). These subjective perceptions, for example, influence how somebody recognises and exploits opportunities (Kirzner, 1973; Shane, 2000). Moreover, subjective perceptions about the possibility of failure, the availability of favourable circumstances, and the expertise of fellow entrepreneurs are highly correlated with the decision of an individual to start their own company (Arenius & Minniti, 2005). Accordingly, Koellinger, Minniti, & Schade (2005) provided evidence that the perception of having adequate knowledge and skill has a considerable positive influence on the choice to become an entrepreneur. Even though most of these arguments are based on observations on the individual level, the same positive relationship is likely to hold at the country level. For example, Walker, Jeger, & Kopecki (2013) found a significant positive link between the percentage of individuals in a country that think they have the right knowledge and skills to become an entrepreneur and total entrepreneurial activity. Thus, based on the entrepreneurial training argument and the subjective perceptions argument the following seventh set of hypotheses is formulated:

H7A: A favourable cultural-cognitive dimension, in the form of more entrepreneurial training, positively affects the presence of entrepreneurial activity.

H7B: A favourable cultural-cognitive dimension, in the form of higher perceptions about own knowledge and skills, positively affects the presence of entrepreneurial activity.

The next paragraphs highlight existing literature that indicates whether the two institutions that cover the cultural-cognitive dimension are more essential for female or male entrepreneurship. Female

entrepreneurs in general have significantly lower subjective perceptions about their skills, knowledge, and the ability to run a business compared to male entrepreneurs (Minniti, 2010). This outcome especially exists in sectors that are traditionally considered as male sectors (Curado, Henriques, & Bontin, 2011; Wilson, Kickul, & Marlino, 2007). Therefore, Thébaud (2010) suggested that women and men take into account occupational gender typing when assessing their own knowledge and skills. Thébaud (2010) provided evidence that even though women in the United States had the same social, financial, and human capital level as men, they are only half as likely to indicate that they have the capacity to become an entrepreneur. Moreover, the portion of women that indicate that they have a fear of failure is significantly higher than men (Minniti, 2010). This higher fear of failure rate and the lower perceived capabilities has an extensive impact on the entrepreneurial activity rate of women, and may be a reason why there are fewer female entrepreneurs (Verheul, Uhlaner, & Thurik, 2003). Therefore, the positive impact of the perception of own skills and knowledge might be more important for female entrepreneurs compared to male entrepreneurs as female entrepreneurs in general have less confidence in their skills.

Entrepreneurial education and training can increase the tacit knowledge, such as general business skills and existing knowledge of financial management, of female entrepreneurs (Chowdhury & Audretsch, 2014). Moreover, by expanding the social capital of women via meetings and lessons with entrepreneurial mentors, women are able to extend their networks (Chowdhury & Audretsch, 2014; Terjesen et al., 2016). This expansion is beneficial since women have in general fewer men in their networks (Klyver & Terjesen, 2007), while men like to favour male entrepreneurs, for example, for the provision of venture capital (Greene, Brush, Hart, & Saparito, 2001). Entrepreneurial education and the facilitation of entrepreneurial mentors give women the opportunity to develop the confidence in their skills and knowledge and to reduce their fear of failure (Terjesen, et al., 2016). Entrepreneurial training and education are likely to be more important for female entrepreneurs compared to their male counterparts as women initially have lower perceived capabilities and a greater fear of failure. Therefore, based on the subjective perceptions argument and the entrepreneurial training argument the eighth set of hypotheses is formulated as follows:

H8A: The positive effect of a favourable cultural-cognitive dimension, in the form of more entrepreneurial training, on the presence of entrepreneurial activity tends to be stronger for female entrepreneurs compared to male entrepreneurs.

H8B: The positive effect of a favourable cultural-cognitive dimension, in the form of higher perceptions about own knowledge and skills, on the presence of entrepreneurial activity tends to be stronger for female entrepreneurs compared to male entrepreneurs.

2.3. Institutions, entrepreneurship, and economic growth

Existing literature provides evidence that institutions influence entrepreneurship, in a way that particular institutions affect the likelihood and quality of (female) entrepreneurship. Moreover, the connection between entrepreneurship and economic growth is dependent on the type of entrepreneurship measure used. Even though there is evidence for a positive association between female entrepreneurship and economic growth, the existing empirical literature on the topic is lacking. Furthermore, the literature that uses institutions and entrepreneurship as an ecosystem that influences economic growth is limited, and to my knowledge, not even existing for female entrepreneurship specifically. Notwithstanding, it is valuable to examine the influence of institutions in the relationship between (female) entrepreneurship and economic growth in a mediation model, as already indicated by Bosma et al. (2018). Institutions clarify and incentivise the endowment of entrepreneurship in a country, which is useful for explaining the variation in effects on economic growth in a particular country compared to other countries (Acs et al., 2008). For that in reason in this study, I am going to examine institutions that encourage productive female entrepreneurship via an entrepreneurial ecosystem to achieve higher growth rates.

Here it is important to distinguish between what I call “broad entrepreneurship” and “institutionally well-integrated entrepreneurship”. “Broad entrepreneurship” is used as the term for the most extensive definition of entrepreneurship that includes all types of entrepreneurship including entrepreneurship out of necessity or opportunity and productive-, unproductive- or even destructive entrepreneurship. This variable is incorporated as the main independent variable in the endogenous economic growth models and as the dependent variable in the endogenous entrepreneurship models. On the other hand, “institutionally well-integrated entrepreneurship” is the part of entrepreneurship that is incentivised by institutions. In the literature this is the part of entrepreneurship that is considered as productive entrepreneurship and as having the largest impact on economic growth (Acs et al., 2018). This variable is constructed in the 3SLS simultaneous equations models. Whereby, it is used as an independent variable in the economic growth equations of the 3SLS simultaneous equations models and as a dependent variable in the entrepreneurship equations of the 3SLS simultaneous equations models.

Aforementioned the impact on economic growth is not identical for every type of entrepreneurship. For example, entrepreneurship out of opportunity has an positive impact on economic development while necessity entrepreneurship is unrelated to economic growth (Acs & Varga, 2005). Broad entrepreneurship includes all types of entrepreneurship. Therefore, the coefficients of these broad entrepreneurship variables in the endogenous economic growth models are likely to be biased towards zero (Bosma et al., 2018). Secondly, the standard errors are expected to be inflated due to the same

reason, such that it is less likely that significant coefficients are estimated for the broad entrepreneurship variables in the endogenous growth models. On the contrary, it is expected that institutionally well-integrated entrepreneurship has the most impact on economic growth, especially as the used institutional variable are proposed to positively impact entrepreneurial activity. Combining these two arguments it is expected that institutionally well-integrated entrepreneurship is more valuable for economic growth than broad entrepreneurship. Hence, the ninth hypothesis can be formulated the following way:

H9: Institutionally well-integrated entrepreneurship is more beneficial for economic growth than broad entrepreneurship.

This study is an extension of the research by Bosma et al. (2018), as the focus is specifically on female entrepreneurship. Hence, a comparison is made between female-, total-, and male entrepreneurial activity. The previous hypotheses introduce the forecast that the positive effect of a favourable regulative, normative, and cultural cognitive dimension is stronger for female entrepreneurship than for male entrepreneurship. Secondly, it is expected that broad female entrepreneurship itself has a less substantial positive impact on economic growth than broad male entrepreneurship. However, the impact of the former is expected to be stronger than the effect of the latter as institutionally well-integrated entrepreneurship is expected to be more beneficial for economic growth than broad entrepreneurship. Therefore, it is predicted that institutionally well-integrated female entrepreneurship has a stronger positive impact on economic growth than institutionally well-integrated male entrepreneurship. Consequently, the tenth and final hypothesis is formulated as follows:

H10: Institutionally well-integrated female entrepreneurship is more beneficial for economic growth than institutionally well-integrated male entrepreneurship.

3. Empirical approach

3.1. Baseline economic growth model

This paper investigates whether institutional factors support female entrepreneurship via an entrepreneurial ecosystem to accomplish higher economic growth rates. In order to investigate this relationship, the empirical strategy of the paper by Bosma et al. (2018) is closely followed. First, a baseline economic growth model in conventional panel data notation is presented in equation (1)[1], to estimate the effect of entrepreneurial activity on economic growth:

$$\Delta \ln y_{it} = \ln y_{it} - \ln y_{it-1} = (\gamma - 1)\ln y_{it-1} + \beta_1\left(ent_{it}^{j}\right) + \beta_2(\ln s_{it}) \quad (1)$$

$$+ \beta_3(\ln hc_{it}) + \beta_4(n + g + \delta)_{it} + \eta_t + \mu_i + v_{it}$$

In equation (1), $\ln y_{it}$ denotes the logarithm of the gross domestic product (GDP) per capita. Ent_{it} stands for entrepreneurial activity per indicator *j*. Three separate measures (*j*=3) for entrepreneurship are included in the regressions, namely female, male, and total entrepreneurial activity. $\ln s_{it}$ represents the logarithm of the saving rate and $\ln hc_{it}$ stands for the logarithm of human capital. Furthermore, *n* and *g* are the exogenous growth rates in labour and technology and δ represents the constant depreciation rate. Lastly, η_t symbolises time dummies, μ_i presents country dummies, and v_{it} stands for the error term. The subscripts indicate whether the variables change per country *i* and/or over time *t*.

3.1.1. Concerns of endogeneity

Estimating the effect of entrepreneurship on economic growth via equation (1) generates biased results, as there are issues of endogeneity in the model. The estimated coefficients in equation (1) should, therefore, not be interpreted as causal effects but as associations. The endogeneity concerns exist in the model due to three main problems, namely reverse causality, omitted variable bias, and measurement error. These three problems are discussed separately in the next paragraphs. A reverse causality problem implies that the main explanatory variable does not only influence the dependent variable but the dependent variable also impacts the main explanatory variable (Wooldridge, 2014). Albeit that the most of the literature focuses on the influence of entrepreneurship on economic growth (e.g. Acs & Szerb, 2007; Audretsch & Keilbach, 2004; Van Stel et al., 2005), economic growth itself can also affect the likelihood of entrepreneurship. For example, Galindo & Méndez (2014) found evidence that economic activity promotes entrepreneurship. If entrepreneurship positively influences economic growth and economic growth also has a positive impact on entrepreneurship at the same time, then the true effect of entrepreneurial activity on economic growth is overestimated due to this reverse

[1] Equation (2) in Bosma et al. (2018).

causality problem. This overestimation suggests that a sort of upper bound of the actual causal effect is revealed, which means that the estimated effect is greater or equal to the true effect of entrepreneurship on economic growth.

A second reason for potential bias in the estimation of equation (1) is omitted variable bias. This problem occurs when one or more relevant variables are left out of the regression (Wooldridge, 2014). The potential omitted variable is a relevant variable in the equation if it is correlated with one of the explanatory variables in the model and if it is a determinant of the dependent variable. The main benefit of a panel data approach is that multiple countries are observed over time, which assists with controlling for time-invariant heterogeneity. An example of such a variable that creates time-invariant heterogeneity in the data is a cultural factor that remains the same in the timeframe of the study. Even though cultural factors are tough to measure and to observe, the included country dummies help with controlling for such omitted factors. Namely, the country dummies in the equation give the possibility of controlling for country-specific factors that do not change over time and are potentially correlated with the observed independent variables. Furthermore, time dummies are already included in the regression that capture the impact of aggregate time trends. For instance, the time dummies control for a trend of an increase in entrepreneurial activity in the group of countries during the timeframe of the study.

Equation (1) already incorporates a set of control variables that vary over time, such as the proxy for human capital and the savings rate. However, there are likely other time-variant factors that are not included in the model but are correlated with the explanatory variables and therefore bias the estimation of coefficients in equation (1). For example, in light of the present study, some institutional factors may potentially have such a biasing effect. The literature review made clear that the presence of entrepreneurship is dependent both on informal and formal institutions. These institutions, however, are not integrated in equation (1). An example of an institution that is correlated with entrepreneurship and is a determinant of economic growth is the size of the government. Literature indicates that a larger government has a negative influence on the likelihood of entrepreneurship, as it provides some kind of safety net that discourages individuals from becoming an entrepreneur (e.g. Bosma et al., 2018; Verheul et al., 2006; 2011). Furthermore, studies also present evidence that a large government negatively affects economic growth, due to lower productivity of labour in countries with a large government (e.g. Dar & AmirKhalkhali, 2002). Hence, leaving the size of government variable out of the regression creates a biased estimate. Omitting this variable from the regression creates a causal effect of entrepreneurship that is biased upwards compared to the true effect, as the government size of a country is negatively correlated with both entrepreneurship and economic growth.

The last potential factor that creates endogeneity in the model is measurement error. Measurement error refers to any systemic error in the accumulation of the data for a study (Wooldridge, 2014). It is characterised as any difference between the observed value and the actual value of a variable. The measurement problem in this study mainly exists due to the unbalanced data set. The data included in the model are derived from various data sources (see below). This combination of multiple data sources creates missing values in the data. Therefore, for a certain variable, data are not always available for every country and every time period used in this study. The missing data mostly come from variables extracted from the Global Entrepreneurship Monitor (GEM) database as some countries decided not to participate in every round of the survey. Therefore, not all countries are represented evenly in the model; a couple of countries have observations for all years in the timeframe while other countries only have three years of observations in total. Furthermore, even if countries participated in each survey of the GEM, there are still missing value for some variables for some years. For example, the perception of good career choice variable and the variable that indicates whether there is entrepreneurship training in higher education have multiple missing values in the data. These missing values could indicate that in a country, those particular questions are left out of the survey in the given year.

3.1.2. Estimation strategy

Following Bosma et al. (2018) and other papers in the entrepreneurship research field (e.g. Aparicio et al., 2016; Audretsch & Keilbach, 2008) correcting for the endogeneity in the model, a 3SLS regression specification is used. With this model, I simultaneously estimate the effect of institutions on entrepreneurship and on per capita economic growth. The 3SLS method goes one step further than the two-stage least squares method (2SLS) by estimating all relevant coefficients of the complete system simultaneously (Zellner & Theil, 1962). The estimation procedure follows three stages. The first stage incorporates getting estimates for the residuals for every relevant equation using a two-stage least squares method in every equation. In the second stage, the optimal instrument is computed, whereby the estimated residuals of stage one are used for the variance-covariance matrix. The third and last stage involves the simultaneous estimation of the relevant equations with the use of the optimal instrument (Zellner & Theil, 1962). In the estimation procedure, the dependent variables in both equations are seen as endogenous variables. Furthermore, the model allows for the possibility that the error terms of the different simultaneous equations are correlated with each other (Wooldridge, 2010; Zellner & Theil, 1962). Lastly, the model corrects the weighting matrix for potential heteroskedasticity of the standard error by using a Generalised Least Square (GLS) framework. This approach is also mentioned in the book of Wooldridge (2010). All these components together make the 3SLS model more efficient than the 2SLS model by assumption.

Intuitively, the 3SLS model mitigates the endogeneity problem in the model for two main reasons. The simultaneity bias in the model, which exists due to the bi-causality of economic growth and entrepreneurship, is corrected for as the model identifies the entrepreneurship variable and the economic growth variable as endogenous variables. Accordingly, the assumption that the entrepreneurship variable needs to be exogenous, which is not possible due to the simultaneity bias, is no longer essential. Secondly, the model corrects for the omitted variable bias, which exists due to institutions factors that are not incorporated in the economic growth regression, by using exogenous variables of the other equation as instruments for the endogenous variables. For this model, it means that the institutional variables in the entrepreneurship equation are used as instruments for the entrepreneurship variable in the economic growth equation.

To be more precise, with the 3SLS model, I establish a system of two equations where entrepreneurship enhancing institutions moderate the influence of (female) entrepreneurship on economic growth. However, both relationships are first examined separately in endogenous models. Therefore, as a first step, the association between entrepreneurship and economic growth will be estimated following the endogenous growth model in equation (1). This relationship is analysed with and without the different entrepreneurship variables incorporated in the regression. Secondly, the association between institutions and entrepreneurship is estimated by means of equation (2)[2].

$$ent_{it}^{j} = a_0 + \sum_{k=1}^{K} a_k \, inst_{it}^{k} + \sum_{m=1}^{M} a_m \, X_{it}^{m} + \varphi_t + \rho_i + \omega_{it} \qquad (2)$$

Where ent_{it}^{j} stands for entrepreneurial activity per indicator *j*. Three separate measures (*j*=3) for entrepreneurship are included in individual regressions, namely female, male, and total entrepreneurial activity. $Inst_{it}^{k}$ denotes a group of *k* institutional variables and X_{it}^{m} stands for a set of *m* control variables. Lastly, φ_t symbolises time dummies, ρ_i stands for the country dummies, and ω_{it} denotes the error term. The subscripts indicate if the variables change per country *i* and/or over time *t*.

As the last step, the association between institutions and the presence of entrepreneurship is used to analyse the effect of institutionally well-integrated entrepreneurship on economic growth with the 3SLS model specification. With this model, the economic growth equation (equation 1) and the entrepreneurial equation (equation 2) are estimated simultaneously, as mentioned before.

[2] Equation (3b) in Bosma et al. (2018).

3.1.3. Robustness checks

A 3SLS regression model is considered to be more efficient than 2SLS regression model due to the allowance of correlations among the error terms of the two simultaneous equations (Belsley, 1988). However, a robustness check is done with a 2SLS regression model to see if the results are robust to this alternative specification. Furthermore, the most straightforward way to measure the change in economic activity from year to year in a country is to use economic growth as the main variable. Whereby economic growth is measured as an annual change of the total production of goods and services in a particular country. Total factor productivity is frequently recognized as the prominent contributor to economic growth, as it incorporates the expansion in economic output of a country caused by an increase in efficiency or the introduction of new production technologies. Furthermore, the different total factor productivity indexes of countries are the main contributors to the differences in economic growth rates between countries according to Easterly & Levine (2001). For that reason, a second robustness check is done with the growth rate of the total factor productivity in a country as a dependent variable, to examine if the results are robust to this alternative dependent variable.

3.2. Data

3.2.1. Data sources and coverage

To execute the empirical strategy, a longitudinal data set containing observations of multiple countries over time is constructed using several data sources. Most of the data come from Penn World Table (PWT) by Feenstra, Inklaar, & Timmer (2015) and the GEM database. The PWT is an extensive database that contains information on income, output, input, and productivity of multiple countries over time. This database is therefore used to measure all development and growth-related variables in this analysis. The GEM database started in 1999 as a research project, and nowadays, governments and other stakeholders use the data to make policy decisions that support sustainable entrepreneurship and entrepreneurial ecosystems worldwide (GEM, 2020). The GEM database consists of the Adult Population Survey (APS) and the National Expert Survey (NES). The APS examines the characteristics, ambitions, and motivations of individuals that want to start their own company. Furthermore, information is also available about the opinion of society towards entrepreneurship in general. The survey is carried out by at least 2000 grown-ups in every country, to have a good national representation. The variables included in the APS GEM database are obtained initially at the individual level via the survey. These results are aggregated to get data points per country. The country observations are included in a national level APS that is used for this study. All samples included in the national level database are weighted according to gender and age patterns, to match the samples with the actual distribution of age and gender in the countries (Bosma, 2013). The NES looks at entrepreneurial framework conditions to measure how different circumstances foster or block the

start of new businesses in a particular country. This survey is administrated by at least 36 experts in every economy. This approach generates a score per condition between 0-5, by which a score of 5 means that the experts entirely agree with the statement. Lastly, the remainder of the data used for some institutional variables and control variables are obtained from the Fraser Institute Economic Freedom project[3], the Social Expenditure Database of the OECD, and the World Development Indicators (WDI) of the World Bank.

The focus is on the member countries of the OECD in this study, to have a diverse data set of developed countries that also includes non-European states, such as Japan and Australia. Moreover, only OECD countries are included in the analysis to construct a data set that is as complete as possible and contains the least amount of missing values. For example, the availability of GEM data for developing countries in Africa is minimal. Inclusion of African data points results in a sample that consists of a couple of observations for developing countries and many observations for developed OECD countries. The study sample is then a total misrepresentation of the actual sample of countries. Hence, the decision is made to only include the OECD member countries in the study sample. The OECD database does not provide data for every OECD country for the given variable. Therefore, not all OECD member countries can be included in the regression[4]. The data set also covers a time frame that is not that extensive compared to other models that examine economic growth (e.g. Barro, 1996; 2003; Omri, Daly, Rault, & Chaibi, 2015), as more limited data were available. All these decisions together result in a maximum total of 304 observations and a data set that includes 33 countries and covers a timeframe from 2003 up to and including 2015. A list of all countries in the sample can be found in Table A.1 in Appendix 1.

3.2.2. The model explaining economic growth

The data on the variables included in the economic growth equation are retrieved from the PWT database (Feenstra et al., 2015), except for the data on entrepreneurial activity. The dependent variable in the economic growth equation is the GDP per capita growth; this is measured with the first-differenced logarithm of expenditure-side real GDP per capita at current Purchasing Power Parity (PPP). Aforementioned, the relationship between entrepreneurship and economic growth is very complicated, for instance, it can take some time before new business formation influences economic growth (Carree & Thurik, 2008). Other studies, therefore, use, for example, five-year intervals to measure economic growth (e.g. Islam, 1995). However, the time span in entrepreneurial data is limited. Therefore, annual data is chosen for the GDP variable instead of an interval of more years. At

[3] https://www.fraserinstitute.org/economic-freedom/dataset
[4] Omitted OECD countries are Canada, Colombia, Greece, and Switzerland.

the end of the previous robustness check section, a robustness check is mentioned that incorporates the growth of factor productivity as a dependent variable instead of the GDP per capita growth. This variable is measured with the first-differenced logarithm of the total factor productivity level at current PPP. The total factor productivity in a country is measured relative to a base country. Throughout the sample of the PWT, the United States is used as the base country to measure productivity. Therefore, the United States gets a value of one for every year in the timeframe.

The main explanatory variable in the economic growth equation is entrepreneurial activity. This variable is measured using Total Early-Stage Entrepreneurial Activity (TEA). The available data for measuring this variable come from APS of the GEM. TEA computes the percentage of adults (18-64 years old) in a country that are nascent entrepreneurs or owners of a very young firm, where a young firm is classified as a company that has been operating for a maximum of 42 months. If an individual satisfies both criteria, he or she is still accounted for as one active person in the data. This variable is compatible with the labour economics approach of entrepreneurship, as it expresses entrepreneurship in terms of choice of occupation (Parker, 2005). Therefore, the reference category of this variable are all adults in a country with a different occupational choice such as wage workers, home workers, unemployed adults, and disabled/retired grownups. TEA is chosen over all other entrepreneurship variables as it is a dynamic variable that incorporates the "real" Schumpeterian entrepreneurs as well as the managerial business owners (Wong, Ho, & Autio, 2005). To distinguish between female and male entrepreneurs, separate regressions are conducted with female TEA and male TEA as the main explanatory variable. These variables come from the same GEM database as well. Logically, these variables measure the percentage of female or male adults that are nascent entrepreneurs or young business owners.

Following the model of Bosma et al. (2018), traditional input factors are included in the regression as control variables. The lagged variable of the logarithm of expenditure-side real GDP per capita at current PPP is included in the regression to limit the potential influence of the reverse causality problem even more (Van Stel et al., 2005). Both the saving rate and the population growth vary across countries; for that reason, different countries arrive at different steady states (Mankiw, Romer, & Weil, 1992). To measure the value of the logarithm of the savings rate, the logarithm of the share of gross capital formation at current PPP is taken from the PWT database. Secondly, to calculate the exogenous growth of labour, the logarithm of the annual population growth rate is used. Excluding a proxy for human capital in the economic growth equation makes the magnitude of the effect of the saving rate and the magnitude of the effect of the population growth too large (Mankiw et al., 1992). Therefore, a proxy for human capital is included in the economic growth regression. The data on the logarithm of the human capital index come from the PWT. This variable uses educational attainment based on the

average years of schooling in a country as a proxy for human capital (Barro & Lee, 2013). I assume that the exogenous growth rate of technology and the depreciation rate are constant over time and across countries. The growth rate of technology only presents the progress of knowledge, which is not specific for a country (Mankiw et al., 1992). Furthermore, according to Mankiw et al. (1992), it is also unlikely that the depreciation rate varies a lot across countries. Therefore, following Mankiw et al. (1992), the value of the exogenous growth rate of technology and the depreciation rate together is set at 0.05 for every country during the whole time period of the study.

Table 1 shows the descriptive statistics of the variables included in the economic growth regression model. The first variable in the table is the main dependent variable in the model. The mean value of this variable is positive, which indicates that on average, the different countries included in the sample had an annual increase in GDP during the timeframe of the study. On the other hand, the mean value for the alternative dependent variable, the first differenced logarithm of the total factor productivity, is negative. This negative mean value suggests that, on average, the annual change of factor productivity was negative during the timeframe of this study. All other variables in the table are explanatory variables included the model. Table 2 present the pairwise correlations of the same set of variables. There exists a very high significant correlation between TEA, TEA male, and TEA female. This result is very logical, as all three variables measure the total entrepreneurial activity in a country only focused on a specific part of the population or the whole population. Every type of TEA variable is used in a separate regression model, which makes the high pairwise correlation coefficient between the different TEA variables not a problem. All other pairwise correlation coefficients in the table are very low, which diminishes the concerns for multicollinearity.

Table 1: Descriptive statistics of the variables included in the economic growth equation.

Variables	N	Mean	St. dev.	Min	Max
Δ ln (GDP per capita)	304	0.026	0.043	-0.177	0.308
ln (GDP per capita)	304	10.42	0.353	9.319	11.47
Δ ln (Total Factor Productivity)	304	-0.007	0.036	-0.155	0.140
ln (Share of gross capital formation)	304	3.228	0.182	2.692	4.003
ln (Population growth)	304	0.001	0.006	-0.036	0.0149
ln (Human Capital Index)	304	1.165	0.117	0.754	1.320
TEA	304	7.649	3.960	1.399	26.83
TEA male	304	9.902	4.681	0.763	30.10
TEA female	304	5.399	3.509	1.044	23.68

Table 2: Pairwise correlation matrix of the variables included in the economic growth equation.

Variables	**1.**	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**
1. Δ ln GDP per capita	1.000								
2. ln GDP per capita	-0.185*	1.000							
3. Δ ln Total Factor Productivity	0.544*	-0.000	1.000						
4. ln Share of gross capital formation	0.223*	0.137*	-0.019	1.000					
5. ln Population growth	-0.053	0.041	-0.206*	-0.114*	1.000				
6. ln Human Capital Index	-0.172*	0.510*	0.035	-0.177*	0.054	1.000			
7. TEA	0.088	-0.255*	0.150*	-0.090	-0.105	-0.076	1.000		
8. TEA male	0.110	-0.241*	0.145*	-0.063	-0.132*	-0.069	0.978*	1.000	
9. TEA female	0.055	-0.265*	0.147*	-0.124*	-0.068	-0.084	0.961*	0.882*	1.000

Note: * denotes significance at the 5% level

3.2.3. The model explaining entrepreneurship

The main dependent variable in the entrepreneurial equation is entrepreneurial activity. This variable is measured the same way as the entrepreneurship variable in the economic growth equation, namely with the TEA variable of the APS of the GEM. Separate regressions are performed with total TEA, female TEA, and male TEA as the dependent variables. The main explanatory variables in the entrepreneurial equation are the institutions capturing the regulative, normative and cultural-cognitive dimension. For every dimension, institutional variables are included in the regression that potentially enhance female entrepreneurship as described in the literature review section. Two institutions are chosen per dimension to balance the importance of the three dimensions evenly. This choice is different in comparison with the paper of Bosma et al. (2018) as they include three regulative institutional variables, two normative institutional variables and one cultural-cognitive institutional variable in their regression models.

The regulative dimension includes the size of the government variable and the public expenditure on childcare variable. The data on the size of the government come from the Fraser Institute. This variable is based on five components (government consumption, transfers/subsidies, government enterprises/investment, marginal tax rate, and state-owned assets) that indicate to what extent countries use the political process to appropriate resources, goods, and services. The Fraser Institute links the components to economic freedom. For example, suppose the amount of government consumption increases in a country relative to private spending by individuals and companies. In that case, government decision making gets more priority compared to personal choice. This shift in priorities lowers the economic freedom. Another example, a high marginal tax rate is also an indication of more dependence on the government, since it lowers the rewards for labour which reduces economic freedom. All five components together generate a score between 0-10 that is based on miscellaneous sources that assess existing rules/regulations of the government. Originally a higher score means a higher level of economic freedom, and therefore less government involvement. However, I reverse coded this indicator such that a higher score means a larger government size with less economic freedom. The data of the second regulative institution, the public expenditure on childcare come from the OECD database. The OECD classified this variable as the total public spending on childhood education and care as a percentage of GDP. The database also contains data that divide the total expenditure into two categories, namely public spending on childhood care in one category, and the second category contains data on public spending on childhood education. However, this separation in the data is not available for eight countries in our sample. Therefore, the decision is made to use the general variable that indicates the total public spending on childhood education and care as a percentage of GDP to measure public expenditure on childcare.

The normative dimension captures to what extent people value entrepreneurship. Therefore, the two institutional normative variables that are included in the regression are perception about entrepreneurship as a good career choice and the media attention for entrepreneurship. The data for both variables come from the APS of the GEM. The first variable measures the percentage of the adult population that thinks that being an entrepreneur is a good career choice. The second variable measures the percentage of the adult population that thinks that entrepreneurship receives a lot of media attention in their country.

The cultural-cognitive dimension focusses on the availability of business skills education for entrepreneurship and the subjective perceptions of those skills by the entrepreneur himself. Therefore, the cultural-cognitive institutional variables that are enclosed in the model are perceived capabilities and educational training. The data on the former come from the APS of the GEM database and measures the percentage of the adult population that thinks that they have the necessary skills and knowledge to begin their firm. The data on educational training are obtained from the NES of the GEM database. The education training measures the extent to which training in starting and directing small and medium enterprises is included in higher education. This variable is preferred over the variable that measures the amount of educational training in primary and secondary education for the reason that in high-income countries, tertiary education positively influences entrepreneurship in general, while secondary education negatively influences entrepreneurship (Hartog, Parker, Van Stel, Thurik, 2010).

The entrepreneurship regression also includes control variables. The set of control variables is based on the paper of Bosma et al. (2018). Studies have shown that socio-demographic factors influence entrepreneurial behaviour (e.g. Arenius & Minniti; Langowitz & Minniti, 2007), especially the education level is of great importance. Although the evidence remains ambiguous at the individual level (Blanchflower, 2004; Alvarez & Urbano, 2012), at the macro level a higher participation rate in tertiary education is associated with a higher rate of individuals that are qualified and enthusiastic to be a large business owner (Van Praag & Van Stel, 2013). For that reason, a proxy for human capital is included in the entrepreneurial regression as a control variable. This variable is measured the same way as the human capital variable in the economic growth equation. The second control variable included in the regression is the logarithm of the unemployment rate as a percentage of the labour force modelled following the International Labour Organization estimate. The data of this variable come from the WDI of the World Bank. This variable is included in the regression, since the presence of new businesses tend to change with variation in the unemployment rate (e.g. Berglann, Moen, Røed, & Skogstrøm, 2011; Faria, Cuestas, & Mourelle, 2010).

Table 3 displays the descriptive statistics of all variables included in the entrepreneurship regression model. The maximum number of observations is lower for some institutional variables that are obtained from the GEM database. Furthermore, the mean values for TEA male and TEA female indicate that on average, there are fewer women entrepreneurs compared to men entrepreneurs, as expected beforehand. Table 4 displays the pairwise correlation matrix of all variables included in the model. Logically, also in this table, the significantly high correlation coefficients among the three different TEA variables are visible. Although the other pairwise correlation coefficients are somewhat higher in table 4 compared to Table 2, there is still no concern for multicollinearity. In Table 4, especially the size of the government variable and the perceived capabilities variable have correlation coefficients with other variables that are somewhat higher than other correlation coefficients displayed in the table.

Table 3: Descriptive statistics of the variables included in the entrepreneurship equation.

Variables	**N**	**Mean**	**St. dev.**	**Min**	**Max**
TEA	304	7.649	3.960	1.399	26.83
TEA male	304	9.902	4.681	0.763	30.10
TEA female	304	5.399	3.509	1.044	23.68
Regulative institutions					
Public childcare provision	304	0.669	0.342	0.072	1.639
Size of the government	304	3.983	0.975	1.773	5.912
Normative institutions					
Good career choice	285	57.44	12.05	25.35	87.41
Media attention	283	54.68	12.84	19.37	84.57
Cultural-cognitive institutions					
Perceived capabilities	304	42.76	10.57	9.000	67.38
Entrepreneurial training	266	2.816	0.296	2.060	3.810
ln (Human Capital Index)	304	1.165	0.117	0.754	1.320
ln (Unemployment rate)	304	1.954	0.444	0.811	3.262

Table 4: Pairwise correlation matrix of the variables included in the entrepreneurship equation.

Variables	**1.**	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10.**	**11.**
1. TEA	1.000										
2. TEA male	0.978*	1.000									
3. TEA female	0.961*	0.882	1.000								
4. Public childcare provision	-0.165*	-0.152*	-0.176*	1.000							
5. Size of the government	-0.568*	-0.550*	-0.557*	0.578*	1.000						
6. Good career choice	0.285*	0.301*	0.245*	-0.138*	-0.190*	1.000					
7. Media attention	0.280*	0.325*	0.195*	-0.002	-0.198*	0.117	1.000				
8. Perceived capabilities	0.600*	0.572*	0.594*	-0.243*	-0.389*	0.466*	0.200*	1.000			
9. Entrepreneurial training	0.269*	0.240*	0.290*	-0.066	-0.124*	0.122	0.092	0.220*	1.000		
10. ln (Human Capital Index)	-0.076	-0.069	-0.084	0.222*	0.150*	-0.377*	0.077	-0.223*	-0.100	1.000	
11. ln (Unemployment rate)	-0.032	-0.034	-0.019	-0.188*	-0.008	0.084	-0.341*	0.1676*	-0.081	-0.280*	1.000

Note: * denotes significance at the 5% level.

4. Results

4.1. Baseline results

4.1.1. Endogenous economic growth model

The Sargan-Hansen test[5] for over-identifying restrictions made clear that a fixed-effects panel regression model is preferred over a random effects panel regression to estimate the endogenous growth model. This outcome of the test suggests that there are time-invariant country-specific factors that are correlated with the error term. The country dummies are included in equation (1), as this was expected beforehand. Hence, the results in Table 5 are obtained via a fixed-effects panel regression model. The regression outcomes in Model 1A are similar to the results of Bosma et al. (2018), where the lagged GDP per capita variable is significantly negatively associated with economic growth. Furthermore, an increase in the share of gross capital formation and an increase in the Human Capital Index are both significantly related to an increase in economic growth. Although Bosma et al. (2018) found no link between population growth and economic growth in their sample of European countries, Model 1A indicates that in our sample of OECD member countries population growth is significantly negatively associated with economic growth. Bosma et al. (2018) indicated in their paper that the insignificant effect of the population growth variable might be due to the low variance in the variable in their sample. However, the variance of the population growth variable in our sample is almost identical to theirs. Therefore, the significant effect in this study might be due to the increase in the number of observations. This study incorporates a sample that includes more countries and covers a larger time frame compared to the paper by Bosma et al. (2018). That is, it uses 304 observations in total instead of 210 observations. Increasing the number of observations in an analysis sample, creates outcomes that are more reliable and precise as a result of higher statistical power.

To be able to test the first hypothesis that specifies that broad entrepreneurship has a positive impact on economic growth, the Total Entrepreneurial Activity (TEA) variable is added to the regression in Model 1B. Moreover, TEA male is included in Model 1C and TEA female is introduced in Model 1D to distinguish between female and male entrepreneurs to test the second hypothesis. The traditional input factors incorporated in the regression are mostly unaffected by the inclusion of the TEA variables,

[5] The fixed-effects model is based on the orthogonality condition that the regressors are uncorrelated with the idiosyncratic error. The random effects model goes one step further and uses an extra orthogonality condition that the regressors are uncorrelated with the group-specific error. This additional orthogonality condition can be seen as an overidentifying restriction. For that reason, the Sargan-Hansen test for over-identifying restrictions can be used to test whether a fixed-effects or random effects model should be used. Furthermore, it is not possible in statistical software package STATA to do a regular Hausman test when clustered standard errors are used in the model. For that reason, the Sargan-Hansen test is preferred over the Hausman test to test whether a random or fixed-effects model should be used.

except for the Human Capital Index variable. The marginal significant association between the Human Capital Index and economic growth disappears when TEA, TEA male or TEA female is included in the regression. This change might indicate that the entrepreneurship variables capture some of the effect of human capital on economic growth in Model 1A. This argument is reconcilable with the literature on entrepreneurship and economic growth, where entrepreneurship is seen as a way through which knowledge is commercialised and in turn leads to economic growth (Acs et al., 2012). However, the effect sizes of the Human Capital Index variable in Models 1B, 1C, and 1D are only a bit lower than the effect size of that variable in Model 1A. Furthermore, the Human Capital Index was only marginally significant in Model 1A. These outcomes taken together diminish the power of the argument.

The inclusion of the different broad TEA variables in Models 1B, 1C, and 1D increase the variance explained by the different independent and control variables in the model. However, broad TEA itself is unrelated to economic growth in Model 1B. Hence, there is no support found for hypothesis 1 in the data. Furthermore, also Models 1C and 1D fail to indicate a significant association between broad male TEA and economic growth and broad female TEA and economic growth. For that reason, there is no difference in the effect of female entrepreneurship on economic growth and the effect of male entrepreneurship on economic growth. This result leaves hypothesis 2 also unsupported.

Table 5: Estimation results of the link between entrepreneurship (Total Early-stage Entrepreneurship total/male/female) and economic growth in an endogenous growth model (Fixed-effects panel regressions).

	Model (1A)	Model (1B)	Model (1C)	Model (1D)
Variables		**Total**	**Male**	**Female**
ln (Lagged GDP per capita)	-0.185***	-0.208***	-0.207***	-0.203***
	(0.039)	(0.042)	(0.041)	(0.042)
ln (Share of gross capital formation)	0.108***	0.109***	0.108***	0.109***
	(0.030)	(0.028)	(0.028)	(0.029)
ln (Population growth)	-3.390***	-3.500***	-3.490***	-3.475***
	(1.104)	(1.096)	(1.123)	(1.065)
ln (Human capital index)	0.365*	0.309	0.314	0.320
	(0.195)	(0.200)	(0.197)	(0.201)
TEA		0.002		
		(0.001)		
TEA male			0.002	
			(0.001)	
TEA female				0.002
				(0.001)
Country dummies	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES
Constant	1.152***	1.436***	1.416***	1.372***
	(0.406)	(0.468)	(0.449)	(0.467)
Observations	304	304	304	304
Countries	33	33	33	33
Within *R*-squared	0.514	0.521	0.521	0.519

Notes: Standard errors clustered by country are shown in parentheses; The natural logarithm of GDP per capita growth in PPP is used as a dependent variable; ***, **, and * denote significance at the 1%, 5%, and 10% level.

4.1.2. Endogenous entrepreneurship model

As made clear in the previous chapters, the link between (female) entrepreneurship and economic growth is only a part of the entrepreneurial ecosystem. The institutional factors that incentive (female) productive entrepreneurship are also crucial for this ecosystem. A 3SLS approach is used to combine all three essential variables in one model using simultaneous equations. However, as a first step, the three different entrepreneurship variables are regressed separately on the six institutional variables that are expected to foster female entrepreneurship. The results of the endogenous entrepreneurship models are presented in Table 6. In Model 2A total entrepreneurial activity is used as the dependent variable, in Model 2B total male entrepreneurial activity is used as the dependent variable, and lastly in Model 2C total female entrepreneurial activity is used as the dependent variable. For these models, the Sargan-Hansen test for overidentifying restrictions also made clear that a fixed-effects model is

preferred over the random effects model. For that reason, the reported results in Table 6 are based on a fixed-effects panel regression model.

The results in Model 2A demonstrate that, concerning the regulative institutions, a larger government size is significantly associated with a decrease in total entrepreneurial activity. This negative coefficient is consistent with the expectation beforehand. This result, therefore, provides support for hypothesis 3A, that a favourable regulative dimension, in the form of a smaller government size, is positively related to the presence of entrepreneurial activity. However, the provision of childcare by the government does not seem to affect the presence of entrepreneurship. Estrin & Mickiewicz (2011) found the same insignificant result but then for females specifically. They indicated that the provision of childcare mostly influences high aspiration entrepreneurship rather than entrepreneurship as a whole. Accordingly, there is no support for hypothesis 3B as a favourable regulative dimension, in the form of more provision of childcare by the government, is unrelated to entrepreneurial activity.

The results in Model 2A indicate that there is no link between the normative institutions included in the regression and entrepreneurship, as both the good career choice variable and the media attention variable have an insignificant regression coefficient. The sign of the media attention variable is consistent with the expectation beforehand. In contrast, the good career choice variable has a negative sign where a positive effect was expected as well. Hence, there is no support found for hypothesis 5A and hypothesis 5B in the data. A favourable normative dimension, in the form of more media coverage for new businesses, is unrelated to the presence of entrepreneurial activity. Secondly, a favourable normative dimension, in the form of higher percentage of individuals that think that entrepreneurship is a good career choice, is also unassociated with the presence of entrepreneurial activity. Lastly, the results indicate that both cultural-cognitive institutions have a positive and strongly significant link with entrepreneurial activity, as anticipated previously. The positive and significant regressions estimated are consistent with hypothesis 7A and with hypothesis 7B. Namely, a favourable cultural-cognitive dimension, in the form of more entrepreneurial training, is positively related to the presence of entrepreneurial activity. Secondly, a favourable cultural-cognitive dimension, in the form of higher perceptions about own knowledge and skills, has positive link with total entrepreneurial activity.

The regression results for TEA male and TEA female specifically (Models 2B and 2C) are comparable with the general results in Model 2A. There are only small differences. For example, public childcare provision negatively influences male entrepreneurship, while the positive estimate for female entrepreneurs is higher in magnitude compared to the estimate for total entrepreneurial activity. However, the effect remains insignificant in both models. Furthermore, the good career choice variable has a positive estimate for TEA male and a negative estimate for TEA female. The magnitude of this

negative effect for TEA female is also higher compared to the result for total TEA. Again, however, these effects are insignificant for both models.

To be able to test the fourth, sixth, and eighth set of hypotheses the results for female entrepreneurs should be compared with the results for male entrepreneurs. Concerning the regulative dimension, there is no significant difference in the effect of public childcare provision on entrepreneurship between the two groups, for the reason that the variable is not significantly associated with TEA male or TEA female. Hence, there is no support found for hypothesis 4B in the data. However, a larger government size is more negatively related to TEA male than to TEA female. Not only does the magnitude of the effect differ between the two groups, also the level of significance differs. The link between a large government size and TEA is only marginally significant for female, while it is highly significant for males. The Wald test[6] even indicated that the effect of the size of the government on entrepreneurial activity is significantly higher for males compared to females at the one per cent significance level. These outcomes taken together make that there is no support found for hypothesis 4A: that a favourable regulative dimension, in the form of a smaller government size, is more important for female entrepreneurs compared to their male counterparts. The results even suggest the opposite, that a smaller government is more important for male entrepreneurs than for female entrepreneurs. A large government does not only produce a safety net in the form of the provision of social security which lowers entrepreneurship, it can also provide public goods such as education that are likely to boost entrepreneurship (Estrin & Mickiewicz, 2011). Furthermore, women have significantly lower perceptions of their skills and knowledge than men (Minniti, 2010). For that reason, an increase in the provision of education due to a larger government might even be partly beneficial for female entrepreneurs. This argument combined with the negative influence of an increase in the safety nets on entrepreneurship might give an indication why the impact of a large government is less negative for female entrepreneurs compared to male entrepreneurs.

Concerning the normative institutions, there is no difference in the effect for female entrepreneurs and male entrepreneurs. The coefficients for the good career choice variable and the media attention variable are insignificant in both Models 2B and 2C. There was already no support found for the general link between a favourable normative dimension and total entrepreneurship in model 2A, which left hypotheses 5A and 5B unsupported. Consequently, there is also no support for hypothesis 6A that the

[6] To conduct the Wald test, both regression equations (Models 2B and 2C) are combined into one model with a seemingly unrelated regression estimation (SUR). However, it is not possible to conduct a SUR regression in the statistical software package STATA with panel fixed-effects equations. Therefore, country dummies are manually included in the models to come to the desired fixed-effects panel regression specification. Correspondingly, there exist minimal differences in the standard errors between the equations included in the SUR estimation and the regression results displayed in Models 2B and 2C, as the models contain an unbalanced panel data set.

positive effect of a favourable normative dimension, in a form of more media attention for entrepreneurs, is stronger for female entrepreneurs compared to male entrepreneurs. Secondly, there is also no support for hypothesis 6B that the positive effect of a favourable normative dimension, in the form of more value for entrepreneurial exercise, is stronger for female entrepreneurs compared to male entrepreneurs. Overall, it can be concluded that there is no link between the normative institutions and the presence of entrepreneurship at all.

The cultural-cognitive dimension consists of the perceived capabilities variable and the existence of entrepreneurial training in higher education variable. Both variables have a positive and significant coefficient for female and male entrepreneurs in Models 2C and 2B. The effect sizes for both variables are larger for male entrepreneurs compared to female entrepreneurs. However, according to the Wald test, the positive effect of entrepreneurial training in higher education on the presence of entrepreneurship is not significantly different for male and female entrepreneurs. Hence, there is no support for hypothesis 8A, that the positive effect of favourable cultural-cognitive dimension, in the form of more entrepreneurial training, is stronger for female entrepreneurs compared to male entrepreneurs. Secondly, the Wald test indicated that the positive impact of an increase in perceived capabilities on entrepreneurship is significantly higher for male entrepreneurs in comparison with female entrepreneurs. However, this difference is only marginally significant at the ten per cent significance level. Thus, this result made clear that there is also no support found in the data for hypothesis 8B that the positive effect of favourable cultural cognitive dimension, in the form of higher perceptions about own knowledge and skills, is stronger for female entrepreneurs compared to male entrepreneurs. The results even slightly suggest that an increase in the perceptions about own knowledge and skills has a stronger positive impact on the presence of male entrepreneurship compared to the presence of female entrepreneurship. A potential explanation for this last finding can be linked to the masculine characteristics associated with entrepreneurship. Even though there is less emphasis on these masculine characteristics in the entrepreneurship field the last couple of years, both men and women still associate a good manager or entrepreneur with a male individual (Powell, Butterfield, & Parent, 2002). Furthermore, due to this male image female are more likely than men to underestimate their skills as an entrepreneur (Beyer, 1990; 1998; Beyer & Bowden, 1997). These arguments taken together suggest that even though the perceived capabilities increase, some women might still think that they cannot become an entrepreneur as it is a more male-oriented occupation. Accordingly, the positive effect of an increase in perceived capabilities on entrepreneurship is smaller for females than for males.

Table 6: Estimation results of the link between regulative, normative, cultural-cognitive institutions and entrepreneurship (Total Early-stage Entrepreneurship total/male/female) (Fixed-effects panel regressions).

	Model (2A)	Model (2B)	Model (2C)
Variables	**TEA total**	**TEA male**	**TEA female**
Public childcare provision	0.225	-0.173	0.544
	(2.176)	(2.944)	(1.588)
Size of the government	-2.203**	-2.825***	-1.584*
	(0.849)	(0.909)	(0.840)
Good career choice	-0.011	0.001	-0.023
	(0.042)	(0.059)	(0.029)
Media attention	0.010	0.017	0.004
	(0.033)	(0.040)	(0.028)
Perceived capabilities	0.104***	0.142***	0.065***
	(0.030)	(0.049)	(0.020)
Entrepreneurial training	1.572***	1.911***	1.244***
	(0.372)	(0.542)	(0.316)
ln (Human capital index)	33.640**	37.299*	30.327**
	(16.20)	(19.77)	(14.19)
ln (Unemployment rate)	-1.062	-1.142	-0.999
	(1.115)	(1.389)	(0.869)
Country dummies	YES	YES	YES
Year dummies	YES	YES	YES
Constant	-29.47	-32.16	-27.13*
	(17.41)	(21.87)	(14.89)
Observations	248	248	248
Countries	33	33	33
Within *R*-squared	0.446	0.431	0.394

Notes: Standard errors clustered by country are shown in parentheses; ***, **, and * denote significance at the 1%, 5%, and 10% level.

4.1.3. 3SLS simultaneous equations model

As a last step in the estimation process, the association between institutions and the presence of entrepreneurship is used to analyse the effect of institutionally well-integrated entrepreneurship on economic growth with the 3SLS simultaneous equations model[7]. The results are shown in Table 7, where Model 3A focuses on total entrepreneurial activity, Model 3B highlights male entrepreneurial activity, and Model 3C pays attention to female entrepreneurial activity.

[7] In the statistical software package STATA, it is not possible to include fixed-effects panel regression equations into the 3SLS simultaneous equations model. Therefore, country dummies are manually included in the simultaneous equations in Model 3A, Model 3B, and Model 3C in Table 7 to come to the desired fixed-effects panel regression specification.

The results of the entrepreneurship equations in the simultaneous equation models in Table 7[8] are very similar to the regression results of the endogenous entrepreneurship models in Table 6. There is only one major difference. The regression estimates for the effect of childcare provision by the government on the presence of entrepreneurship becomes negative and significant for total entrepreneurial activity, male entrepreneurship activity, and female entrepreneurial activity in Table 7. The coefficient for the male regression model is the largest in magnitude and the highest in significance compared to total and female entrepreneurial activity. This coefficient for childcare provision variable was already negative, but insignificant in Model 2B (Table 6) for male entrepreneurship. An explanation for this unexpected negative relationship between public childcare provision and total, female, and male entrepreneurship might be based on the argument from Elam & Terjesen (2010). They state that public childcare provision can be seen as a form of social security, similar to having a large government in a country. This supply of social security decreases the awareness of good business opportunities and therefore lowers the existence of entrepreneurship. Although Elam & Terjesen (2010) specifically focus on female entrepreneurship, the results in Table 7 show that the argument might also apply to male entrepreneurs. Another small difference between the entrepreneurship equation in Table 7 and Table 6 is that the unexpected adverse effect of the good career choice variable on female entrepreneurial activity becomes marginally significant in Model 3C. This result might indicate that a positive public opinion about entrepreneurship can even discourage women a little to become an entrepreneur.

The results of standard input variables included in the economic growth equation are mostly comparable with the results in Table 5 for all three models. Even though the magnitude of the effect of lagged GDP on economic growth increased a lot for total entrepreneurial activity, it remains almost the same for male and female entrepreneurial activity. The fitted values for *TEA, TEA male, and TEA female* as displayed in Models 3A, 3B, and 3C are constructed in the 3SLS approach with the simultaneous estimation of both equations (1) and (2). The explanatory exogenous variables included in the entrepreneurship regression are used as instruments for entrepreneurship in the economic growth regression. In that way, most of the institutional quality induced productive entrepreneurship is captured. The fitted value for *TEA* in Model 3A indicates that the part of total productive entrepreneurial activity that is influenced by institutions is positively and significantly related to

[8] In the earlier reported economic growth model (Table 5) and entrepreneurship model (Table 6), clustered standard errors at the country level were used because serial correlation can exist in the error term within a country over time. It is, therefore, preferable to include these same type of clustered standard errors in the 3SLS simultaneous equations models in Table 7 as well. However, in the statistical software package STATA, it is only possible to include the regular standard errors in a 3SLS regression model at this moment in time. This means that regular standard errors are used in the 3SLS regressions in Table 7, instead of the preferred clustered standard errors at the country level.

economic growth. The magnitude of this effect also increased compared to the estimate for broad TEA in Model 1A. This result gives support for hypothesis 9 that institutionally well-integrated total entrepreneurial activity is more beneficial for economic growth than broad total entrepreneurial activity as included in Table 5.

The results in Models 3B and 3C demonstrate that the fitted values for *TEA male* and *TEA female* both have a positive and significant effect on economic growth. These positive estimates are consistent with the estimate for institutionally well-integrated total entrepreneurial activity in Model 3A. However, there exists a difference in the coefficient displayed in all three models. The effect of *TEA female* is larger in magnitude compared to the effect of *TEA*, while the magnitude of the effect of *TEA male* is smaller than the magnitude of the effect of *TEA.* This outcome suggests that even though female entrepreneurship seems to be less affected by a favourable regulative institutional dimension and a favourable cultural-cognitive institutional dimension, the institutional integrated part of female entrepreneurship seems to add more to economic growth than the institutional integrated part of male entrepreneurship. This outcome is purely based on the magnitudes of the estimates. However, the effect is unlikely to be signficantly different for males and females. Based on the coefficients and standard errors presented in Model 3B and Model 3C, it can be concluded that the 95 per cent confidence intervals overlap for both variables. For that reason, I fail to conclude whether institutionally well-integrated female entrepreneurship adds more to economic growth than institutionally well-integrated male entrepreneurship. Hence, there is no support for hypothesis 10.

Table 7: Estimation results of the relationship between institutions, entrepreneurship (Total Early-stage Entrepreneurship total/male/female), and economic growth (3SLS simultaneous equations model).

	Model (3A)	Model (3B)	Model (3C)
Variables	**Total**	**Male**	**Female**
Economic growth equation			
ln (Lagged GDP per capita)	-0.261***	-0.244***	-0.278***
	(0.052)	(0.047)	(0.069)
ln (Share of gross capital formation)	0.092***	0.092***	0.0918***
	(0.016)	(0.016)	(0.018)
ln (Population growth)	-2.899**	-2.872**	-3.017**
	(1.143)	(1.123)	(1.207)
ln (Human capital index)	-0.291	-0.202	-0.463
	(0.278)	(0.266)	(0.334)
TEA	0.017***		
	(0.003)		
TEA male		0.012***	
		(0.002)	
TEA female			0.025***
			(0.005)
Country dummies	YES	YES	YES
Year dummies	YES	YES	YES
Constant	-25.854*	-27.60	-23.78*
	-15.557	(19.52)	(13.97)
Entrepreneurship equation			
Public childcare provision	-1.809*	-2.648**	-1.405*
	(0.955)	(1.219)	(0.780)
Size of the government	-2.218***	-2.941***	-1.513***
	(0.380)	(0.477)	(0.330)
Good career choice	-0.028	-0.027	-0.027*
	(0.018)	(0.023)	(0.014)
Media attention	0.007	0.012	0.003
	(0.014)	(0.018)	(0.011)
Perceived capabilities	0.097***	0.133***	0.062***
	(0.021)	(0.028)	(0.017)
Entrepreneurial training	1.069***	1.409***	0.663*
	(0.407)	(0.513)	(0.350)
ln (Human capital index)	32.855***	36.160**	29.410***
	(12.621)	(15.829)	(11.349)
ln (Unemployment rate)	-1.466***	-1.718***	-1.213***
	(0.432)	(0.552)	(0.349)
Country dummies	YES	YES	YES
Year dummies	YES	YES	YES
Constant	2.624***	2.355***	2.978***
	(0.628)	(0.566)	(0.824)
Observations	248	248	248
Countries	33	33	33

Notes: Standard errors are shown in parentheses; The natural logarithm of GDP per capita growth in PPP is used as a dependent variable in all the economic growth equations; The dependent variable in the entrepreneurship equations is TEA in Model 3A, TEA male in Model 3B, and TEA female in Model 3C; In the economic growth equations are *TEA*, *TEA male*, and *TEA female* replaced with the fitted values from the first stage entrepreneurship regressions; ***, **, and * denote significance at the 1%, 5%, and 10% level.

4.2. Robustness checks

The upcoming paragraphs in this chapter cover the results of the two robustness checks that are executed and explained more thoroughly in chapter 3. The first robustness exercise examines the relationship between institutions, entrepreneurship, and economic growth in a 2SLS regression model instead of a 3SLS regression model to examine if the results are robust to this alternative specification. The second and last robustness check uses an alternative dependent variable in the 3SLS simultaneous regression model to scrutinize the link between institutions, entrepreneurship, and productivity growth in order to see if an entrepreneurial ecosystem also influences this alternative economic variable. Total factor productivity growth is chosen as it is recognized as the most important contributor to economic growth. This variable measures the part of the economic development of a country that is established due to an increase in efficiency or due to the adoption of new production technologies.

The 3SLS method used for the regression results displayed in Table 7 is more efficient than the 2SLS model by assumption. Namely, the 3SLS simultaneous equations model allows the error terms of the two simultaneous equations to be correlated (Belsley, 1988). However, in footnote 8, I explained why it would be optimal to use clustered standard errors although it is not possible to use them in STATA's 3SLS implementation. Therefore, I reran the models using a 2SLS specification using clustered standard errors to see whether the main results are driven by the inability to cluster the standard errors. The 2SLS results are displayed in Table 8. The predicted values of Models 2A, 2B, and 2C in Table 6 are used as instruments for *TEA*, *TEA male*, and *TEA female* in Table 8. The regression estimates of the standard input variables included in the models are quite similar to the results for the same input variables in all three economic growth equations in Table 7. The only major difference is that the significant effect of population growth on economic growth disappeared in all models.

Furthermore, the magnitude of the effect of lagged GDP on economic growth and the magnitude of the effect of the share of gross capital formation on economic growth increased a little bit for all types of entrepreneurial activity. The estimates for the fitted values for the three entrepreneurial activity variables are almost the same as the estimates for the fitted values in the 3SLS model. This similarity indicates that institutionally well-integrated total entrepreneurial activity is beneficial for economic growth. Based on the coefficients and standard errors presented in Model 4B and Model 4C, it can be concluded that also the 95 per cent confidence intervals for *TEA male* and *TEA female* overlap in these 2SLS regression models. Therefore, there is also no indication that institutionally well-integrated female entrepreneurial activity had a stronger impact on economic growth than institutionally well-integrated male entrepreneurial activity in these 2SLS regression models. Hence, it can be concluded that the inability to cluster standard errors in the 3SLS specification has not driven the results.

Table 8: Estimation results of the relationship between institutions, entrepreneurship (Total Early-stage Entrepreneurship total/male/female), and economic growth (2SLS Fixed-effects panel regressions).

	Model (4A)	Model (4B)	Model (4C)
Variables	**Total**	**Male**	**Female**
ln (Lagged GDP per capita)	-0.412***	-0.376***	-0.471***
	(0.092)	(0.083)	(0.120)
ln (Share of gross capital formation)	0.126***	0.119***	0.139***
	(0.030)	(0.029)	(0.034)
ln (Population growth)	-2.859	-2.765	-2.992
	(2.488)	(2.726)	(2.065)
ln (Human capital index)	-0.031	0.024	-0.120
	(0.356)	(0.320)	(0.474)
TEA	0.018***		
	(0.005)		
TEA male		0.013***	
		(0.003)	
TEA female			0.027***
			(0.010)
Country dummies	YES	YES	YES
Year dummies	YES	YES	YES
Constant	3.744***	3.339***	4.404***
	(1.065)	(0.910)	(1.434)
Observations	248	248	248
Countries	33	33	33

Notes: Standard errors clustered by country are shown in parentheses; The natural logarithm of GDP per capita growth in PPP is used as a dependent variable; The predicted values of Model 2A, 2B, and 2C in Table 6 are used as instruments for *TEA*, *TEA male*, and *TEA female*, where the predicted value of Model 2A is used as an instrument for *TEA*, where the predicted value of Model 2B is used as an instrument for *TEA male*, and where the predicted value of Model 2C is used as an instrument for *TEA female*; ***, **, and * denote significance at the 1%, 5%, 10% level.

The most straightforward way to measure the change in economic activity from year to year is to use economic growth as the main variable. However, it is also possible to measure economic development with the main driver of economic growth, namely the total factor productivity in a country. Therefore, Table 9[9] shows the results of a 3SLS model with productivity growth as a dependent variable in the growth equation. Consistent with the procedure for the economic growth model, as a first step, endogenous productivity growth models are obtained with the three different entrepreneurial activity variables acting as the independent variables. These results can be found in Table A.2 in Appendix 2. The results indicate that broad total entrepreneurial activity, broad male entrepreneurial activity, and

[9] As mentioned before in footnote 8, in the statistical software package STATA it is only possible to include the regular standard errors in a 3SLS regression model at this moment in time. This means that regular standard errors are used in the 3SLS regressions in Table 9, instead of the preferred clustered standard errors at the country level.

broad female entrepreneurial activity do not have a significant influence on productivity growth. Naturally, the results for the endogenous entrepreneurship models for productivity growth are the same as the results in Table 6, as the growth variable is not included in this regression. However, there exists a small difference between the results of the entrepreneurship equation included in the simultaneous equations model with economic growth in Table 7 and the entrepreneurship equation included the simultaneous equations model with productivity growth in Table 9. Namely, in the productivity growth model, the marginal significant negative effect of public childcare provision on TEA, TEA male, TEA female disappeared. This disappearance might have happened because in a 3SLS simultaneous equations model both dependent variables are seen as endogenous, and the exogenous variables of the other equation are used as instruments for these endogenous variables. Accordingly, the incorporation of the lagged total factor productivity variable in the productivity growth equation instead of the lagged GDP per capita variable as used in the economic growth equation might cause this minimal difference.

The results of the productivity growth equation in the simultaneous equations model in Table 9 make clear that an increase in the lagged total factor productivity and an increase in the share of gross capital formation are both negatively related to productivity growth. The former is consistent with the results for economic growth, while the latter is the opposite result in comparison with the economic growth model. This result indicates that more annual savings discourage productivity growth. Lastly, both the population growth and the human capital index do not seem to influence productivity growth significantly. The estimates for the fitted values for the three TEA variables are all positive and significant. These results, therefore, provide evidence for the fact that institutional well-integrated entrepreneurial activity also positively influences productivity growth. Furthermore, the effect size for female entrepreneurship is also larger than the effect size for male entrepreneurship with this alternative dependent variable. However, the economic significance of this effect is somewhat lower compared to the economic growth model, as one unit increase in institutionally well-integrated female entrepreneurial activity only increases productivity growth with 0.01. Logically, this economic relevance is even smaller for total and male entrepreneurial activity. Moreover, the coefficients and standard errors for *TEA male* and *TEA female* indicate that the 95 per cent confidence intervals overal for both variables. Accordingly, there is no reason to believe that institutionally well-integrated female entrepreneurial activity has a more substantial impact on productivity growth than institutionally well-integrated male entrepreneurial activity. Table A.3 in Appendix 2 displays the results for the productivity growth models with the alternative 2SLS specification. These regression estimates are very similar to the results in Table 9 concerning sign and significance. Hence, it can be concluded that the choice for the dependent variable to measure economic activity has not driven the results.

Table 9: Estimation results of the relationship between institutions, entrepreneurship (Total Early-stage Entrepreneurship total/male/female), and productivity growth (3SLS simultaneous equations model)

	Model (5A)	Model (5B)	Model (5C)
Variables	**Total**	**Male**	**Female**
Productivity growth equation			
ln (Lagged Total Factor Productivity)	-0.260***	-0.254***	-0.274***
	(0.045)	(0.043)	(0.050)
ln (Share of gross capital formation)	-0.059***	-0.057***	-0.062***
	(0.017)	(0.017)	(0.017)
ln (Population growth)	-0.264	-0.285	-0.271
	(1.236)	(1.236)	(1.243)
ln (Human capital index)	-0.271	-0.228	-0.340
	(0.253)	(0.247)	(0.273)
TEA	0.007**		
	(0.003)		
TEA male		0.005***	
		(0.002)	
TEA female			0.010***
			(0.004)
Country dummies	YES	YES	YES
Year dummies	YES	YES	YES
Constant	0.409	0.360	0.490
	(0.313)	(0.307)	(0.332)
Entrepreneurship equation			
Public childcare provision	-0.432	-0.905	-0.211
	(1.089)	(1.376)	(0.946)
Size of the government	-2.215***	-2.860***	-1.581***
	(0.425)	(0.533)	(0.378)
Good career choice	-0.030	-0.024	-0.038**
	(0.022)	(0.028)	(0.019)
Media attention	0.020	0.028	0.015
	(0.017)	(0.022)	(0.015)
Perceived capabilities	0.100***	0.138***	0.062***
	(0.026)	(0.032)	(0.022)
Entrepreneurial training	1.327***	1.650***	0.945**
	(0.475)	(0.596)	(0.422)
ln (Human capital index)	33.893***	37.547**	30.560***
	(12.782)	(16.015)	(11.548)
ln (Unemployment rate)	-1.598***	-1.807***	-1.530***
	(0.496)	(0.625)	(0.437)
Country dummies	YES	YES	YES
Year dummies	YES	YES	YES
Constant	-29.120*	-32.258	-25.903*
	(15.830)	(19.837)	(14.287)
Observations	248	248	248
Countries	33	33	33

Notes: Standard errors are shown in parentheses; The natural logarithm of Total Factor Productivity growth in PPP is used as a dependent variable; The dependent variables in the entrepreneurship equations are TEA in Model 5A, TEA male in Model 5B, and TEA female in Model 5C; In the economic growth equations are TEA, TEA male, and TEA female replaced with the fitted values from the first stage entrepreneurship regressions; ***, **, and * denote significance at the 1%, 5%, and 10% level.

5. Conclusion

This paper examined the relationship between institutions, (female) entrepreneurship, and economic growth with an unbalanced longitudinal panel data set of OECD member countries. The empirical strategy followed a three-step procedure to obtain a final conclusion about the main topic. Based on the first set of results, it can be concluded that entrepreneurship does not have an impact on economic growth if it is measured with the broadest definition of entrepreneurship. This broad definition of entrepreneurship includes all types of entrepreneurship such as entrepreneurship out of necessity, entrepreneurship out of opportunity, productive entrepreneurship, unproductive entrepreneurship and even destructive entrepreneurship. This conclusion does not only hold for total entrepreneurial activity, but also for female and male entrepreneurial activity. Furthermore, this conclusion remains also valid when productivity growth is used as a dependent variable. This conclusion can be linked to the argument of Bruns et al. (2017) who indicated that the relationship between entrepreneurship and economic growth is multi-interpretable because studies use all kinds of definitions to measure entrepreneurship. However, not all types of entrepreneurship that are incorporated in the broad definition of entrepreneurship, have a significant impact on economic growth.

The second set of results makes clear that especially a favourable cultural-cognitive dimension is beneficial to entrepreneurship. More entrepreneurial training and higher perceived capabilities increase the presence of entrepreneurial activity. In particular for male entrepreneurs is the effect of the latter significantly higher compared to female entrepreneurs. Concerning the regulative institutions, it can be concluded that only a small government is significantly associated with more male, female, and total entrepreneurial activity. A small government increases male entrepreneurial activity even more compared to female entrepreneurial activity. Lastly, childcare provision by the government, media attention for entrepreneurship, and whether entrepreneurship is seen as a good career choice are all unrelated to entrepreneurial activity. For policy implications, these outcomes indicate that education should not only be focused on improving the cognitive skills of individuals to increase the confidence in individuals own skills and knowledge. Education should also include training specifically for entrepreneurs. However, this education structure must be established without increasing the size of the government.

Based on the last and most important set of results, it can be concluded that the part of entrepreneurship that is incentivised by institutions has a positive impact on economic growth. This conclusion is consistent with the study of Bosma et al. (2018). Furthermore, support is found for this conclusion for institutionally well-integrated total, female, and male entrepreneurial activity. Logically, the effect of institutionally well-integrated entrepreneurial activity on economic growth is stronger

than the effect of broad entrepreneurial activity on economic growth, as I fail to find support for any relationship between broad entrepreneurial activity and economic growth. Moreover, there does not seem to be any significant difference between the positive effect of institutionally well-integrated female entrepreneurship on economic growth and the positive effect of institutionally well-integrated male entrepreneurship on economic growth. Therefore, no conclusion can be drawn whether female entrepreneurship incentivised by institutions or male entrepreneurship incentivised by institutions is more important for the economic development of a country.

Combining the previous three bundles of conclusions, it can be concluded that entrepreneurship is beneficial for economic growth when it is productive entrepreneurship. This argument suggests that is must be entrepreneurship that is incentivised by institutions, instead of broad entrepreneurship that also includes all types of unproductive entrepreneurship. Especially favourable cultural-cognitive institutions and a small government are good institutions that foster entrepreneurship. Lastly, both female productive entrepreneurship and male productive entrepreneurship are beneficial for economic growth as there is no statistically significant difference between both positive effects. For policy implications, this conclusion suggests that governments should aim attention to incentivising productive entrepreneurship, with policies primarily focusing on promoting the cultural-cognitive dimension and reducing the size of the government, to foster economic growth. These public policies should be balanced between male and female entrepreneurs, as both groups are essential for promoting economic growth.

5.1. Limitations and recommendations for future research

Even though this study provides an essential contribution to the literature on (female) entrepreneurship, institutions, and economic growth, several limitations and suggestions for future research can be made. Aforementioned in footnote 7 and 8, at this moment in time it is not possible to include a fixed-effects panel specification or clustered standard errors in a 3SLS simultaneous equations model in the statistical software package STATA. Even though the robustness checks conducted with the 2SLS regression model indicated that the results are not driven by the inability to cluster the standard errors or the manual inclusion of the country dummies, it is more appropriate to use the exact same assumptions and specifications in the 3SLS simultaneous equations models as in the endogenous economic growth models and endogenous entrepreneurship models. Therefore, future research might exploit the possibility to do so when StataCorp decides to include these options in the 3SLS simultaneous equations model in their statistical software package.

The results presented in this study about the entrepreneurship equations are only based on the six institutions included in the model that cover the regulative, normative, and the cultural-cognitive

dimension. Even though the choices for these variables are based on the previous literature, it is a good suggestion for future research to also include other institutional variables in the model. In that way, it can be verified if the results are the same for these alternative institutional variables. Furthermore, it provides an opportunity to analyse whether the most relevant institutions, that foster female entrepreneurship, are indeed used in this study. For example, the results of this study indicate that the normative institutions are unrelated to entrepreneurship. Even though this result is consistent with the study of Bosma et al. (2018) that uses one other normative institutional variable, it can still be the case that different normative institutions provide different results. A further motivation for this argument can be found in the review paper of Urbano et al. (2019). The authors of this paper indicated that different quantitative and qualitative studies presented evidence that informal institutions, such as normative institutions, have a higher positive impact on entrepreneurship than formal institutions.

Lastly, the conclusions made in this research are based on a sample of OECD member countries. This restriction makes it harder to generalise the results to a larger sample of countries. For example, in lower-income countries, there is more entrepreneurship out of necessity, while in high-income countries there is more entrepreneurship out of opportunity (Acs et al., 2008). Therefore, the results might be different if a sample of low-income countries is used instead of a sample of high-income countries. Even though the decision is made to include only OECD member countries to have a complete as possible data set, for future research it may be beneficial to incorporate other countries in the sample as well. This enlargement of the number of countries in the study sample is only possible if the GEM remains expanding their database with other countries and new data points.

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Appendix 1: Countries

Table A.1: List of countries and number of years included in the sample per country.

Countries included in the sample	Number of years included in the sample per country
Australia	8
Austria	4
Belgium	13
Chile	12
Czech Republic	3
Denmark	11
Estonia	4
Finland	13
France	12
Germany	12
Hungary	12
Iceland	8
Ireland	12
Israel	8
Italy	12
Japan	11
Latvia	10
Lithuania	4
Luxembourg	3
Mexico	9
The Netherlands	13
New Zealand	3
Norway	13
Poland	5
Portugal	8
Slovakia	5
Slovenia	13
South Korea	6
Spain	13
Sweden	11
Turkey	7
United Kingdom	13
United States	13
Total	304

Appendix 2: Additional results

Table A.2: Estimations results of the link between entrepreneurship (Total Early-stage Entrepreneurship total/male/female) and productivity growth in an endogenous growth model (Fixed-effects panel regressions).

	Model (6A)	**Model (6B)**	**Model (6C)**	**Model (6D)**
Variables		**Total**	**Male**	**Female**
ln (Lagged Total Factor Productivity)	-0.212***	-0.218***	-0.217***	-0.219***
	(0.043)	(0.045)	(0.044)	(0.045)
ln (Share of gross capital formation)	-0.050*	-0.051*	-0.051*	-0.051*
	(0.026)	(0.026)	(0.026)	(0.026)
ln (Population growth)	-1.127	-1.188	-1.180	-1.180
	(1.146)	(1.161)	(1.164)	(1.156)
ln (Human capital index)	0.066	0.022	0.030	0.022
	(0.189)	(0.185)	(0.185)	(0.186)
TEA		0.001		
		(0.001)		
TEA male			0.001	
			(0.001)	
TEA female				0.001
				(0.001)
Country dummies	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES
Constant	0.0507	0.0975	0.0892	0.0972
	(0.222)	(0.223)	(0.222)	(0.223)
Observations	304	304	304	304
Countries	33	33	33	33
Within *R*-squared	0.298	0.300	0.299	0.300

Notes: Standard errors clustered by country are shown in parentheses; The natural logarithm of Total Factor Productivity growth in PPP is used as a dependent variable; ***, **, and * denote significance at the 1%, 5%, and 10% level.

Table A.3: Estimation results of the relationship between institutions, entrepreneurship (Total Early-stage Entrepreneurship total/male/female), and productivity growth (2SLS Fixed-effects panel regressions).

	Model (7A)	**Model (7B)**	**Model (7C)**
Variables	**Total**	**Male**	**Female**
ln (Lagged Total Factor Productivity)	-0.299***	-0.281***	-0.332***
	(0.0652)	(0.0601)	(0.0767)
ln (Share of gross capital formation)	-0.052**	-0.052**	-0.051**
	(0.0220)	(0.0217)	(0.0235)
ln (Population growth)	-0.603	-0.618	-0.529
	(1.718)	(1.774)	(1.629)
ln (Human capital index)	-0.330	-0.276	-0.422
	(0.288)	(0.268)	(0.340)
TEA	0.009**		
	(0.004)		
TEA male		0.006**	
		(0.003)	
TEA female			0.013**
			(0.006)
Country dummies	YES	YES	YES
Year dummies	YES	YES	YES
Constant	0.439	0.383	0.534
	(0.311)	(0.289)	(0.370)
Observations	248	248	248
Countries	33	33	33

Notes: Standard errors clustered by country are shown in parentheses; The natural logarithm of Total Factor Productivity growth in PPP is used as a dependent variable; The predicted values of Model 2A, 2B, and 2C in Table 6 are used as instruments for TEA, TEA male, and TEA female, where the predicted value of Model 2A is used as an instrument for TEA, where the predicted value of Model 2B is used as an instrument for TEA male, and where the predicted value of Model 2C is used as an instrument for TEA female; ***, **, and * denote significance at the 1%, 5%, and 10% level.