

A CROSS-NATIONAL STUDY OF THE DRIVERS OF FINTECH STARTUPS: THE ROLE OF CULTURE

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Signature

Handwritten signatures of Jenten Lefevre and Toon Germonpré in blue ink.

Preface

This dissertation contains a cross-national study of the cultural drivers of fintech startups and is written in the context of our graduation within the Master of Science in Business Economics – Corporate Finance. First of all, we would like to thank our promotor Prof. Dr. Tom Vanacker for his guidance and support throughout the preparation of our master’s thesis. Furthermore, we would like to express our sincere gratitude towards Dimitrios Kolokas, who works as a doctoral researcher at Vlerick Business School. In collaboration with him, we were able to thoroughly research this topic.

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List of abbreviations

A	Agreeableness – Big Five personality trait
AIC	Akaike Information Criterion
BA	Business Angel
C	Conscientiousness – Big Five personality trait
CEO	Chief Executive Officer
E	Extraversion – Big Five personality trait
EI	Entrepreneurial Intention
EU	European Union
GDP	Gross Domestic Product

ICT	Information and Communication Technology
IND	Individualism index – Hofstede cultural dimension
IMF	International Monetary Fund
LN	Natural logarithm
LTO	Long-Term Orientation index – Hofstede cultural dimension
M	Million
MAS	Masculinity index – Hofstede cultural dimension
N / ES	Neuroticism / Emotional Stability – Big Five personality trait
O	Openness (to experience) – Big Five personality trait
PDI	Power Distance Index – Hofstede cultural dimension
SIC	Schwarz Information Criterion
S&P	Standard & Poor's
UA	Uncertainty Avoidance index – Hofstede cultural dimension
UK	United Kingdom
US	United States
VC	Venture capital
WEF	World Economic Forum

1. Introduction

“You have to serve financial markets, re-imagine how money can be managed and moved because there’s going to be more change in the next five years in financial services than happened in the past 30” ~ Dan Schulman, CEO PayPal

The five classical functions of the financial sector are: making and receiving payments, saving to invest or consume later, borrowing to be able to consume or invest now, the insurance of risks and advice on all the above. Nowadays, all these five dimensions know a new wave of technological initiatives which is accelerating change in the global financial landscape (He, et al., 2017). This emerging wave is called fintech or financial technologies and can be defined as financial solutions based on information technology (Douglas et al., 2016; Keke et al., 2018; Pollari, 2016). The application of these technologies may be business-to-consumer or business-to-business and are often found in applications for mobile devices such as M-Pesa and PayPal. As documented in the literature review, the fintech industry has experienced a substantial growth in recent years. It has led to fierce competition but also to cooperation with financial incumbents, revolutionising financial services and products.

But what drives the formation of fintech startups? Previous studies have focused on specific fintech sectors such as crowdfunding behaviour (Burtch et al., 2015), home bias in crowdfunding (Lin & Viswanathan, 2016) or the success of crowdfunded ventures (Mollick, 2013). Although these studies offer insight into the success of specific fintech sectors, only one study that explains the startup rate of fintech companies as an industry can be found. Haddad and Hornuf (2018) investigated the economic and technological determinants of fintech startups. They find that fintech companies are more likely to be formed in countries that have a well-developed economy and where venture capital is available.

Other than the aforementioned paper, very little research has tried to explain the startup rates of fintech companies in general. There are however indications that cultural variables are related to high innovation and high growth entrepreneurship and therefore possibly also to startup rates (Frese, Rauch, & Zhao, 2012). We try to fill this scientific lacuna by building a theory based on

cultural dimensions, personality traits and use correlation with entrepreneurship and innovation to link and predict the possible explanatory power of culture for the emergence of startup formations in the fintech industry.

We contribute to literature by replicating a study on fintech startups and exploring the impact of culture on startup rates. Bettis et al. (2016) argue that replication studies are critical for building a body of research knowledge. A replication study for fintech startups is particularly relevant due to the extremely limited research that has been done. Due to the nature of our research topic, we test the robustness of the findings of Haddad and Hornuf (2018) to a different model and added different dimensions measuring cross-country cultural values. Finally, we also examine interactions between cultural dimensions to explain fintech startup rates. Our results indicate that culture may/may not impact startup rates in an emerging sector and could therefore be relevant for research in this field. In the following sections this paper will discuss:

- A literature review of fintech and culture and its influence on entrepreneurship, innovation and investments;
- The introduction of our hypothesizes;
- The description of our variables and data;
- The descriptive and regression results;
- A summary of our contribution and implications.

2. Literature review

The literature review starts by showing the relevance of the fintech industry and its growth in recent years. In the second section, culture is explained using Hofstede's cultural dimensions. This section also reviews literature that links cultural dimensions with entrepreneurship and innovation. Because personality traits can be linked to culture, the third section reviews the relationship between the Big Five personality traits and entrepreneurship, firm performance and innovation. The next section describes the relationship between the Big Five and Hofstede's cultural dimensions, which is required to formulate hypotheses based on both measures. Finally, the fifth section reviews literature which relates to the link between investments in young ventures and cultural dimensions.

2.1 Fintech

Several forces are driving the interest in fintech. On the one hand, technologies allow the creation of new products and services. These technologies may bring cost-savings to incumbents or easily give market entrants access to profitable markets (Keke et al., 2018). On the other hand, customer behaviour and demand are also changing. Consumers adopt new technologies more quickly than before and they demand more convenience and immediacy (Pollari I., 2016). The adaptation of mobile devices and digital platforms allows fintech companies to easily access markets and respond to consumer demands. In Australia, for example, the alternative financing market for fintech companies increased from 24 million US dollar in 2013 to over 348 million US dollar in 2015 (Pollari I., 2016).

Businesses developing or exploiting financial technologies may compete against or collaborate with financial incumbents. The entities developing new financial technologies in collaboration with financial incumbents are not always independent organisations but may be owned by a financial institution. One of the reasons new ventures are able to attract considerable customer bases are the declining levels of trust in major financial institutions. Pollari I. (2016) argues that "review communities" give customers a more objective opinion of service providers or products than information of major financial institutions that they distribute themselves. Possible

shortcomings in service by incumbents are therefore more easily discovered by customers, who will look for an alternative service provider. Stewart and Jürjens (2017) also argue that banks are embracing fintech due to the promise of higher revenue streams, personalisation of offers, and consumer service improvement.

Regulators also recognize the importance of the fintech industry. Nowadays, more than twenty countries try to support the sector with a mechanism called “regulatory sandboxes”.¹ This is a framework set up to allow small scale, live testing of innovations by private firms in a controlled environment (operating under a special exemption, allowance, or other limited, time bound exception) under the financial sector regulator’s supervision. These sandboxes are established to promote competition and efficiencies in financial service markets through innovation (Jenik & Lauer, 2017). It has the goal to reduce the time and cost of getting innovation to the market. A sandbox also has the objective to improve access to finance for startups by reducing the risk of the product or service’s client adoption and increasing the return on capital investment (Ernst & Young, 2018).

Within the fintech sector, there are several markets in which competition can arise. Haddad and Hornuf (2018) find that financing is by far the most important segment of the emerging fintech market, followed by payment, asset management, insurance, loyalty programs, risk management, exchanges and regulatory technology. The fintech sector can also be divided into other segments. A WEF report (2017) also uses the payment, investment management and insurance categories, but adds a digital banking, and market infrastructure category. Additionally, financing is split into a lending and equity crowdfunding segment. Based on these two papers, we consider the following fintech categories:

Fintech category	Definition
Asset & Investment management	Services related to investments and portfolio management such as robo-advice, financial or stock exchange services, wealth management, personal financial management apps, or software.
Financing & Lending	Services and platforms that facilitate project or venture financing, for example: crowdfunding (equity), crowdlending, microcredit, and factoring solutions.

¹ Other initiatives like “(fintech) innovation hubs” or “(fintech) accelerators” are also common mechanisms that support financial innovative companies.

Insurance	Insurance related services e.g. spot insurance, usage-driven insurance, insurance contract management, and brokerage services as well as claims and risk management services
Loyalty programmes	B2C applications providing rewards for brand loyalty or giving customers advanced access to new products, special sales coupons, or free merchandise.
Payment & Digital Banking	Banking services and innovative payment solutions, such as mobile payment systems or e-wallets.
Regulatory technology	Services based on technology in the context of regulatory monitoring, reporting, and compliance benefiting the finance industry
Others	Other services e.g.: innovative background services like authorization services, or other technical advancements classified under other business activities of fintech startups.

The fintech industry has experienced a significant growth during the last few years leading to extensive access to finance. According to the Dealroom data base, the invested amount in fintech has increased from 23.4 billion and 24.3 billion euros in 2016 and 2017 respectively to at least 46,7 billion euro in 2018 in Europe alone. The large increase is partly driven by the size of the deals. Draganov (2019) reported 127 mega-rounds larger than 50 million euro using the Dealroom data base. KPMG (2019) also confirms that the sector was characterized by mega-deals in 2018, e.g. VC's invested 14 billion dollars in Art Financial and 12.8 billion dollars in Worldpay. The fintech industry belonged to the top three sectors in which most investments were made. Exit-wise, the fintech segment ranks as the third largest sector in Europe, with an exit value of at least 103 billion euro in 2018. This is an increase from 85 billion euro in 2017, when it was the sector with the highest value of venture capital exits.

Recent growth of the fintech industry has been documented by literature as well. The high growth of fintech is associated with more investments in the sector. Haddad & Hornuf (2018) find that well-developed economies and capital markets allow entrepreneurs to more easily finance their business and have a higher demand for fintech services such as asset management. Secondly, they hypothesized that fintech startups are more frequent in countries where latest technologies and supporting infrastructure are prevalent. Haddad & Hornuf only find results that support the need for latest technologies in their sample without the US, but variables measuring supporting infrastructure are found significant in their entire sample. These variables include the amount of secure internet servers and mobile telephone subscriptions. Thirdly, Haddad & Hornuf

hypothesize that fintech startups occur more frequently in countries with a fragile banking sector. The authors find significant coefficients for variables measuring regulation but not for soundness of banks, partially supporting their hypothesis. Their final hypothesis argues that the size of the labour market and more benevolent regulations regarding labour, credit and business conditions and bankruptcy laws leads to more fintech startups. Haddad & Hornuf find positive significant coefficients for regulation and strength of legal rights, supporting their theory. Other aspects that positively impact the startup rates of this sector are related to the use of information technology, available labour force, benevolent regulations and the degree to which companies find it easier to obtain credits.

Some scholars even argue that venture capital investments in fintech are becoming inefficient (Cumming & Schwienbacher, 2018). They find that fintech companies are more likely to receive equity financing in countries without a major financial centre, which is due to differential enforcement of banking rules. The differential enforcement originates from economies of scale in prudential supervision that can be achieved in countries with a major financial centre. Cumming and Schwienbacher (2018) also find that fintech companies have a higher probability to fail in countries without a major financial centre. This is possibly due to a higher entrepreneurial risk-taking resulting from weaker regulation. The same authors also find that fintech deals are less likely to be acquired after the financial crisis, and that they have a higher likelihood to be liquidated. However, He et al. (2017) showed that market valuations of fintech sectors have quadrupled since the crisis. Haddad and Hornuf (2018) declare that this happened because of various reasons such as of lack of confidence in banks (especially in countries that suffered extensively in the financial crisis), increased cost of debt of traditional banking products and the frequent exemption for fintechs from regulations due to differential enforcement of the more strict banking rules (Koetter & Blaseg, 2015). Cumming and Schwienbacher (2018) argue that there is an exuberance of venture capital investment in fintech, which is described as a “hot industry”. The investment data in the fintech sector and the literature thus point to an increase of interest in the sector. The success of some applications such as M-Pesa, a mobile money transfer service, demonstrate that fintech applications can bring true added value to an economy

and its participants. Research exploring drivers of fintech venture creations may consequently unveil pathways to facilitate startup rates and indirectly stimulate economies.

The given number of startups depends upon the entrepreneurs that nations can draw from their population and sources of financing that entrepreneurs can obtain (Pollari, 2016). Overall, young ventures typically rely heavily on love money and venture capital (VC) to obtain financing for their growth and commercialization. Thus, in order to conduct research regarding fintech startups, variables that influence entrepreneurship and the availability of VC financing must be taken into consideration. Although both entrepreneurship and venture capital have been extensively studied, there is no consensus about the impact of culture on fintech startups, or startups in general.

2.2 Cultural dimensions, innovation and entrepreneurship

Numerous studies have examined the impact of cultural variables on entrepreneurial activity (e.g. Thornton et al., 2011; Frese, Rauch & Zhao, 2012). These have indicated that culture may impact entrepreneurship and new firm formation rates. Davidsson and Wiklund (1997) argue that culture influences the psychological characteristics of individuals in a population, increasing or decreasing the supply of entrepreneurs. The results of their study suggest that cultural variation has an impact on new firm formation rates. Frese, Rauch and Zhao (2012) argue that culture affects entrepreneurial activities through the behaviour inherent to specific cultures and through formal institutions. They call these views respectively the “national culture-personal values-entrepreneurial behaviour model” and the “culture-institution-entrepreneurship model”. Frese, Rauch and Zhao (2012) find that entrepreneurial activity can to some extent be explained by cultural variables. This study mostly focuses on the relation between cultural dimensions and personality traits, entrepreneurship and innovation. Additionally, the literature review will take possible relationships between culture and investment behaviour is also taken into account.

Researchers have primarily used Hofstede’s culture dimensions (Hofstede & Bond, 1984) to study the relations between culture and entrepreneurship and innovation. The fintech sector is an emerging market, using technology to bring innovative solutions to its clients. Innovation

therefore is relevant and may help to explain startup rates indirectly through the degree to which personalities are associated with innovation. Furthermore, innovation is also important because it is described as a critical factor to distinguish between entrepreneurs and small business owners (Carland et al., 1984). There are several data sets that describe culture with different dimensions such as the Schwartz, GLOBE and World values survey (Aggarwal et al., 2016). This study will make use of Hofstede's cultural dimensions which are available in the data set and seem to be mostly used in empirical research. According to Hadwick (2011), the group of researchers that analyses cross-cultural themes in other primary academic fields, like finance, will mainly focus on the main constructs of Hofstede rather than the more complex findings of the GLOBE study. The reason is that the Hofstede dimensions are somewhat, with regard to culture, the lingua franca for reviewers.

In the following sections, this paper will discuss the cultural dimensions and their correlation with personality traits, entrepreneurship, innovation and investments in new firms.

Hofstede's cultural dimensions are based on a population of employees in a multinational corporation (IBM). He defines culture as broad patterns of thinking, feeling and acting (Hofstede, 1990). This "collective programming of the mind" allows to make distinctions of one group of people from another. These distinctions can have an impact on institutions which are "product of dominant cultural value systems" (Hofstede, 2001). Institutions can stimulate or obstruct startup rates because they comprise economic, political and contractual rules (Li & Zahra, 2008). Hofstede identified four cultural dimensions that are widely used in research. These dimensions describe cultures at the national level and may explain variables across nations. Using a different inquiry, the Rockeach Value survey, taken on a different population and a correlation analysis, Hofstede and Bond (1984) find that the same dimensions can be identified. Initially, four cultural dimensions were uncovered. Several years later, a fifth dimension was added after a Chinese value survey. Because the fifth cultural dimension, *long-term orientation*, was added only years after the first four dimensions, not a lot of studies cover this dimension. In 2010 a sixth dimension, indulgence, was added to Hofstede's cultural dimensions. Because it was only added recently, there is even less literature to be found that connects this dimension with entrepreneurship, innovation or financing. Moreover, it was not included in the data set and is

not used in the data analysis of this paper. Consequently, indulgence will not be reviewed in the literature review.

Power distance

The first cultural dimension, *power distance*, is described as the extent to which less powerful members of institutions and organizations accept that power is distributed unequally and the amount of authority a person has over others. People with authority in societies high on power distance are expected to be courageous, capable, socially recognized, imaginative. They tend to control a lot of resources which are not as easily accessible for others. Parents in cultures with a high-power distance would also put a higher value on children's obedience and students' politeness (Hofstede, 1984).

Regarding entrepreneurship and the power distance dimension, there seems to be a negative relationship. Bogatyreva et al. (2019) find that power distance has a negative moderating effect of entrepreneurial intention on entrepreneurial action. Entrepreneurial intention is often used in research because intentions are a good predictor of planned behaviour such as entrepreneurship (Krueger et al., 2000). Ozgen (2012) argues that social inequality and the localization of resources in the hands of a few prevent individuals with entrepreneurial intentions from commencing a venture. According to Rusu (2014), low power distance societies can be associated with a more entrepreneurial mindset because these societies would support high independence and autonomy. A study by Mitchell et al. (2000) studied conceptualized script dimensions which were afterwards used to examine the venture creation decision. Arrangement scripts are related to having contacts, resources and assets that are necessary to create new ventures. Mitchell et al. (2000) find that power distance moderates the relationship between arrangement scripts and the venture creation decision. This study therefore also indicates that culture may have an impact on venture creation.

Another theory, formulated by Simón-Moya et al. (2014), argues that a nation high in power distance ought to be more entrepreneurial. They theorise that there is a need for independence which cannot be satisfied when working as an employee in organisations with autocratic leadership. A greater economic independence could be achieved by working for one's own

account and eliminating the risk of being dismissed as an employee. Therefore, these individuals will seek greater independence by trying to start their own venture. However, Simón-Moya et al. (2014) did not find evidence to support their own theory. Other empirical results also contradict the positive relation between power distance and support the first theories that link higher power distance with lower entrepreneurial action. Societies high in power distance also are less inclined to change power distributions (Hofstede, 1980). This is detrimental for the innovation opportunities that arise, because Tushman (1977) finds that innovation tends to alter the distribution of power in organisations. The change in power distribution occurs when the persons generating the innovative ideas were originally lower in the hierarchy. Knight (1987) notes that the chances for success of innovative ideas decrease dramatically if “the person generating the idea is not the person who gets to run with it as champion”. Shane (1993) later find support that power distance is negatively related with innovation, measured as per capita number of trademarks. The results were only statistically significant for 1975 and not for data from 1980. Given the age of the studies, it is possible that the role of the power distance variable has changed over time. In a later study, Bukowski & Rudnicki (2019) examine the effect of culture on national innovation rates which is measured by e.g. patent applications. The authors also find a negative relationship between power distance and rates of innovation. The negative relationship is however only significant one of the six dependent variables that were used as a proxy for innovation. Power distance thus seems to be weakly related to innovation rates through time. It is however noteworthy that this cultural dimension seems to be negatively related to both innovation and entrepreneurship in prior studies.

Individualism & collectivism

The second dimension, *individualism* versus *collectivism*, reflects the degree to which individuals depend upon themselves and their immediate family. Cultures that lean more towards collectivism have a high sense of loyalty towards the groups or collectivities that they belong to. Hofstede (1980) finds that individualism is correlated to variety, enjoyment in life and pleasure. People in an individualistic culture therefore value freedom, autonomy and individual interests. They have a preference for acting in their own interest rather than that of a larger group to which they belong.

Literature on individualism reveals different theories with regards to its relationship with entrepreneurship. Mitchell et al. (2000) find that individualism has a significant moderating effect on the relationship between arrangement scripts and the venture creation decision. Their results do not formulate a positive or negative relation with individualism, but they provide further support that culture may influence entrepreneurship across cultures. Other research indicates that individualism is associated with higher entrepreneurial activity due to the focus on materialistic achievement whereas collectivistic cultures exhibit more group conformity (Hofstede, 1980; Gupta et al., 2010). In a study by Mueller and Thomas (2000), the likelihood of entrepreneurial orientation is found to be positively correlated with cultures that score higher in individualism. Shane (1993) find indications that there might be a positive relationship between individualism and the rate of innovation across countries. Mueller and Thomas (2000) also find more support that there is a positive and significant coefficient between individualism and innovative orientation, measured by the Jackson Personality Inventory Manual (JPI). Thirdly, Bukowski and Rudnicki (2019) also confirm that individualism may be a predictor of innovation rates. Populations that are more inclined towards individualism thus seem to have a higher chance of creating startups and bringing innovation. For tech-related sectors, older research has linked the motivation of high-tech entrepreneurs in Japan with the drive for self-actualization, which can be associated with personal achievements and individualism (Ray & Turpin, 1990). Other authors however have argued that individualism is negatively correlated with entrepreneurship. Tiessen (1997) argues that entrepreneurship may be a group effort and therefore is linked with the collectivist side of the cultural dimension. This is based on “clan” cultures within organisations, in which trust and commitment move individuals to serve the group interest. The intimate ties between members in these organisations allow resources to be stretched through efficient internal communications and the lack of the need to monitor contingent agreements between workers and the company (Tiessen, 1997). Overall, the consensus seems to point to a positive relationship between individualism and both entrepreneurship and innovation rates.

Masculinity & Femininity

The third cultural dimension is related to the choice of social sex roles and its effect on people's self-concepts (Hofstede, 1980), the two opposing poles are *masculinity* and *femininity*. Masculine societies value money and success, whereas the dominant values in a feminine society are the quality of life and care for others. Femininity is associated with social justice, self-controlled (versus macho behaviour in masculine cultures) and self-respect. Populations scoring higher on femininity have a stronger belief in service and intuition. The feminine pole is also described as more modest, whereas masculinity is rather assertive and competitive (Hofstede & McCrae, 2010).

Bogatyreva et al. (2019) argue that individuals in societies scoring high on masculinity give the value of their career more weight than the value of family interests compared to societies scoring high on femininity. Starting up a venture is usually a time-consuming process; entrepreneurs consequently tend to count more working hours than an employee. When individuals spend more time at work, there is less time left to build up relationships. Bogatyreva et al. (2019) find that entrepreneurial intention is translated into a higher chance of starting a venture for individuals scoring higher on masculinity. Regarding innovation, Shane (1993) did not find that this cultural dimension has explanatory power in the United States sample. More recently, Bukowski & Rudnicki (2019) also did not find any support for hypotheses claiming that masculinity is related to national innovation rates in their sample of 33 countries.

Uncertainty avoidance

The fourth cultural dimension *uncertainty avoidance* is also related to politeness and obedience. Cultures scoring high in uncertainty avoidance construct institutions and beliefs that impede the creation of ambiguous situations. These cultures also require a high level of obedience and politeness so that the structures of organizations can be held intact. The population of countries characterised by a low uncertainty avoidance index tend to attach high value to self-respect, "inner harmony" and capability (Ng et al., 1982). Individuals in countries high in uncertainty avoidance are characterised by a greater fear of failure and lower levels of ambition. They try to minimize uncertainty by applying strict rules and laws (Shinnar et al., 2012).

Kreiser et al. (2010) examined the relationship between cultural values and risk taking within SMEs. They find that both risk taking and proactiveness are negatively related to uncertainty avoidance, suggesting that this cultural dimension has a negative relation with entrepreneurial traits. Entrepreneurs have shown a higher propensity for risk-taking in prior research (Stewart et al., 1999). Decision-making in a venture involves assessing and taking risks due to uncertain outcomes, individuals that are less uncomfortable with uncertainty thus may be less likely to start a business. A study by Wennekers et al. (2007) looked at the rate of business ownership and the cultural dimensions. They find that the effect of uncertainty avoidance changed over time: from a push effect of high uncertainty avoidance on the rate of business ownership to a pull towards entrepreneurship in a climate of low uncertainty avoidance. Baum's push hypothesis argues that individuals dissatisfied with a climate of high uncertainty avoidance are pushed towards self-employment, reducing uncertainty related to labour conditions. Wennekers et al. (2007) argue that individuals in low uncertainty avoidance societies are pulled towards self-employment because these individuals attach higher utility to the rewards of self-employment. In later studies, uncertainty avoidance also is found to be negatively correlated with starting up a new venture. In the model that predicts entrepreneurial action that Bogatyreva et al. (2019) constructed, the uncertainty avoidance variable is found as a negative significant variable. On top of this main effect, this cultural dimension also has a negative moderating effect on the relationship between entrepreneurial intentions and the formation of new ventures. The findings of Kreiser et al. (2010) mentioned above may help explain the findings of Bogatyreva et al. Moreover, Shinnar et al. (2012) argue that individuals in low uncertainty avoidance societies tend to engage more in analysing entrepreneurial activities as opposed to cultures high in uncertainty avoidance where an entrepreneurial career may be socially discouraged to do so. Two important characteristics that guide individuals towards entrepreneurship are risk-taking and tolerance for ambiguity (Shane et al., 2003). Because cultures scoring high on uncertainty avoidance try to avoid ambiguity and uncertainty, it seems logical that individuals in these cultures are less likely to embark on a new activity. Moreover, earlier research (Shane S., 1993) has provided support that innovation is higher in populations where individuals are more tolerant towards risk and change and have a higher uncertainty acceptance. Innovative orientation however is not found

to be dependent on the uncertainty avoidance dimension (Mueller & Thomas, 2000). Bukowski and Rudnicki (2019) also find inconclusive results for the predictive power of uncertainty avoidance on measures of innovation. Due to a lack of more recent studies regarding innovation and uncertainty avoidance, it is difficult to formulate a relation between the two. It is also possible that this cultural dimension may not impact the innovative orientation of the population, but that it does impact the execution of new ideas. If this is the case, then uncertainty avoidance could indeed be negatively related to the formation of new ventures.

Long-term orientation

Later, a fifth cultural dimension was uncovered: *long-term versus short-term orientation*. Following the results that people's way of thinking might be culturally constrained, Bond and Hofstede argue that their own thinking also might be constrained (Hofstede & Minkov, 2010). Hofstede's questionnaire and Bond's adapted version of the Rockeach Value Survey (RVS), which examine cultural differences, were both developed in western cultures. They asked themselves to what extent this was responsible for the correlation of their results and whether relevant questions had been omitted. A new questionnaire was developed by Chinese colleagues, the Chinese Value Survey (CVS), which found a new cultural dimension that is strongly correlated with economic growth. On one side the new dimension combined the values persistence and thrift and on the other side it combined personal stability, tradition and a focus on the present and the past. Hofstede (1991) introduced the fifth cultural dimension as respectively long-term and short-term orientation. In long-term oriented cultures, children learn thrift, tenacity and not to expect immediate gratification of their desires (Hofstede & Minkov, 2010). Hofstede and Minkov argue that working values in these cultures are honesty, learning, adaptiveness, accountability and self-discipline. Owners, managers and workers share the same aspirations and people invest in life-long personal networks. In short-term oriented cultures, norms require people to respect social codes and to be seen as stable individuals. People in these cultures also seem to be sensitive to social trends in consumption, an immediate need for gratification and want to 'protect their face'. Main work values in short-term oriented cultures are freedom, rights, achievements and thinking for oneself. Hofstede and Minkov argue that managers and workers are in two different psychological camps as personal loyalties vary with business needs.

Regarding long-term orientation, Bogatyreva et al. (2019) hypothesize that cultures scoring high on this cultural dimension should be more likely to translate entrepreneurial intentions into entrepreneurial actions. Their reasoning is that individuals in a long-term orientation culture have a higher propensity to plan and are better prepared to wait for entrepreneurial rewards. Additionally, the positive relationship between innovation and long-term orientation (Bukowski & Rudnicki, 2019) may support their hypothesis. The results of Bogatyreva et al. (2019) however do not provide support for their theory. The cultural variable long-term orientation as a main effect is not found to be significant in their regressions predicting the start of a new venture. The interaction term consisting of entrepreneurial intention and long-term orientation are significant but negative, indicating a negative moderating relationship. Bogatyreva et al. believe that individuals in short-term oriented cultures are less hesitant to commence a venture as they value quick results.

In the next section, literature that further links the previously described dimensions with personal traits will be reviewed. The section will also include a review of correlation between certain personal traits and entrepreneurship or innovation. If certain traits associated with cultures are correlated with more entrepreneurship or innovation, this may indicate that cultural dimensions help explain fintech startups through personality dimensions more prevalent in one culture than the other.

2.3 Personality traits, innovation and entrepreneurship

There are indications that entrepreneurs display certain traits (Stewart et al., 1998; Rauch & Frese, 2007) that distinct them from other individuals in countries who do not embark on a business venture. These traits may be more pronounced in certain cultures than in others, leading to a population with more individuals that would seem capable of starting a successful venture. Because fintech startups are the result of entrepreneurship, predictors of entrepreneurship are discussed in this section. Therefore, explaining variables of entrepreneurial intention that can be linked with culture are relevant for this study. Personalities are considered to consist of several traits. Based on these dimensions of personality, an entrepreneurial profile may be defined. Because certain personality traits can be related to cultural dimensions

(Hofstede & McCrae, 2004), entrepreneurial profiles could be more common within certain cultures. An additional aspect of entrepreneurship that may be related to personality traits is innovation (Marcati et al., 2008). Out of all theories that construct a set of personality traits, the five-factor theory (Goldberg, 1993) seems to be the most validated (e.g. Benet-Martínez & John, 1998) and most widely applied in empirical research. This theory describes the following five traits: Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism. They are also referred to as “the Big Five” or the OCEAN acronym.

In this chapter, on one hand the Big Five are explained and they are linked to entrepreneurship using two studies. Firstly, a meta-analysis by Zhao et al. (2010) verified potential relationships between the Big Five and entrepreneurial intention or entrepreneurial performance. Secondly, Wang et al. (2016) tested the mediating effect of self-efficacy on the relationship between the Big Five and entrepreneurial intention among 195 agricultural students. The latter study is added to the review because it is more recent and uses different data. In their study, Wang et al. (2016) use conviction and preparation to account for entrepreneurial intention. On the other hand, the Big Five are also linked to innovation. Marcati et al. (2008) define specific innovation as the predisposition to be among the first to adopt innovations in a specific domain. Their study links innovativeness with personality traits based on a questionnaire answered by 188 entrepreneurs.

Openness to experience

Openness to experience defines the extent to which individuals are intellectually curious, seek new experiences and explore novel ideas (Zhao & Seibert, 2006). People scoring high on this trait could be described as creative, innovative and untraditional. These characteristics ought to improve the odds of entrepreneurship (Schumpeter, 1942). Individuals low on openness to experience may be more conventional, unanalytical and narrow in interests (Zhao & Seibert, 2006). The meta-analysis performed by Zhao et al. (2010) shows that the coefficient of openness to experience is positively related to entrepreneurial intention. The coefficient of openness is also positively related to firm performance, but its confidence interval includes zero. If zero is included in the interval, it means that there possibly is no relation between openness and firm performance. The authors thus find no evidence of a relation between openness to experience

and firm performance. Wang et al. (2016) find that openness predicts entrepreneurial intention through self-efficacy. Additionally, statistical results suggest that openness has a direct effect on the conviction to become an entrepreneur. Openness thus seems to be positively related to entrepreneurial intention but cannot be significantly related to firm performance. Openness to experience is also found to be positively related to innovation (Marcati et al., 2008). People high on this personal trait should therefore be more capable of creating a venture in an innovative market such as the fintech sector.

Conscientiousness

Conscientiousness describes values that seem to occur more frequently with ambitious individuals. It indicates the degree to which one is persistent, hardworking and motivated by goal achievement (Zhao & Seibert, 2006). This dimension has proven to be a good personality predictor of the ability to work hard (Barrick & Mount, 1991) and could be regarded as a composition of achievement motivation and dependability (Mount & Barrick, 1995). Literature suggests that values such as achievement motivation are correlated to entrepreneurship because individuals feel that performance is due to their own efforts rather than other factors (McClelland, 1961). The meta-analysis of Zhao et al. (2010) finds support for this theory because conscientiousness is found to be positively related to entrepreneurial intention. Wang et al. (2016) also find that conscientiousness can predict entrepreneurial intentions, but through the effect of self-efficacy. Just like openness to experience, Zhao et al. (2010) find a positive relationship between conscientiousness and firm performance but its confidence interval contains zero. Therefore, conscientiousness is also positively related to entrepreneurial intention but also cannot be significantly related to firm performance. Regarding innovation, Marcati et al. (2008) find a negative significant correlation with conscientiousness. Individuals high on conscientiousness may consequently aspire entrepreneurial ambitions but may not be sufficiently inclined to adopt innovative technologies to start a fintech venture.

Extraversion

Extraversion describes energetic, talkative, enthusiastic, assertive and dominant people (Costa & McCrae, 1992). More introverted individuals that score low on this trait are more reserved, quiet

and independent. Zhao & Seibert (2006) find that entrepreneurs score higher on extraversion than managers, which suggests that extraversion is positively correlated to entrepreneurship. They argue that traits related to extraversion are important for entrepreneurs who need to convince stakeholders to invest or do business with them. Additionally, they argue that extraversion promotes social interactions with employees. Entrepreneurs who are talkative and enthusiastic may improve human relations at work and enhance team performance. The study by Zhao et al. (2010) provides support for a positive relationship between extraversion and performance. Wang et al. (2016) also find an indirect relationship between extraversion and entrepreneurial intention, supporting the previously mentioned arguments. Finally, extraversion is also positively related to innovation (Marcati et al., 2008). Individuals high on this personality dimension therefore ought to be more likely and capable to start a fintech venture.

Agreeableness

Agreeableness indicates to which degree individuals are trusting, forgiving, caring, altruistic and even gullible. Individuals scoring high on agreeableness have a preference for positive interpersonal relationships whereas individuals on the opposite side of the scale are more manipulative, self-centred and suspicious (Costa & McCrae, 1992). Zhao and Seibert (2006) argue that high agreeableness may inhibit the willingness to drive hard bargains, look out for one's own self-interest and the ability to manipulate others for one's own interests. These characteristics are probably helpful in venture creation and success. Later, Zhao et al. (2010) hypothesised that agreeableness would be negatively related to entrepreneurial intentions. They argue that people high on agreeableness are more interested in careers in social work or teaching than in business, because those occupations allow them to work for the benefit of others. The confidence interval predicting entrepreneurial intention contains zero in the study of Zhao et al. (2010), they consequently find no support for a relationship between agreeableness and entrepreneurial intention. Wang et al. (2016) however, do find an indirect relationship between agreeableness and entrepreneurial intention. Agreeableness therefore is the first personality dimension for which no clear relationship with entrepreneurial intention exists. For firm performance, Zhao et al. (2010) also did not find sufficient studies to examine the relation with agreeableness. This dimension is found to be negatively related to the adaptation of innovations (Marcati et al.,

2008). Agreeableness thus does not seem to promote innovative entrepreneurial action which is required for fintech startups.

Neuroticism

Neuroticism represents the emotional stability of individuals; the low end of this scale is emotionally stable. Individuals scoring high on neuroticism are characterised by negative emotions such as anxiety, hostility, impulsiveness, vulnerability and self-consciousness (Costa & McCrae, 1992). Emotionally stable individuals ought to be more calm, self-confident, even tempered and relaxed (Zhao & Seibert, 2006). Because entrepreneurs and young ventures are likely to deal with uncertainty and consequently stressing environments, individuals acting in these environments ought to be emotionally stable. This theory is supported by Zhao et al. (2010) who find a positive relationship between emotional stability and the intention to become an entrepreneur. However, for this personality dimension, Wang et al. (2016) did not find a relation with entrepreneurial intention. Based on the meta-analysis of Zhao et al. (2010) and the study of Wang et al. (2016) the effect of neuroticism on entrepreneurial intention thus remains inconclusive. Interestingly, Zhao et al. (2010) find that neuroticism is negatively related to firm growth and profitability which proxy for firm performance. This may indicate that more calm and self-confident individuals can make better decisions regarding firm operations and strategy. Marcati et al. (2008) found no significant correlation between neuroticism and specific innovation.

The following table summarizes the expected correlations between personality traits and entrepreneurial intention, firm performance and innovative behaviour. Openness to experience and extraversion seem to be beneficial traits to possess when one starts a venture. Conscientiousness and agreeableness seem to be positively related to entrepreneurial intention but negatively to the adaptation of new innovations. These two traits therefore may not increase the likelihood of successful venturing in emerging markets where new technologies are key to diversify from incumbents and competitors. Neuroticism is negatively related to both entrepreneurial intention and firm performance and thus is unlikely to stimulate startup formation and success.

Big 5 dimension	EI (Zhao et al.)	EI (Wang et al.)	Firm performance	Innovation
O	+	+	/	+
C	+	+	/	-
E	+	+	*	+
A	/	+	*	-
N	-	/	-	/

*: no sufficient data /: no significant correlation

2.4 Personality traits and cultural dimensions

In the previous section, personality traits were linked to entrepreneurial and innovative behaviour which could influence fintech startup rates. Hofstede and McCrae (2004) studied the degree to which these personality traits can be associated with cultural dimensions. They argue that mean levels of personality traits in populations may give rise to different cultural practices or institutions. Hofstede and McCrae did not include the long-term orientation in their study because its scores were only available for 24 out of the 33 countries used to measure the other four dimensions. Additionally, the LTO-dimension is only positively with extraversion, but the correlation of extraversion with individualism is stronger so adding long-term orientation added no value to the analysis. Long-term orientation also was too strongly correlated with individualism (0.72). Hofstede & McCrae (2004) found the following zero-order correlations between the cultural dimensions and the Big Five.

IBM Culture Dimension	E	C	O	N	A
IND	0.64***				
PDI	-0.57**	0.52**	-0.39*		
MAS			0.40*	0.57**	-0.36*
UA				0.58**	-0.55**

Significance levels: *p < 0.05 **p < 0.01 ***p < 0.001

In the remainder of the article, Hofstede and McCrae (2004) each offer a model in which dimensions of culture explain mean levels of traits and vice versa. However, it is interesting to note that individualism is only strongly and positively correlated with extraversion.

Hofstede's stepwise regression includes gross national product per capita, a proxy for wealth, as a control variable. If this variable predicts a phenomenon better than culture, the explanation from cultural dimensions is considered to be probably redundant. This is the case for power distance as a predictor of conscientiousness. Hofstede & McCrae (2004) argue that prosperity allows people to behave less conscientiously or more wastefully.

Stepwise regression of Big 5 scores against cultural dimensions across 33 countries		
<i>Criterion</i>	<i>Predictors</i>	<i>Cumulative Adj. R²</i>
Neuroticism	+ UA	0.31
	+ MAS	0.55
Extraversion	+ IND	0.39
	- MAS	0.46
Openness to Experience	+ MAS	0.13
	- PDI	0.29
	+ UA	0.36
Agreeableness	- UA	0.28
Conscientiousness	+ PDI	0.24

The variance of neuroticism, which appears to be negatively correlated with entrepreneurial intention and innovation, could partly be explained by uncertainty avoidance and masculinity. Hofstede (2001) found studies that link uncertainty avoidance with stress, anxiety and expression of emotions. Masculinity is associated with higher neuroticism because cultural femininity has a focus on relationships, people and quality of life, which are more conducive for emotional stability.

Extraversion is mostly explained by the individualism dimension. Hofstede (Hofstede & McCrae, 2004) argues that collectivism is correlated with expertise, duty and security, which suggest more introverted behaviour. Femininity also explains extraversion; this is possibly because individuals need to display extraverted behaviour to build relationships which are important for people scoring high on femininity.

Openness to experience is positively correlated with masculinity and uncertainty avoidance, but negatively with power distance. Cultures low on power distance tend to stimulate independent exploration. Hofstede shows that low power distance countries obtained more Noble prizes to support this theory (Hofstede, 2001).

McCrae (Hofstede & McCrae, 2004) proposes two hypotheses which support his claim that personality traits may be among the causes of cultural-level differences. Firstly, the *selective migration* hypothesis argues that individuals move in and out of groups to find an environment where they fit best. Populations high on power distance could for example be explained by highly introverted individuals who more easily tolerate the restricted access to positions of leadership. Secondly, the *reverse causation* hypothesis suggests that culture is shaped by the aggregate personality traits of its members (Hofstede & McCrae, 2004). Consequently, value systems and institutions are seen as social adaptations to the psychological environment, represented by the distribution of personality traits.

Stepwise regression of culture scores against Big 5 scores across 33 countries		
<i>Criterion</i>	<i>Predictors</i>	<i>Cumulative Adj. R²</i>
Uncertainty Avoidance	+ N	0.31
	- A	0.45
Power Distance	- E	0.31
	+ C	0.43
Individualism	+ E	0.39
Masculinity	+ N	0.30
	+ O	0.37

The combined effect of neuroticism and low agreeableness leads to a group of people who generally are tense and irritable (Hofstede & McCrae, 2004). Decisions in these groups would be a potential source of conflict, so they adopt rules and develop institutions to avoid this. Individualism is associated with freer social interactions and the inclination to make new social contacts. These behavioural actions are more associated with extraverts which consequently is found to predict individualism. Introverted individuals rather tend to stick in tight groups, which are familiar people such as family or colleagues. Power distance is associated with introversion and conscientiousness because natural leaders, which are few due to high levels of introversion, can easily rise to positions of authority. Individuals are conscientious in this scenario and would therefore accept the dominance of leaders, leading to a stable and productive system (Hofstede & McCrae, 2004). Hofstede & McCrae (2004) find no real reason why neuroticism or openness would be positively associated with masculinity.

2.5 Cultural dimensions and venture investments

Another factor that has an impact on the amount of startup companies across different nations is the availability of capital that can be invested in fintech startups. Haddad and Hornuf (2018) find that access to venture capital is an important factor to facilitate the startup of fintech ventures. They state that access to venture capital is not equally available in every region of the world, indicating geographical differences, possibly originating from cultural differences. Literature linking culture and capital investments in young businesses is very scarce. This is possibly due to the fact that the venture capital markets seem to be nationally based and the relevance of culture is probably low (Wright et al., 2005). Wright et al. (2005) argue that venture capitalists would be restricted from investing abroad due to cultural differences and geographical distance.

Li and Zahra (2012) argue that venture capital activity is lower in cultures high in uncertainty avoidance because risky activities require a higher risk premium and investors in high uncertainty societies are less likely to enter into these risky activities. Their results support this theory with a significant negative coefficient for uncertainty avoidance predicting the number of investments in new firms. Later, Cumming et al. (2016) report a negative and statistically significant impact of uncertainty avoidance on the amount of cleantech venture capital deals. They attribute this relationship to a lower openness of venture capitalists towards risk taking and new ideas in high uncertainty avoidance countries. Perry et al. (2015) also find that new venture investments are influenced by this cultural dimension. They report that individuals with high degrees of uncertainty avoidance are less likely to invest in a family member's venture. Perry et al. (2015) hypothesize that societies characterised by a high uncertainty avoidance strive to make the future predictable. In these societies investments in new ventures would be perceived as too risky versus investments in established companies. Their tests support this hypothesis, providing further support for a negative expected relationship between uncertainty avoidance and investments in new ventures.

There are indications that collectivism is also negatively associated with the number of startups that are being invested in. Li and Zahra (2012) hypothesize that a collectivist orientation weakens

the positive impact of formal institutional development on venture capital activity. They argue that the collectivist orientation would limit the development of institutions, confine venture capitalists' deal flows to those connected to their existing network and exclude potential new unknown venture capitalists from joining the network. Li and Zahra (2012) find that the collectivism coefficient is negative and significant, predicting fewer investments in new firms and supporting their hypothesis. Perry et al. (2015) studied the effect of in-group collectivism on the likelihood of investment in new ventures begun by family members. GLOBE's in-group collectivism refers to the degree to which individuals express pride, loyalty, and cohesiveness in their groups. This definition corresponds with Hofstede's collectivism dimension. Perry et al. find a negative significant coefficient which implies that not only venture capital investments, but also investments made by earlier stage financiers seem to be negatively affected by cultures that are highly collectivist. This cultural dimension thus may also influence the financing before venture capital is required for further growth financing.

3. Hypotheses

To explore the impact of the cultural dimensions on fintech startups, we build in this section our hypotheses around the five Hofstede dimensions and three indispensable factors for venture creation: entrepreneurship, innovation and access to financing.

The literature review gave insight into different contradicting theories regarding the first cultural dimension, power distance, and entrepreneurship. The lack of a consensus suggests that this cultural dimension on its own will not impact the fintech startups. A potential manner for this dimension to influence the startup rate of fintech ventures is through ownership of ideas and innovations. This is based on Knight's theory (1987) that the chances of success of innovative ideas increases with the degree of ownership that individuals can take for it. In nations scoring low on power distance, the acceptance of unequal distribution of power is less inherent and the possibility to take ownership may be higher. Individuals might therefore have more incentive to pursue innovative ideas that may bring new fintech services or products. Moreover, individuals in these societies may have access to resources more easily and quickly in low power distance cultures and can consequently execute ideas more easily and quickly. Finally, power distance is

also found to be negatively related to the adaptation of innovative technologies (Marcati et al., 2008) and entrepreneurial intention through its negative correlation with extraversion (Zhao et al., 2010; Wang et al., 2016; Hofstede & McCrae, 2004). Building on the “Ownership Theory” and the relation of power distance with extraversion, we hypothesise the following:

Hypothesis 1: Fintech startup occur more frequently in countries that score low on the power distance variable.

Hofstede (1980) argued that the population of countries scoring high on individualism tend to be more autonomous and attach more value to freedom, and individual interests rather than the interests of groups they pertain to. Additionally, successful entrepreneurship can bring great rewards for entrepreneurs. The literature review found that individualistic cultures may have more interest in materialistic achievement against whereas there seems to be a propensity in collectivist cultures towards conformity. The population of individualistic countries may thus be more motivated to pursue the creation of ventures. Additionally, individuals in high individualism countries may be more confident and believe that they can make successfully start a venture. Mueller & Thomas (2000) argue that individualistic cultures foster entrepreneurial values which promote self-reliance and independent action as opposed to collectivistic cultures. They find that individualism is a positive and significant predictor for internal locus of control. Locus of control measures to what degree individuals believe that external factors around them drive events in their lives. An internal locus of control indicates the belief that one can control events. This theory is supported by the relation of extraversion with individualism (Hofstede & McCrae, 2004), because extraversion is associated with a higher entrepreneurial intention and adaptation of new technologies (Zhao et al., 2010; Wang et al., 2016; Marcati et al., 2008). Innovation therefore seems to be positively related to individualism. The freedom and autonomy that are correlated to individualism may spur individuals to think creatively and execute new ideas. The combined positive influence of individualism on entrepreneurial traits, intention and innovation suggests that fintech startup rates are positively correlated with individualism.

Hypothesis 2: fintech startups are more likely to occur in countries that score high on the individualism cultural dimension.

Cultures that score high on the masculinity dimension ought to have populations that are more ambitious because they value money and success more than people in cultures that score low on masculinity. However, Hofstede and McCrae (2004) show that the correlation of masculinity with personality traits is the strongest with neuroticism and has a positive relation. Neuroticism is negatively related to both entrepreneurial intention and firm performance. Additionally, femininity is associated with agreeableness and building good relationships with people. This may benefit relationships with both internal and external stakeholders. Masculinity should thus lead to fewer successful startups given its expected relation with personality traits. On the financing side, the competitive aspect combined with machoism may lead to more risk-taking behaviour to strive to be the best. This could have a positive impact on available financing. Fund managers in a more masculine culture could be more easily persuaded to invest in risky businesses with high potential resulting in a higher count of VC backed fintech startups. Because we don't find conclusive answers in the literature review and think that the feminine pole also has advantages for startup creation, we hypothesize that masculinity will have no predictive power.

Hypothesis 3: fintech startup rates cannot be predicted by the masculinity dimension.

The fourth cultural dimension, uncertainty avoidance, goes hand in hand with greater fear of failure and less ambition which aren't beneficial for entrepreneurship. Bogatyreva et al. (2019) argue that individuals in societies low in uncertainty avoidance are also more comfortable in unstructured situations and find supporting results for their theory. To start a venture in a technology related sector, the company and entrepreneurs will have to bear risks and be tolerant to ambiguity. Risks can originate from the potentially fierce competition against incumbents and other fintech companies, entrepreneurs in the sector should thus be proactive and ambitious. Additionally, Hofstede and McCrae (2004) find a positive relation between uncertainty avoidance and the neuroticism personality trait. Neuroticism is negatively related to both entrepreneurial

intention (Zhao et al., 2010) and the adaptation of new innovations (Marcati et al., 2008). Finally, the negative relationships between uncertainty avoidance and investments by venture capitalists (Li & Zahra, 2012) or family venture financing (Perry et al., 2015) suggest that early stage financing is harder to obtain in cultures high on uncertainty avoidance. We therefore expect that countries that score higher on the uncertainty avoidance index see fewer fintech startup formations due to a smaller supply of entrepreneurs which may be less inclined to adopt innovations and less access to financing.

Hypothesis 4: fintech startups occur more frequently in countries that score low on the uncertainty avoidance index.

Because fintech companies highly depend on their technology and innovation, values that characterize long-term oriented cultures ought to be more beneficial for the creation of these companies than their short-term counterparts. Long-term working values that may be particularly stimulating for fintech entrepreneurs are learning, planning and adaptiveness. These values are important for acquiring knowledge and using that knowledge to create more relevant products or services. An environment or nation where these values are prevalent may consequently stimulate the search for new, alternative products within the financial technology market. Additionally, the importance of thrift and tenacity to pursue goals are also expected to be positively correlated with entrepreneurial characteristics. Values associated with short-term orientation on the other hand may be detrimental for entrepreneurial success. The immediate need for gratification and spending norms could for example lead to a population that has a lower tendency to apply bootstrapping whereas the opposite would be true for cultures on the other side of the spectrum. A national long-term orientation should thus stimulate the application of knowledge in the creation of innovative products or services. We therefore hypothesize the following:

Hypothesis 5: fintech startups occur more frequently in countries with a long-term orientation.

The effect of high individualism may be strengthened in a culture low in uncertainty avoidance, because this combination ought to make entrepreneurs more comfortable in a dynamic,

ambiguous environment. Ambitious individuals who take initiative, are comfortable in ambiguous situations and that have a high degree of independence should be more predisposed for fintech entrepreneurship than their less ambitious counterparts who prefer less risky working environments. We therefore introduce the following hypothesis with an interaction between individualism and uncertainty avoidance:

Hypothesis 6: fintech startups are more likely to occur in countries that score high on the individualism and low on the uncertainty avoidance cultural dimension.

Because growing a business requires patience and long-term planning, we argue that there may be an interaction effect of individualism and long-term orientation. Previously, we mentioned that people in individualistic cultures tend to attach more value to materialistic achievement. If these individuals are more able to learn and to use knowledge to reach their goals, they may be more inclined to start a venture, trying to obtain a higher wealth. This relation may be enhanced by cultures high on long-term orientation because investment managers may be more inclined to be educated and think in the long term in a more pragmatic approach.

Hypothesis 7: fintech startups are more likely to occur in countries that score high on the individualism and high on the long-term orientation cultural dimension.

4. Methodology

The platform used to gather data for our dependent variable is the Dealroom database. It helps investors, corporates and local governments to discover and track innovative companies by collecting data across all investment stages, from seed to late growth-stage. In total, the database holds information of about 831 845 companies (from which 441 049 startups) and 85 324 corporate investors across the entire globe. The database has information about 38 412 fintech startup companies worldwide. The sample of Haddad and Hornuf (2018) was restructured in Dealroom, finding 17 420 fintechns. This is remarkably higher than the 7 353 fintech startup formations found in their sample using CrunchBase. As a result, Dealroom is used instead of CrunchBase because it collects more data about fintech companies and its financing.

We retrieved the data about fintech startups at March 8, 2019 in collaboration with Dimitrios Kolokas from Vlerick Business School. Our sample consists of 85 countries over the period of 2009 until 2017 and includes cross-country data without any income, geographical or restriction filter (see appendix **Table 1** for a list of countries used in our data). However, information of 2018 is not included because it is possible that some of the Dealroom data is obtained with a time lag.

To research the impact of culture on the fintech startups, data of the two dependent variables: *new fintech* and *new VC-backed fintech* is retrieved from Dealroom. In this sample, consisting of panel data, 765 observations per dependent variable are collected. The variable *new fintech* describes the number of fintech startup formations in a given year and country and is our main dependent variable. The second measure defines the number of the previously mentioned new fintech startups in a given year and country that currently are or were backed by venture capitalists (from seed to late growth stage) up to 2019. The second measure will be used as a robustness check in our research. In total, 17 477 new fintech formations, of which 6 049 VC-backed, started in the post 2008 financial crisis period. We controlled for survivorship bias by excluding the hidden filter “closed” in Dealroom. As a result, our analysis also takes into account startups that are no longer operational today, but that were launched during the period of 2009-2017. In line with the statistical method used in research by York and Lenox (2013), Dushnitsky et al. (2016) and Haddad and Hornuf (2018), we also apply a random effects model for our regression analyses. However, the dependent variables are count variables and thus normalized through its natural logarithm.² The random effects model takes into account the clustering of observations at country level by affirming that dispersion varies randomly from cluster to cluster (Rao, 2004). It incorporates random cross-country specific effects into the relationship between the expected number of fintechs, independent variables and mediators. We also include a set of year dummies to account for the unobserved effect of time on the number of fintech startups.

For the independent variables, data about the cultural factors *power distance*, *individualism*, *masculinity*, *uncertainty avoidance* and *long-term orientation* is collected from the database of

² All mentioned transformations of variables are executed by calculating the $\ln(X+1)$ with X as the observed value of the variable.

Hofstede Insights and checked with the most recent data provided by professor Geert Hofstede. Not only the main effects, but also interaction effects of these dimensions, named $IND * (-UA)$ and $IND * LTO$, will be researched to test the aforementioned hypotheses. The quantified scores of the five Hofstede dimensions are given in a range of 0-100. Consequently, multiple mediators are included in our data set to control for several factors that will affect the number fintech startup formations. These variables are lagged for one year (2008-2016) to predict the effect on the dependent variable for the period of 2009-2017. There are several databases consulted to collect this data. As mentioned in literature, Haddad and Hornuf (2018) proved that several factors will positively or negatively impact the number of fintech formations. The authors do not link this with cultural traits and the appropriate variables which control for factors other than culture. However, we include one model (named **model I**) in which we replicate the study of Haddad and Hornuf, but with adding the cultural dimensions. Furthermore, we built a second model (named **model II**) following the method used in the paper of Frese, Rauch and Zhao (2012). Beside culture, they distinguish two variables that are important to predict early-stage or high-innovation entrepreneurship.

Model I

First, we specify the control variables for **model I** by replicating the significant variables in research about the emergence of fintech startup formation from Haddad and Hornuf (2018).

To test the impact of well-developed economies and capital markets we included several variables. Firstly, to control for the general development of financial inclusion in capital markets, the natural logarithm of the variable *deposits to GDP* is introduced. The *deposit to GDP* variable is retrieved from the version of the IMF's International Financial Statistics by using demand, time and saving deposits in deposit money banks as a share of GDP.³ Research shows that countries where the availability of financial products and services is higher, with *deposits to GDP* used as proxy, will not only aid economic development and poverty alleviation, but will also help to enhance financial stability (Han & Melecky, 2013). The variable *deposits to GDP* is not included

³ Calculated using the following deflation method: $\{(0.5) * [F_t/P_{e_t} + F_{t-1}/P_{e_{t-1}}]\} / [GDP_t/P_{a_t}]$ where F is demand, time and saving deposits, P_e is end-of period CPI, and P_a is average annual CPI.

in the research of Haddad and Hornuf. We insert this variable because we believe that it is a good proxy to indicate strong economies. Furthermore, to evaluate the development of the venture capital markets, the measure *VC availability* is used as mediator. The variable is measured by the World Economic Forums' Global Competitiveness Index and answers the question: "In your country, how easy is it for entrepreneurs with innovative but risky projects to find venture capital?" [1 = extremely difficult; 7 = extremely easy]. Thereafter, the natural logarithm of *GDP per capita* measures the prosperity in a certain country and is collected from the World Development Indicators database. According to research from Durham (2002), higher levels of GDP per capita should lead to more growing capital markets. Furthermore, Haidar (2008) proves that the level of investor protection matters for economic growth. Countries with better protection tend to grow faster than those with poor investor protection. To control for this effect, we included the variable *investor protection* in the analysis. By using the World Economic Forum's Global Competitiveness Index, the strength of the investor safeguard in each country for each year is measured on a 0-10 scale.

The impact of the soundness of the cross-national financial sectors is proxied by the variable *ease of access to loans*. The availability to external financing can indicate the frailty of the financial system. Schwaab, Koopman and Lucas (2011) interpret variation in credit supply and changes in ease of credit access as warning signals for financial frailty by demonstrating that these variables were a prior indicator for financial distress in the past. The variable is measured from the survey of the World Economic Forum's Global Competitiveness report. In this survey the following question was asked: "In your country, how easy is it to obtain a bank loan with only a good business plan and no collateral?" [1 = extremely difficult; 7 = extremely easy].

The effect of the availability of the latest technology on fintech startups is measured by the log-transformation of the variables *secure internet servers*, *mobile subscriptions* and *availability of latest technologies*. The first variable measures the number of distinct, publicly-trusted servers using encryption technology per one million people. It is composed by information from the Netcraft Secure Server Survey and population data from the World Bank. The mediator *mobile subscriptions* shows how mobile cellular subscriptions (per 100 people) vary by country. The indicator includes the number of post-paid subscriptions and active prepaid accounts (i.e. that

have been used during the last three months) and applies to all mobile cellular subscriptions that offer voice communications. It is retrieved from the World Telecommunication/ICT Development report and database of the International Telecommunication Union. The third variable *availability of latest technologies* is constructed by answers from the survey question in the Global Competitiveness Report of the World Bank: “In your country, to what extent are the latest technologies available?” [1 = not at all; 7 = to a great extent].

Furthermore, we need to check for the effect of market regulations and labour force on fintech startup formations. The variables *credit market regulations*, *labour market regulations*, *business regulations* and *strength of legal rights* represent the market regulations for a country in a specific year. The first three variables are collected from the Fraser Institute database and give a score of zero to ten. A high rating indicates that countries have less control over market forces and allow the market to determine e.g. interest rates in a private banking system (credit market), hiring and firing regulations or minimum wages (labour market) or licensing restrictions and rules about starting up a business (business regulations). Moreover, the *strength of legal rights* index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. The index ranges from 0 to 12 with higher scores indicating that these laws are better designed to expand access to credit. This data is collected from the Doing Business Project of the World Bank. Finally, the *labour force* variable is measured by using the World Development Indicators database and transformed to its natural logarithm. It comprises the total of people from at least 15 years of age who supply labour for the production of goods and services during a specified period. The variable includes people who are currently employed, but also people who are unemployed but seeking work and first-time job-seekers are included.

The general efficiency of the legal system in a country may affect entrepreneurship. For this reason, we introduce the variable *rule of law*. This measure provides a perception of the extent to which agents have confidence in and will abide by the rules of society, and particularly the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Higher values indicate better legal systems. The Worldwide Governance Indicators project of the World Bank has collected this data. Haddad and Hornuf also

control for entrepreneurial environment (total number of new startup formations) in their research. As indicated in literature, we assume that the cultural dimensions can be used as a proxy for this variable and for this reason we don't insert this variable in our research.

Model II

For the mediators in **model II**, we inserted variables that coincide with those used in the work of Frese, Rauch and Zhao (2012) about cross-country differences in entrepreneurial activity. It concerns two variables that have been discussed in the above outline of model I. The first one, *GDP per capita*, is used as a proxy for national wealth in the different countries. Secondly, the variable *business regulations* is inserted as an institutional variable controlling the presence and good-natured strictness of entrepreneurial laws in a particular country.

All variables of both models are explained and referenced to its source in appendix **Table 2**.

5. Descriptives

5.1 Summary statistics

Concerning the summary statistics of the dependent variables, it is remarkable that over all 765 observations on average around twenty-three fintech startups per country are launched during the period of 2009-2017 and that, on average, approximately eight of these twenty-three fintech startups are backed by venture capitalists. This proves that the fintech startup market is highly financed through VC-funds. The importance of VC investing in fintechs becomes clear in KPMG's biannual analysis of investment in fintech sectors. This report shows that the growing global popularity of private equity venture investing into fintech enterprises is showing an upwards trend in invested capital from 2013 until 2018 (KPMG, 2019).⁴

Table 3 describes the new fintech startups and VC-backed startups in detail. Several ratios are calculated to interpret the importance of the fintech startups over the entire, or VC-backed,

⁴ Includes seed capital and investments by BA, early and late VC's

startup market. Panel A considers the number of fintechs per year. Panel B certifies the twenty largest fintech suppliers and panel C summarizes the sample per continent.

Panel A notices an increasing trend of fintech startup formations from 2009 until 2014. This corresponds with the analysis of Haddad and Hornuf, in which they declare an upsurge of fintech formations after the 2008 financial crisis. From 2015 onwards, the number of fintech formations decreased until 2017. In 2017, 38.65% less fintech startups were founded in comparison with 2014 which was the period with the maximum financial technology startup formations. The same evolution is recognized for the total startup formations over the sample period. The only difference is that total number of startups started decreasing from 2013 and not 2014. However, deducted from the ratio of the fintech with the total startup market, the presence of the fintech industry is the largest in 2017 when 14.60% of the startup market consisted of fintech corporations. The reason for this is a proportional higher decline of the total startup companies when compared to the indicated decrease in the aggregated amount of fintech companies. Furthermore, the VC activity in fintech startups is investigated. Important to mention is that according to research by KPMG (2018) and Innovate Finance (2018), both VC deals and VC invested funds in fintech startups are still increasing every year with China, The United States and The United Kingdom as the most important countries (measured by invested capital). The collected data about VC financing only takes into account companies that are backed from early to late growth stage and disregards whether they are financed by one or more VC's in one or multiple financing rounds and neither the size of the deal is taken into account. Using these variables, it is possible to measure how many companies have financed their project with VC capital during the startup phase. This ratio of VC-backed fintech startups over total fintech startups does not vary much over the entire sample period. However, the highest percentage dates from 2014 and 2015 when venture capitalists backed approximately 38% of all launched fintechs. The proportion of the VC-backed fintechs over all VC-backed corporation's is the most noticeable in 2017 (16.58%). In general, over the period of 2009-2017, 9% of all collected startups are fintech firms, 10.76% of all VC-backed startups are active in the fintech sector and 34.61% of all reported fintech firms are financed with venture capital.

Panel B of table 3 provides statistics for the different continents per year. All 85 countries were distributed over the different geographic regions by using the method developed by the Statistics Division of the United Nations. However, this is for statistical convenience and does not imply any assumption regarding political or other affiliation of countries or territories (United Nations, 2019). Fintech startups, also the count of those financed by venture capitalists, are most present in North-America, followed by Europe and Asia. Nevertheless, the ratio of fintechs over the total startup market is the highest in Central-Latin America, with Mexico as main driver, where almost one fifth of all collected startups are fintechs. The market share of VC-backed fintech startups over the total number of fintech startups is the largest in Europe and North-America, because of dominant presence of VC's in the UK and US fintech startup market.

To further analyse the cross-national differences, we report the twenty most important suppliers in the fintech industry. Panel C makes clear that the United States is the largest fintech supplier with almost five times as much fintechs as the United Kingdom and nine times more than India. Almost half (45.52%) of all fintech startups collected at Dealroom are launched in the United States. According to a report from S&P (2018), startups in the US fintech industry have grown rapidly during the post-crisis economic expansion, strong credit quality and bull markets. Their ability to grow successfully is not only because of their own developed tools, but also because of financial institution their partner with. These US partners offer reliable funding, are well-established brands and have experience in navigating in changing economic circumstances (Darden, Dixit, & Mason, 2018). Nevertheless, based on the fintech penetration in the total startup market, only 8.33% of all reported startups in the US are fintechs. This is relatively higher in countries like Singapore (20.93%), Mexico (17.72%) or China (15.43%). About the VC activity, half of the backed fintechs are from the USA (48.45%) and is again followed by the UK (10.30%) and India (4.10%). In line with the general startup market, the same conclusion can be made for the ratio of the fintech over the general VC market. Singapore (26.28%), Mexico (20.78%) and China's (14.85%) penetration ratio is higher than the one of the USA (10.14%). This indicates that VC's in the US will also invest in various other niches aside from the fintech sector. Relatively, China, Sweden and Russia report the most VC-backed fintechs within their fintech startup

market. In these countries, more than half of the fintech startups is co-financed by a venture capitalist.

Table 3: Description of the fintech startups per year and country. These tables represent descriptive statistics of the dependent variables over the entire sample retrieved from the Dealroom database. Panel A reports summary statistics over the fintech startup, general startup market and the related VC financing per year. Panel B shows the 20 largest fintech suppliers in the world (in absolute figures). Panel C describes the fintech startups per continent, based on a geographical allocation of countries.

Panel A: Summary statistics per year for the entire sample. Column (1) “number fintech startups” represents the number of fintech startups over all 85 countries per year. The next column represents the total number of collected startups. The columns (4) and (5) “VC-backed (fintech) startups” describes the number of total (fintech) startups that are backed by venture capitalists in a certain year. Ratios are calculated to know how the fintech and VC-backed fintech startup markets evolve over the years. “Ratio fintech startup market” divides the number of fintech startups by the total number of startups (column 3). “Ratio VC-backed fintech over total VC-backed startup market” divides the number of VC-backed fintech startups by the total number of VC-backed startups (column 6). “Ratio of fintech startups, VC-backed” in column 7 is calculated by dividing the number of VC-backed fintech startups with the number of fintech startups.

Year	(1) N° fintech startups	(2) N° startups	(3) Ratio (1) / (2)	(4) N° VC- backed fintech startups	(5) N° VC- backed startups	(6) Ratio (4) / (5)	(7) Ratio (4) / (1)
2009	1 233	17 431	7.07%	341	3 915	8.71%	27.66%
2010	1 427	20 881	6.83%	414	5 015	8.26%	29.01%
2011	1 675	23 058	7.26%	601	6 457	9.31%	35.88%
2012	2 093	27 254	7.68%	719	7 948	9.05%	34.35%
2013	2 410	27 528	8.75%	867	8 234	10.53%	35.98%
2014	2 701	25 885	10.43%	1 026	8 674	11.83%	37.99%
2015	2 389	22 937	10.42%	906	7 861	11.53%	37.92%
2016	1 892	16 832	11.24%	699	5 243	13.33%	36.95%
2017	1 657	11 351	14.60%	476	2 871	16.58%	28.73%
TOTAL	17 477	193 157		6 049	56 218		

Panel B: Summary statistics for fintech startups in the different continents. All 85 countries are allocated to their geographical region (according to the United Nations). Europe takes into account all current 28 EU-member states + Russia, Switzerland, Norway, Belarus, Ukraine, Isle of Man, Gibraltar and Guernsey. The definition of the data described in the columns is explained under panel A and here calculated for separate continents.

Continent	(1) N° of countries	(2) N° fintech startups	(3) N° startups	(4) Ratio (2) / (3)	(5) N° VC- backed fintech startups	(6) N° VC- backed startups	(7) Ratio (5) / (6)	(8) Ratio (5) / (2)
Africa	9	134	1 088	12.32%	19	152	12.50%	14.18%
Europe	36	5 357	56 171	9.54%	2 038	18 887	10.79%	38.04%
Asia	21	2 677	26 434	10.13%	835	6 662	12.53%	31.19%
North- America	2	8 407	101 165	8.31%	2 989	29 352	10.18%	35.55%
Central- Latin America	9	137	753	18.19%	37	167	22.16%	27.01%
South- America	6	368	3 641	10.11%	80	646	12.38%	21.74%
TOTAL	85	17 477	193 157		6 049	56.218		

Panel C: Summary statistics for the twenty largest suppliers of fintech startups in absolute numbers. The definition of the data described in the columns is explained under panel A, but here calculated for separate countries.

Country	(1) N° fintech startups	(2) N° startups	(3) Ratio (1) / (2)	(4) N° VC backed fintech startups	(5) N° VC- backed startups	(6) Ratio (4) / (5)	(7) Ratio (4) / (1)
USA	7 956	95 485	8.33%	2 931	28 898	10.14%	36.84%
UK	1 725	14 716	11.72%	623	4 543	13.71%	36.12%
India	861	11 607	7.42%	248	2 434	10.19%	28.80%
Israel	650	5 234	12.42%	111	996	11.14%	17.08%
Germany	557	5 715	9.75%	234	2 168	10.79%	42.01%
Canada	451	5 680	7.94%	58	454	12.78%	12.86%
France	411	5 597	7.34%	221	2 683	8.24%	53.77%
Netherlands	392	4 518	8.68%	99	1 189	8.33%	25.26%
Singapore	355	1 696	20.93%	113	430	26.28%	31.83%
Australia	351	3 534	9.93%	44	317	13.88%	12.54%
Spain	293	4 365	6.71%	121	1 474	8.21%	41.30%
China	289	1 873	15.43%	184	1 239	14.85%	63.67%
Brazil	215	2 054	10.47%	43	312	13.78%	20.00%
Sweden	207	2 574	8.04%	123	1 107	11.11%	59.42%
Italy	194	2 405	8.07%	84	823	10.21%	43.30%
Switzerland	146	955	15.29%	60	424	14.15%	41.10%
Russia	140	1 328	10.54%	78	563	13.85%	55.71%
Ireland	136	2 248	6.05%	50	570	8.77%	36.76%

Mexico	121	683	17.72%	32	154	20.78%	26.45%
Denmark	108	1 335	8.09%	50	446	11.21%	46.30%
TOTAL	15 558	173 602		5 507	51 224		

Table 4 investigates the summary statistics of the independent variables more extensively. Panel A documents a cross tabulation of the cultural dimensions. Panel B combines the lower and upper scales of the dimensions with the figures and ratios of the dependent variables. Panel A shows data over all seventy countries from which data about the cultural dimensions was available. It's clear that the average scale for the cultural dimension's masculinity and long-term orientation is somewhat in the middle scales. The cross-country mean is more tending towards collectivism and a higher than average level of power distance is present. The latter confirms that the majority of the sample has to comply with societies where hierarchical order with an unequally distribution of power is more common. However, the uncertainty avoidance dimension in approximately 70% of the countries results in a noticeable higher scale. Hofstede G., Hofstede G. J., and Minkov (2010) declare that the average person in Central Europe, Latin America, Japan, South-Korea, Russia, Middle-East and Pakistan - which considers the majority of our sample - is more neurotic and less agreeable than in an uncertainty tolerant culture (Hofstede and Hofstede, 2005; Hofstede and McCrae, 2004). On the other hand, "easy travellers" are China, South-East Asia, Scandinavia, Anglo countries⁵ and India (Hofstede, Hofstede, & Minkov, 2005).

Table 4: Description of the five cultural dimensions of Hofstede. These tables represent descriptive statistics of the independent variables over the entire sample retrieved from the Hofstede Insights database and data from Geert Hofstede. Panel A reports a cross table over the different dimensions. Panel B (in appendix) shows the countries with the lower and upper scores in the Hofstede cultural dimensions combined with data about the fintech startups and VC-backed fintech startups of these countries.

Panel A: Cross tabulation of cultural dimensions. The different columns represent the five Hofstede cultural dimensions. The scale is divided over four categories. "Low" represents the countries with a score of lower or equal to 25. "Medium-low" typifies the scores over 25 until 50. "Medium-high" describes the countries with a score below and equal to 75. "High" shows all scores over 75 with a maximum of 100.

⁵ Which includes: United States of America, United Kingdom, Canada, Australia, New Zealand

		PDI	IND	MAS	UA	LTO
Low	Count	4	22	8	2	15
	<i>% of total</i>	5.71%	31.43%	11.43%	2.86%	21.43%
Medium-low	Count	21	19	32	19	24
	<i>% of total</i>	30.00%	27.14%	45.71%	27.14%	34.29%
Medium-high	Count	31	21	26	20	20
	<i>% of total</i>	44.29%	30.00%	37.14%	28.57%	28.57%
High	Count	14	8	4	29	11
	<i>% of total</i>	20.00%	11.43%	5.71%	41.43%	15.71%
Total		70	70	70	70	70

Panel B (in appendix) of table 4 analyses data of the Hofstede dimensions and the fintech startup market with the intention to distract trends between the independent and dependent variables. Entrepreneurship in the fintech sector is compared between the lower (0-25) and upper (75-100) scales within each cultural factor. However, we recognize that several other mediators will impact the number of cross-national fintech startups and that countries in the medium-low and medium-high segment of the dimensions could have a possible significant effect towards fintech entrepreneurship. The assumed main and moderating effects of culture will be analysed later in this work. Nevertheless, we want to research the impact of the most extreme cases on the fintech startup market and its financing. After the absolute number of fintech startups, we introduced two ratios which control for the differences in country's size. In 2017 for example Brazil has more than 210 million inhabitants and Sweden around 10 million, but the amount of fintechs raised is, on average, similar in both countries. As a result, the fintech startups are a "hotter industry" in Sweden, with 2.54 fintechs per 1 million inhabitants, than Brazil where the average is only 0.12 fintechs. Population data per country (divided by one million) is retrieved from the World Bank to check for this effect.

The first section about the power distance index shows that fintech startup formations mainly occur in countries with the lowest scores by which, on average, 219 fintechs are founded with 3.24 fintech startups per million capita. This is remarkably higher than highest quarter scores, which report averages of 118 fintechs and only 0.17 fintech per million capita. The main driver of the low-PDI score sample is Israel where approximately 9 fintech companies are set up per one million people. According to Hofstede Insights (2019), Israelis strongly believe in decentralized

power with independency, equal rights, accessible superiors and empowerment as core values. A report of Deloitte (2018) describes Israel's fintech landscape and concludes that Israel is becoming a fintech hub, in line with Silicon Valley, Singapore and London. The core reasons are the innovative disruptive entrepreneurial culture, which encourages experimentation and embraces failure, and substantial government support (Deloitte, 2018). Furthermore, the absolute VC fintech activity is somewhat similar between the country split. However, VC-backed fintech startup companies per 1 million inhabitants are more common in low PDI countries.

The individualism cultural factor places the majority of countries in the low side of this dimension. Although, comparing the fintech activity in both categories, it is obvious that fintech startup formations are more widespread in individualistic countries with an average of 1 248 fintechs (against 53 fintechs) and if controlled for size 1.58 fintech per 1 million people (against 0.46). The US and UK are responsible for the largest effect. Children in the UK are taught from an early age to think for themselves and how they can uniquely contribute to society. The US society is also loosely knit in which people look after themselves. Americans are accustomed to do business with people they do not know and display initiative in the corporate world (Hofstede Insights, 2019). Together with Australia, Canada, the Netherlands and Italy, six out of the twenty largest fintech suppliers are represented in the individualism dimension's upper level. Also, it seems that VC-backed fintech startups can be found in more self-reliant societies.

Furthermore, the third section is about the masculinity dimension. Only a small part of the total sample shows high masculine or feminine scores. The average number of financial technology startups in absolute figures and per million capita is higher in more feminine countries. Noticeable is that the highest ratio per 1 million inhabitants is for Lithuania, a small Eastern European country with only 3 million inhabitants, has 3.32 fintech per million capita. It knows a tender culture where standing out of the crowd is not admirable and where people are motivated because they just do what they like to do. The presence of venture capitalists in the fintech markets are slightly higher in the low masculinity countries. If controlled for population, 42% of all fintech startups are financed by private equity players in countries low on masculinity against 39% for countries high on masculinity scores.

About uncertainty avoidance, only two countries have a remarkable low value for this dimension. The average of the fintech startups in these countries, Singapore and Denmark, is about four fintechs per one million people higher than the average in the risk averse countries. Both countries are well-known as societies of risk takers that prefer changes and challenges. Furthermore, it seems that VC-backed fintechs are also more present in these low uncertainty avoidance countries.

The last caption of table 4 - panel B describes the long-term orientation dimension. It can be deducted that fintech entrepreneurship is more common in pragmatic countries. These countries like Germany and China report a high number of fintech startup formations, but these are both countries with an enormous population. When controlled for number of fintech startups per one million people, another East-European country, Estonia, reports 6.49 fintechs during 2009-2017. According to Hofstede Insights (2019), Estonians show ability to adapt easily to other conditions and have a tenacity in achieving results. For example, the long-term vision in the country becomes clear by the e-Estonia⁶ services offered by the government. The amount of fintech startups financed by venture capitalists is highest for the LT-orientated countries. On average and controlled for population, almost four out of ten fintech startups had a venture capital injection in comparison with 25% for countries that report the lowest scores in this dimension. Moreover, **Table 5** in appendix describes the univariate statistics of the variables after listwise deletion of missing data points.

5.2 Bivariate statistics

Table 6 (in appendix) describes the Pearson correlations of the data set.⁷ We recognize that this simple empirical relation between dependent and independent variables does not directly indicate the concept of causation. Extraneous variables, called spurious factors, may also intervene in the relationship between the dependent and independent variables. The effect of

⁶ Refers to an Estonian governmental organization that facilitates citizen interactions (such as government services, voting, taxes, education) through the use of electronic solutions. For example, voting is done with an application.

⁷ As a robustness check, the Spearman's rho is obtained for measuring covariation between variables with an ordinal distribution and the scale dependent variable. Similar correlations were found.

the most plausible factors, based on prior research and the particular context of fintech startups, is researched in the following chapter. However, several patterns in the correlations are worth mentioning. Furthermore, the lagged variables and the cultural factors which are rooted from country related traditions, satisfy the condition of temporal precedence (Van de Ven, 2007).

The covariations between the dependent and independent variables are all significant. First of all, *power distance index* is negatively correlated (-0.354) with the new fintech startups formations. This is in line with the assumption in hypothesis 1 that nations with low scores on the PDI stand for more ownership and thus by following Knight's theory more fintech startups. Moreover, a strong positive relationship (0.605) between *individualism* and the number of fintechs is recognized. As a result, a higher level of individualism might lead to an upwards tendency of fintech startup formations. This may support our second hypothesis in which is assumed that the positive influence of individualism on entrepreneurial traits, motivations and innovation will upwards affect the number of fintech startup formations. Hypothesis 3 suggests that neither lower nor higher values on the *masculinity* dimension are linked with the dependent variable. This may not be affirmed by the correlation matrix in which is shown that this cultural dimension relates positively (0.107), however weak, with the dependent variable. Concerning the fourth hypothesis, *uncertainty avoidance* is negatively (-0.226) correlated with the number of fintech startups. In line with Bogatyreva et al. (2019), this may elucidate that entrepreneurs starting in a technology related sector need to be more comfortable in unstructured situations. For the *long-term orientation* dimension, the Pearson correlation coefficient shows a positive relationship (0.285). As stated in the last hypotheses about the main effects, it can be suggested that long-term working values may stimulate entrepreneurs to start fintech ventures.

Interesting to mention is that different findings can also be encountered with respect to our own correlations and those in the work of Haddad and Hornuf. For the replicated variables that will be used in **model I**, we compared both correlation matrices while acknowledging the aforementioned limitations about correlation and causation. In line with their findings, we find that the variables describing the development of the economy and capital markets are positively correlated with the dependent variable. For the *ease of access to loans* variable, measuring the effect of the soundness of the financial system, a positive correlation in both samples can be

found. Considering the availability of the latest technologies and infrastructure, it can be said that the variables *secure internet servers* and *availability of latest technologies* are in both samples positively correlated with the number of fintech startups. A difference can be found for the variable *mobile telephone subscriptions*. But with a very weak and insignificant correlation, it can be concluded that this variable does not covariate with the number of fintech startup formations in both cases. Moreover, the measures describing the impact of market regulations and labour force on the fintech startups show similar and so positive correlations in our research and that of Haddad and Hornuf. Overall, it can thus be concluded that analogous covariations for the corresponding measures between both samples were found and that those bivariate relationships are in line with three out of four hypotheses in the paper of Haddad and Hornuf (about the well-developed capital markets; latest technologies and infrastructure; regulation and labour market). Although, the variable *ease of access to loans* shows a correlation which is opposite to the assumption that fintech startups occur more in countries with a more fragile financial sector. This might indicate that fintech and traditional financial services can be complements (Haddad & Hornuf, 2018).

Both control variables that will be applied in **model II** show significant and positive correlations with the number of fintech startup formations. This may indicate that countries with a higher GDP, that provide a richer environment for ventures, embrace more high-quality entrepreneurship than countries with a medium- or low-GDP. Moreover, the higher value of the variable *business regulation* may point out that countries with more adaptive institutional conditions may support entrepreneurial activities (Frese, Rauch, & Zhao, 2012).

6. Cultural determinants of fintech startups

In order to analyse the impact of cultural dimensions on the number of fintech startup formations, we implemented a multivariate analysis on our longitudinal data for the two aforementioned models. This chapter will test the hypotheses and so determine whether culture has an impact on fintech startup formations. We therefore specify six different regressions for both models. The first five regressions research the main effect of each dimension separately on the amount of fintech startups. The integral and thus sixth model includes all cultural dimensions along with the specified interaction terms of the independent variables. As mentioned in the methodology, this study proposes the following random effects regression in which i indicates the separate countries (63 countries after listwise deletion covering 14 452 fintechs) and t specifies the years (2009-2017) in our research:

MODEL I

$$\text{Ln (new fintech)} =$$

$$\begin{aligned} & \alpha + \beta_1 * \text{power distance index}_{i,t} \text{ (1)} + \beta_2 * \text{individualism}_{i,t} \text{ (2)} + \beta_3 * \text{masculinity}_{i,t} \text{ (3)} \\ & + \beta_4 * \text{uncertainty avoidance}_{i,t} \text{ (4)} + \beta_5 * \text{long term orientation}_{i,t} \text{ (5)} + \beta_6 * \text{Ln(depositis to GDP)}_{i,t-1} \\ & + \beta_7 * \text{VC availability}_{i,t-1} + \beta_8 * \text{Ln (GDP per capita)}_{i,t-1} + \beta_9 * \text{investor protection}_{i,t-1} \\ & + \beta_{10} * \text{ease of access to loans}_{i,t-1} + \beta_{11} * \text{Ln (secure internet servers)}_{i,t-1} \\ & + \beta_{12} * \text{Ln (mobile subscriptions)}_{i,t-1} + \beta_{13} * \text{availability of latest technology}_{i,t-1} \\ & + \beta_{14} * \text{credit market regulations}_{i,t-1} + \beta_{15} * \text{labour market regulations}_{i,t-1} \\ & + \beta_{16} * \text{business regulations}_{i,t-1} + \beta_{17} * \text{strength of legal rights}_{i,t-1} \\ & + \beta_{18} * \text{Ln(labor force)}_{i,t-1} + \beta_{19} * \text{rule of law}_{i,t-1} \\ & + \beta * \sum \text{culture interaction effects (6)} + \text{time effects} + u_i + e_{i,t} \end{aligned}$$

MODEL II

$$\ln(\text{new fintech}) =$$

$$\begin{aligned} & \alpha + \beta_1 * \text{power distance index}_{i,t} \text{ (1)} + \beta_2 * \text{individualism}_{i,t} \text{ (2)} + \beta_3 * \text{masculinity}_{i,t} \text{ (3)} \\ & + \beta_4 * \text{uncertainty avoidance}_{i,t} \text{ (4)} + \beta_5 * \text{long term orientation}_{i,t} \text{ (5)} \\ & + \beta_6 * \ln(\text{GDP per capita})_{i,t-1} + \beta_7 * \text{business regulations}_{i,t-1} \\ & + \beta * \sum \text{culture interaction effects (6)} + \text{time effects} + u_i + e_{i,t} \end{aligned}$$

Regression 1: main effect of power distance index (PDI) (1) ; Regression 2: main effect of individualism (IND) (2)
 Regression 3: main effect of masculinity (MASC) (3) ; Regression 4: main effect of uncertainty avoidance (UA) (4)
 Regression 5: main effect of long-term orientation (LTO) (5); Regression 6: main effect of all cultural dimensions (1-5) plus associated interaction term (6) (FULL)

The six regressions indicate generalized least square estimations and are thus robust against autocorrelation and heteroskedasticity patterns in the error term. Furthermore, the panel structure of our data set alleviates multicollinearity through linking variation across countries with variation over time (Kennedy, 2003).⁸ Random country effects u_i and time dummies are inserted to clarify country or time effects that are not included in the regression. The existence of these effects is tested by the Lagrange multiplier test and indicates that the random effect is able to deal with the heterogeneity better than a pooled OLS model (Breusch & Pagan, 1980). The Hausman test evaluates whether or not the individual effect u_i is correlated with other regressors in the model. As a result, the random effects model is not the Best Linear Unbiased Estimate (BLUE) if such a correlation is present (Hausman, 1978). Moreover, we acknowledge that the fixed effects model with de-measured variables is not applicable for this study because of the time-invariant character of the independent variables. In what follows, the regression results are discussed for both models. We also test and report the Lagrange multiplier test, called the Breusch-Pagan test, and Hausman test to prove that the random effects regression is an

⁸ As a robustness check for multicollinearity, the variance inflation factors for the independent and control variables were calculated. All values are below 10 and indicate no collinearity problems.

adequate fit for our statistical analyses. The robustness of the results is checked by replicating both models with the dependent variable *new VC-backed fintech*.

6.1 Model I

The first model, including all six regressions, is reported in **Table 7 – Panel A** (with Panel B as robustness check in the appendix). In order to research the first five hypotheses, the main effect of the individual cultural dimensions is investigated. The last regression includes two interaction terms testing hypotheses 6 and 7. All regressions indicate that the use of a random effects model is appropriate. In general, the results of all six regressions show a relatively uniform picture. It displays that the majority of Hofstede's cultural dimensions are not direct predictors of the prevalence of fintech startup formations in a society, taken into account so-called spurious factors that are significant according to Haddad and Hornuf.

Regarding PDI, we find no significant relationship between the power distance index and the number of fintech startup formations. This does not support hypothesis 1 which assumes a negative relationship between these variables because of the “Ownership Theory” and the relation between power distance and extraversion. For individualism, Table 7 shows that the relation between this dimension and the number of fintech startups is positive and significant ($p < 0.05$). This is in line with the expected combined effect of individualism on entrepreneurial traits, intention and innovation described in hypothesis 2. The result therefore indicates that more fintech startup formation emerge in the 63 countries during the sample period if they are proven to be more individualistic and extravert (this Big Five trait was strongly correlated with the individualism dimension). Furthermore, we find no evidence that more or less masculine values should lead to an increase of decrease fintech formations. This is in line with hypothesis 2 in which we argue that either values linked to the masculine and feminine pole of the dimensions can be advantages for startup creation. Moreover, uncertainty avoidance is not statistically related to the number of fintech formation during the period of 2009-2017. The assumption of hypothesis 4 that fewer fintech formations emerge due to smaller supply of entrepreneurs in high UA-countries therefore does not hold. Similar results were found for the LTO dimension. Although high scale values indicate a pragmatic society, we cannot confirm hypothesis 5. Thus,

the positive effect that the application of modern knowledge, as a way to prepare for the future, should have on the number of new fintech ventures stays out. Finally, the effect of both interaction terms in the column “FULL” is also not significant, indicating that the combination of being more individualistic and less risk-averse or more pragmatic does not indicate that a country will know an upsurge in its number of fintech startup ventures.

Comparing our results with those of Haddad and Hornuf, we find some conflicting results. Overall, we also discover a positive significant link between GDP per capita and fintech startup formations in the following year ($p < 0.05$). In addition, a higher investor protection index is positively related with LN (new fintech startup) in the next year ($p < 0.01$). A country with this kind of optimized legal protection, which is present in financial hubs such as Silicon Valley, London or Singapore, leads logically towards more investors which can explain the positive relation between both variables knowing that nowadays private equity players invest a large amount in fintech ventures. Though, as indicated, we use this variable as a proxy for the well-developed economies trying to find support for the assumption that fintech startups occur more if a country has a well-developed economy and capital markets. Both variables are in line with the results of Haddad and Hornuf and indicate that fintech formations take place in well-developed economies. However, Haddad and Hornuf report a strong and positive relationship between VC financing and the dependent variable, but we don't find direct statistical support between our variable VC availability and the number of fintech startup formations. This result may be explained because the variable in our research measures the availability of VC capital as an answer on an ordinal scale in a cross-national survey. The measure in the work of Haddad and Hornuf gauges the total amount of VC funding of all startups (excluding the fintech startups) while our measure does not take into account the absolute amount of venture capital available over all startup ventures. For example, high values for our variable *VC availability* are found for Hong Kong and Malaysia, but the invested amount is certainly higher in the US and UK compared to the former mentioned regions. Hong Kong and Malaysia also don't immediately show a high number of fintech startups when compared to the US and UK.

Consequently, our sample shows no evidence that the presence of new technologies or supporting infrastructure should impact the number of startup formations in the fintech industry.

This is not in line with Haddad and Hornuf that find support that more fintech formations are launched in countries where secure internet servers, mobile telephone subscriptions or the latest technologies are emphatically more available. Concerning their hypothesis about the frailty of the financial system, Haddad and Hornuf included several variables like “the soundness of banks”; “investment profile” and the “ease of access to loans”. The latter is found to be significant and thus included in our research.⁹ Comparing our results with theirs, no negative relationship between the dependent and this variable is found in this multivariate analysis. So, easier access to corporate credits in year_{t-1}, linked to a less frail financial system, leads not directly towards an upward trend of fintech startup formations in year_t. As assumed by Haddad and Hornuf, a larger and more varied supply of labour, signalling a probable higher number of talent and entrepreneurship, is significant and positively related to the number of fintech startups in the following year ($p < 0.01$). The regulation index is in our sample, in contradiction with Haddad and Hornuf, split into three variables for our sample. Table 7 shows that higher a credit market index is positively related to the number of new beginning fintech ventures in the next year ($p < 0.10$). Accordingly, Haddad and Hornuf demonstrate that individuals are more likely to have entrepreneurial ambitions with a supportive regulatory regime. In this case, benevolent credit markets should lead to more entrepreneurial activity in the fintech sector. Both variables are in line with the hypothesis of Haddad and Hornuf indicating that fintech startups occur more frequently in countries with a benevolent regulation and a larger labour market.

The robustness check (Panel B in appendix) shows that the individualism dimension has no statistical positive impact anymore when the dependent variable is filtered for fintech startups that are or were VC-backed. The presence of venture capitalists in a country takes thus the feature of being more entrepreneurial through individualism away. This can be explained by the fact that in large financial ecosystems a lot of private equity players provide a huge amount of capital, but these financial ecosystems indicate that a higher amount of backed fintech startups is not naturally linked with a high individualism dimension. Concerning the mediators, similar

⁹ The variable “soundness of banks” measures the health of banks on a 1 (need to recapitalize) – 7 (healthy) scale. The other variable “investment profile” signals the risk of investment that is not linked towards any political, economic or financial risk component on a 0 (very high risk) – 4 (very low risk).

results were found when compared with the sample of panel A (with exception of the credit market regulations index).

Table 7 – Panel A: Regression output of model I about impact of culture on fintech startups. This table represents a random effect regression model. Columns (1)-(5) describe the main effect of the separate Hofstede dimensions on the number of new fintech startups with all significant mediators according to Haddad and Hornuf. Column (6) describes the effect of all cultural dimensions and two additional interaction terms on the dependent variable. The variables are defined in Table 2. All regressions include a constant and year fixed effect (not reported due to space considerations). Further, column (1)-(6) all report goodness of fit indicators including the p-value of the joined test on named regressors (null hypothesis indicates that the aggregated effect of all coefficients is zero); Hausman test (null hypothesis indicates no correlation between the random effect and the effect of other regressors) and Breusch-Pagan test (null hypothesis indicates that the variance of the unit-specific error is zero).

Dependent variable: Ln(new fintech startup)	(1) PDI	(2) IND	(3) MASC	(4) UA	(5) LTO	(6) FULL
Power distance index	-0.008	—	—	—	—	0.003
Individualism	—	0.026**	—	—	—	0.040
Masculinity	—	—	0.005	—	—	0.004
Uncertainty avoidance	—	—	—	-0.001	—	0.005
Long-term orientation	—	—	—	—	0.010	0.018
IND * (-UA)	—	—	—	—	—	0.000
IND * LTO	—	—	—	—	—	0.000
Ln (deposits to GDP)	-0.318	-0.342	-0.359	-0.343	-0.355	-0.376
VC availability	0.040	0.051	0.038	0.036	0.038	0.052
Ln (GDP per capita)	0.518**	0.369	0.552**	0.565***	0.542**	0.342
Investor protection	0.117**	0.119***	0.119***	0.119***	0.122***	0.121***
Ease of access to loans	0.011	0.012	0.010	0.010	0.011	0.012
Ln (secure Internet servers)	-0.040	-0.071	-0.037	-0.036	-0.045	-0.081
Ln (mobile subscriptions)	-0.123	-0.047	-0.127	-0.134	-0.147	-0.049
Availability of latest technologies	0.023	0.027	0.028	0.027	0.029	0.033
Credit market regulations	0.091*	0.090*	0.089*	0.089*	0.085*	0.085*
Labour market regulations	0.015	-0.008	0.009	0.012	0.012	-0.014
Business regulations	0.042	0.053	0.041	0.039	0.041	0.055
Strength of legal rights	0.007	0.005	0.008	0.008	0.009	0.004
Ln (labour force)	0.568***	0.512***	0.541***	0.553***	0.538***	0.466***
Rule of Law	0.417	0.355	0.474*	0.453*	0.449*	0.376
<i>Fixed time effects</i>	Yes	Yes	Yes	Yes	Yes	Yes

<i>Random country effects</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Log likelihood</i>	-559.15	-532.68	-561.50	-561.53	-556.15	-525.74
<i>AIC</i>	1 162.30	1 109.37	1 167.00	1 167.06	1 156.30	1 107.47
<i>SIC</i>	1 251.65	1 198.72	1 256.36	1 256.41	1 245.65	1 221.19
<i>Joint test on regressors (p-value)</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Hausman test (p-value)</i>	0.33	0.63	0.31	0.30	0.37	0.72
<i>Breusch-Pagan test (p-value)</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Observations</i>	429	429	429	429	429	429

Significance levels: *p < 0,10; **p < 0.05; ***p < 0.01

6.2 Model II

The second model, including all six regressions, is reported in **Table 8 – Panel A** (with Panel B as robustness check in the appendix). In order to research the first five hypotheses, the main effect of the individual cultural dimensions is investigated. The last regression includes two interaction terms testing hypotheses 6 and 7. All regressions indicate that the use of a random effects model is appropriate. In contrast with model I, we use the mediators (GDP per capita and business regulations) of culture suggested by Frese, Rauch and Zhao.

Generally, the output of all six regressions show relatively similar results as in model I in which we find that the majority of the cultural dimensions of Hofstede are not direct predictors of fintech startups.

Concerning culture, the results find statistical support for hypothesis 2 (IND) and hypothesis 3 (MASC) on the one hand but reject hypothesis 1 (PDI); hypothesis 4 (UA); hypothesis 5 (LTO) and hypotheses 6-7 (interactions) on the other hand. Even if we use mediators important to predict early-stage or high-innovation entrepreneurship, we cannot find any evidence that all mentioned cultural dimensions of Hofstede are linked with more entrepreneurship in the fintech sector. This can be explained by Hofstede's conclusion that if GNP (or GDP in our sample) per capita variable predicts a phenomenon better than culture, the explanation from cultural dimensions is considered to be redundant. As mentioned in literature, Hofstede proved this in his sample with only GNP per capita as mediator. Individualism is the sole exception with a strong significant impact on the number of fintech startups ($p < 0.01$). So, the assumption that the population of

individualistic cultures may thus be more motivated to pursue the creation of innovative ventures still holds. Also, in line with hypothesis 3, we find no link that either high masculine or feminine values should lead to a change in the amount of fintech startup formations.

The first mediator *GDP per capita* is used as a proxy for national wealth in the different countries. A significant positive relationship seconds the expectation of Frese, Rauch and Zhao that high-growth and high-innovation entrepreneurship is stronger in high-GDP countries ($p < 0.01$). Secondly, the variable *business regulations* is inserted as an institutional variable controlling the presence and benevolent strictness of business laws in a particular country. One should think that better corporate regulations and legislations determine individuals' choices leading towards more entrepreneurship, but no empirical evidence is found for this relationship with regard to the fintech industry.

The robustness check (Panel B in appendix) shows results that are mainly in line with those of Panel A. There can be deducted that the individualism dimension still has a statistical positive impact when the dependent variable is filtered for fintech startups that are or were VC-backed ($p < 0.05$). Checking for VC-backed companies only also indicates a significant negative impact of UA on the amount of startups in the fintech sector. This result supports the assumed negative relationship between uncertainty avoidance and VC-investment and can be explained by the lower openness of VC towards risk taking and new ideas in high UA countries. Without including all mediators according to Haddad and Hornuf, the general effect of culture over the number fintech can be calculated because the appropriate variables which control for factors other than culture, national wealth and legislation, are incorporated.

Table 8 – Panel A: Regression output of model II about impact of culture on fintech startups. This table represents a random effect regression model. Columns (1)-(5) describe the main effect of the separate Hofstede dimensions on the number of new fintech startups with the suggested mediators by Frese, Rauch and Zhao (2012). Column (6) describes the effect of all cultural dimensions and additionally two interaction terms on the dependent variable. The variables are defined in Table 2. All regressions include a constant and year fixed effect (not reported due to space considerations). Further, column (1)-(6) all report goodness of fit indicators including the p-value of the joined test on named regressors (null hypothesis indicates that the aggregated effect of all coefficients is zero); Hausman test (null hypothesis indicates no correlation between the random effect and the effect of other regressors) and Breusch-Pagan test (null hypothesis indicates that the variance of the unit-specific error is zero).

Dependent variable: Ln (new fintech startup)	(1) PDI	(2) IND	(3) MASC	(4) UA	(5) LTO	(6) FULL
Power distance index	-0.007	—	—	—	—	0.007
Individualism	—	0.031***	—	—	—	0.075**
Masculinity	—	—	0.010	—	—	0.008
Uncertainty avoidance	—	—	—	-0.012	—	0.009
Long-term orientation	—	—	—	—	0.013	0.017
IND * (-UA)	—	—	—	—	—	0.000
IND * LTO	—	—	—	—	—	-0.001
Ln (GDP per capita)	0.379**	0.113	0.440***	0.445***	0.396***	0.124
Business regulations	0.111	0.111	0.125	0.091	0.114	0.108
<i>Fixed time effects</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Random country effects</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Log likelihood</i>	-714.26	-671.76	-709.59	-705.50	-707.08	-635.55
<i>AIC</i>	1 448.52	1 363.53	1 439.18	1 431.00	1 434.16	1 303.11
<i>SIC</i>	1 489.13	1 404.14	1 479.80	1 471.61	1 474.78	1 368.09
<i>Joint test on named regressors (p-value)</i>	0.000	0.000	0.000	0.000	0.000	0.000
<i>Hausman test (p-value)</i>	0.700	0.763	0.616	0.516	0.782	0.749
<i>Breusch-Pagan test (p-value)</i>	0.000	0.000	0.000	0.000	0.000	0.000
<i>Observations</i>	429	429	429	429	429	429

Significance levels: *p < 0,10; **p < 0.05; ***p < 0.01

6.3 Limitations

A first limitation is the measure of culture as dimensions with values on a national level. Within nations there may be considerable different cultures and associated institutions between groups or regions. By using nation scores of cultural dimensions, variance of culture and other variables may be eliminated. Consequently, a potential present impact of culture may not have been found due to the nature of the data.

Secondly, it is possible that cultural dimensions interact with other variables that are not present in the data set. High education levels could for example provide individuals with more knowledge that can be applied to develop fintech services. This variable could interact with long-term orientation and lead to more well-thought out business plans with a viable, innovative technology. Another example is the presence of sandboxes which stimulate the creation of fintech startups. This variable was omitted in the models of this study and should preferably be included in future research.

Another limitation that may hide the impact of culture on the startup rates is the dataset. Although we add as many countries as possible, there are few countries included that score low on power distance, masculinity or uncertainty avoidance. For these dimensions, the amount of countries in the “low” category represent less than 12% of all nations. This indicates that the variance of these cultural dimensions may be low and reduces the possibility to use them as explaining variables. Particularly power distance and uncertainty avoidance illustrate how concentrated the values on some cultural dimensions can be. The aggregated proportion of nations scoring medium-low and medium-high for these dimensions amounts to over 74% and 82% respectively.

7. Conclusion

The prevalence of fintech activity varies strongly between countries and is definitely more present in financial centres. However, fintech is globally recognized as a strong emerging market and belongs to the top three sectors in which is invested in 2018. The main scope of this paper is to discover the impact of Hofstede's cultural dimensions on fintech startup rates during 2009-2017 over a cross-country sample. Using two models, we find limited support for this, because only the main effect of individualism seems to be a robust positive predictor of the startups. The individualism dimension may explain the higher rates through its association with entrepreneurial intention, entrepreneurial traits such as extraversion and adaptation of innovations. Furthermore, our research also shows that the gender-related cultural dimension masculinity shows no impact on fintech formations and is in line with the inconclusive literature about masculinity and entrepreneurship. The other cultural dimensions did not show a significant coefficient, resulting in the rejection of their corresponding hypotheses. The sole exception was a significant negative effect of uncertainty avoidance over the sample of VC-backed fintech formations. This conclusion is in line with those of Li and Zahra (2012) or Cumming et al. (2016). Moreover, the tested moderating effects between individualism and uncertainty avoidance or long-term orientation seems to have no effect on fintech startup rates. In general, we can conclude that culture thus appear to play a role in explaining startup rates in the fintech sector.

The structure of the study also allowed to partly replicate the model of Haddad and Hornuf (2018) and to confirm their findings. Our results are mostly in line with their results and show a positive impact of well-developed economies, larger labour market and benevolent regulation on the amount of fintech startups. We could however not find support that the appearance of fintech startups is more common in countries that dispose of the newest technologies and associated supporting infrastructure available. Consequently, our sample cannot confirm the hypothesis that the frailty of the financial sector influences fintech startup rates.

8. References

Aggarwal, R., Faccio, M., Guedhami O., & Kwok, C. (2016). Culture and finance: An introduction. *Journal of Corporate Finance*, Vol. 41, pp. 466-474.

<https://doi.org/10.1016/j.jcorpfin.2016.09.011>

Baeyens, K., Vanacker, T., & Manigart, S. (2006). Venture Capitalists selection process: the case of biotechnology proposals. *International Journal of Technology Management*, Vol. 34, No. 1 & 2, pp. 28-46.

Barrick, M. R., Mount, M. K., & Strauss, J. P. (1993). Conscientiousness and performance of sales representatives: Test of the mediating effects of goal setting. *Journal of Applied Psychology*, Vol. 78, 715–722. <https://doi.org/10.1037/0021-9010.78.5.715>

Benet-Martínez, V., & John, O. (1998). Los Cinco Grandes Across Cultures and Ethnic Groups: Multitrait Multimethod Analyses of the Big Five in Spanish and English. *Journal of Personality and Social Psychology*, Vol. 75, No. 3, pp. 729-750. <https://doi.org/10.1037/0022-3514.75.3.729>

Bettis, R., Helfat, C., & Shaver, M. (2016). The necessity, logic, and forms of replication. *Strategic Management Journal*, Vol. 37, pp. 2193–2203. <https://doi.org/10.1002/smj.2580>

Bogatyreva, K., Edelman, L., Manolova, T., Osiyevskyy, O., & Shirokova G. (2019). When do entrepreneurial intentions lead to actions? The role of national culture. *Journal of Business Research*, Vol. 96, pp. 309-321. <https://doi.org/10.1016/j.jbusres.2018.11.034>

Brandstätter, H. (2011). Personality aspects of entrepreneurship: A look at five meta-analyses. *Personality and Individual Differences*, Vol. 51, pp. 222-230. <https://doi.org/10.1016/j.paid.2010.07.007>

Breusch, T., & Pagan, A. (1980). The Lagrange Multiplier Test and its Applications to Model Specification in Econometrics. *Review of Economic Studies*, Vol. 34, pp. 239-253. <https://doi.org/10.2307/2297111>

Brockhaus, R. H. (1982). The psychology of the entrepreneur. In C. Kent, D. Sexton, and K. Vesper, eds., *Encyclopedia of entrepreneurship*. Englewood Cliffs, NJ: Prentice Hall, pp. 39-57

- Bukowski, A. & Rudnicki, S. (2019). Not Only Individualism: The Effects of Long-Term Orientation and Other Cultural Variables on National Innovation Success. *Cross-Cultural Research*, Vol. 53, No. 2, pp. 119-162. <https://doi.org/10.1177/1069397118785546>
- Burtch, G., Ghose, A., & Wattal, S. (2015). The Hidden Cost of Accommodating Crowdfunder Privacy Preferences: A Randomized Field Experiment. *Management Science*, Vol. 61, No. 5, pp. 949-962. <http://dx.doi.org/10.1287/mnsc.2014.2069>
- Carland, J., Hoy, F., Boulton, W. & Carland, J. (1984). Differentiating Entrepreneurs from Small Business Owners: A Conceptualization. *Academy of Management Review*, Vol. 9, No. 2, pp. 354-359. <https://dx.doi.org/10.2307/258448>
- Costa, P. T., & McCrae, R. R. (1992). Revised NEO Personality Inventory (NEO-PI-R) and NEO Five Factor Inventory (NEO-FFI) Professional manual. Odessa, FL: Psychological Assessment Center.
- Cumming, D., Henriques, I., & Sadorsky, P. (2016). 'Cleantech' venture capital around the world. *International Review of Financial Analysis*, Vol. 44, pp. 86-97. <http://dx.doi.org/10.1016/j.irfa.2016.01.015>
- Cumming, D., & Schwienbacher, A. (2018). Fintech venture capital. *Corporate Governance: An International Review*, Vol. 26, No. 5, pp. 374-389. <https://doi.org/10.1111/corg.12256>
- Darden, K., Dixit, N., & Mason, T. (2018). *2018 US Fintech Market Report*. Available at: <https://www.spglobal.com/marketintelligence/en/documents/2018-us-fintech-market-report.pdf>
- Davidsson, P., & Wiklund J. (1997). Values, beliefs and regional variations in new firm formation rates. *Journal of Economic Psychology*. Vol. 18, No. 2, pp. 179-199. [https://doi.org/10.1016/S0167-4870\(97\)00004-4](https://doi.org/10.1016/S0167-4870(97)00004-4)
- Deloitte. (2017). Connecting global fintech: Hub interim review 2017. Available at: http://thegfhf.org/wp-content/uploads/2017/04/J11481-Global-Fintech-WEB.pdf?utm_source=gfhf_pdf&utm_medium=home&utm_campaign=Interim_Hub_Review_2017_pdf

- Deloitte. (2018). *Israel Fintech Landscape Report*. Available at: <https://www2.deloitte.com/content/dam/Deloitte/il/Documents/technology/Israel%20Fintech%20Landscape%20Report.pdf>
- Draganov, I. (2019). *Global fintech investment doubles to €43 billion in 2018*. Retrieved June, 2019, from Dealroom: <https://blog.dealroom.co/global-fintech-investment-doubles-to-e43-billion-in-2018/>
- Durham, J. (2002). The Effects of Stock Market Development on Growth and Private Investment in Low Income Countries. *Emerging Markets Review*, Vol. 3, No. 3, pp. 211-232. [https://doi.org/10.1016/S1566-0141\(02\)00022-5](https://doi.org/10.1016/S1566-0141(02)00022-5)
- Dushnitsky, G., Guerini, M., Piva, E., & Rossi-Lamastra, C. (2016). Crowdfunding in Europe: determinants of platform creation across countries. *California Management Review*, Vol. 58, 44–71. <https://doi.org/10.1525/cmr.2016.58.2.44>
- Eckhardt, J.T., & Shane, S.A. (2003). Opportunities and Entrepreneurship, *Journal of Management*, Vol. 29, No. 3, pp. 333-349. <https://doi.org/10.1177/014920630302900304>
- Ernst & Young. (2018). Regulatory "sandboxes" facilitate optimal regulation in Asia Pacific. Available at <https://www.ey.com/gl/en/industries/financial-services/fso-insights-regulatory-sandboxes-facilitate-optimal-regulation-in-asia-pacific>
- Frese, M., Rauch, A., & Zhao, X. (2012). Cross-country Differences in Entrepreneurial Activity: The Role of National Cultural Practice and Economic Wealth. *Frontiers of Business Research in China*, Vol. 6, No. 4, 447-474. <https://doi.org/10.3868/s070-001-012-0021-0>
- Gai, K., Qiu, M., & Sun, X. (2018). A survey on FinTech. *Journal of Network and Computer Applications*, Vol. 103, 262–273. <https://doi.org/10.1016/j.jnca.2017.10.011>
- Goldberg, L. R. (1993). The structure of phenotypic personality traits. *American Psychologist*, Vol. 48, No. 1, pp. 141-165. <https://doi.org/10.1037//0003-066X.48.1.26>
- Gupta, D., Veliyath, R. & George, R. (2018). Influence of national culture on IPO activity. *Journal of Business Research*, Vol. 44, pp. 226-246. <https://doi.org/10.1016/j.jbusres.2018.04.023>

Haddad, C. & Hornuf, L. (2018). The emergence of the global fintech market: economic and technological determinants. *Small Business Economics*, Vol. 53, No. 1, pp. 81-105.

<https://doi.org/10.1007/s11187-018-9991-x>

Hadwick, R. (2011). Should I Use GLOBE or Hofstede? Hawaii: Shidler College of Business.

Available at https://www.anzam.org/wp-content/uploads/pdf-manager/574_ANZAM2011-335.PDF

Haidar, J. I. (2008). Investor protections and economic growth. *Economics Letters*, Vol. 103, pp. 1-4. <https://doi:10.1016/j.econlet.2008.12.007>

Han, R., & Melecky, M. (2013). Financial Inclusion for Financial Stability - Access to Bank Deposits and the Growth of Deposits in the Global Financial Crisis. *Policy Research working paper*, no. WPS 6577. Washington, DC: World Bank. Available at:

<http://documents.worldbank.org/curated/en/850681468325448388/pdf/WPS6577.pdf>

Hausman, J. A. (1978). Specification Tests in Econometrics. *Econometrica*, Vol. 46, No. 6, pp. 1251-1271. <https://doi:10.2307/1913827>

Hayton, J., George, G., & Zahra, S. (2002). National Culture and Entrepreneurship: A Review of Behavioral Research. *Entrepreneurship Theory and Practice*, Vol. 26, No. 4, pp. 33-52. Available at: http://ink.library.smu.edu.sg/lkcsb_research/4642

He, D., Leckow, R., Haksar, V. et al. (2017). Fintech and Financial Services: Initial Considerations. IMF Staff Discussions note 17/05. <http://dx.doi.org/10.5089/9781484303771.006>

Hofstede, G. (2001). *Cultures consequences: Comparing values, behaviors, institutions and organizations across nations* (2nd edition). Thousand Oaks, CA: Sage.

Hofstede Insights. (2019). *Comparison between United States and United Kingdom*. Retrieved May 08, 2019, from <https://www.hofstede-insights.com/country-comparison/the-uk,the-usa/>

Hofstede Insights. (2019). *What about Israel?* Retrieved May 08, 2019, from: <https://www.hofstede-insights.com/country/israel/>

Hofstede, G., & Hofstede, G. J., & Minkov, M. (2010). *Cultures and Organizations: Software of the Mind*. USA: McGraw-Hill.

Hofstede, G., & McCrae, R. (2004). Personality and Culture Revisited: Linking Traits and Dimensions of Culture. *Cross-Cultural Research*, Vol. 38, No. 1, pp. 52-88.

<https://doi.org/10.1177/1069397103259443>

Hofstede, G. & Minkov, M. (2010). Long- versus short-term orientation: new perspectives. *Asia Pacific Business Review*, Vol. 16, No. 4, pp. 493-504.

<https://doi.org/10.1080/13602381003637609>

Hopp, C., & Stephan, U. (2012). The influence of socio-cultural environments on the performance of nascent entrepreneurs: Community culture, motivation, self-efficacy and start-up success. *Entrepreneurship & Regional Development*, Vol. 24, No. 4&5, pp. 917-945.

<http://dx.doi.org/10.1080/08985626.2012.742326>

Innovate Finance. (2018). *Fintech VC investment landscape*. Available at:

<https://cdn2.hubspot.net/hubfs/5169784/Innovate-Finance-2018-FinTech-VC-Investment-Landscape.pdf>

Jenik, I., & Lauer, K. (2017). *Regulatory Sandboxes and Financial Inclusion*. CGAP. Available at:

<https://www.cgap.org/sites/default/files/researches/documents/Working-Paper-Regulatory-Sandboxes-Oct-2017.pdf>

Kennedy, P. (2003). *A guide to econometrics: Panel Data* (chapter 17). Cambridge, MA: The MIT Press.

Knight, R. (1987). *Corporate innovation and entrepreneurship: A Canadian study*. *Journal of Product Innovation Management*, Vol. 4, No. 4, pp. 284-297. [https://dx.doi.org/10.1016/0737-6782\(87\)90032-4](https://dx.doi.org/10.1016/0737-6782(87)90032-4)

Koetter, M. & Blaseg, D. (2015). *Friend or foe? Crowdfunding versus credit when banks are stressed*. IWH Discussion Papers. Available at: http://www.iwh-halle.de/fileadmin/user_upload/publications/iwh_discussion_papers/8-15.pdf.

KPMG. (2019). *The Pulse of Fintech 2018*. Available at:

<https://assets.kpmg/content/dam/kpmg/xx/pdf/2019/02/the-pulse-of-fintech-2018.pdf>

Krueger, N., Reilly, M., & Carsrud, A. (2000). Competing models of entrepreneurial intentions. *Journal of Business Venturing*, Vol. 15, No. 5-6, pp. 411-432. [https://doi.org/10.1016/S0883-9026\(98\)00033-0](https://doi.org/10.1016/S0883-9026(98)00033-0)

Kreiser, P., Marino, L., Dickson, P., & Weaver, K. (2010). Cultural Influences on Entrepreneurial Orientation: The Impact of National Culture on Risk Taking and Proactiveness in SMEs. *Entrepreneurship Theory and Practice*, Vol. 34, No. 5, pp. 959-984. <https://doi.org/10.1111/j.1540-6520.2010.00396.x>

Lee, I., & Shin, Y. (2018). Fintech: Ecosystem, business models, investment decisions, and challenges. *Business Horizons*, Vol. 68, 35–46. <http://dx.doi.org/10.1016/j.bushor.2017.09.003>

Li, Y., & Zahra, S. (2012). Formal institutions, culture, and venture capital activity: A cross-country analysis. *Journal of Business Venturing*, Vol. 27, 95–111. <http://dx.doi.org/10.1016/j.jbusvent.2010.06.003>

Lin, M., & Viswanathan, S. (2016). Home Bias in Online Investments: An Empirical Study of an Online Crowdfunding Market. *Management Science*, Vol. 62, No. 5, 1393–1414. <http://dx.doi.org/10.1287/mnsc.2015.2206>

Philippon, T. (2016). The FinTech Opportunity. NBER Working paper. Available at: <https://www.nber.org/papers/w22476.pdf>

Pollari, I., (2016). The rise of fintech opportunities and challenges. *The Journal of Applied Science in Southern Africa*, Vol. 3, pp. 15-21. Available at: http://thegfhf.org/wp-content/uploads/2017/04/J11481-Global-Fintech-WEB.pdf?utm_source=gfhf_pdf&utm_medium=home&utm_campaign=Interim_Hub_Review_2017_pdf

Marcati, A., Guido, G., & Peluso, A. (2008). The role of SME entrepreneurs' innovativeness and personality in the adoption of innovations. *Research Policy*, Vol. 37, No. 9, pp. 1579-1590. <https://doi.org/10.1016/j.respol.2008.06.004>

McClelland, D. (1961). *The achieving society*. Princeton, NJ: Van Nostrand.

McCrae, R. R. (1987). Creativity, divergent thinking, and openness to experience. *Journal of Personality and Social Psychology*, Vol. 52, pp. 1258– 1265. <https://doi.org/10.1037//0022-3514.52.6.1258>

Minkov, M. & Hofstede, G. (2012). Hofstede's Fifth Dimension: New Evidence From the World Values Survey. *Journal of Cross-Cultural Psychology*, Vol. 43, No. 1, pp. 3-14. <https://doi.org/10.1177/0022022110388567>

Mitchell, R., Smith, J., Morse, E., Seawright, K., Peredo, A., & McKenzie B. (2002). Are Entrepreneurial Cognitions Universal? Assessing Entrepreneurial Cognitions Across Cultures. *Entrepreneurship Theory and Practice*, Vol. 26, No. 4, pp. 9-32.

Mitchell, R., Smith, B., Seawright, K., & Morse, E. (2000). Cross-cultural Cognitions And The Venture Creation Decision. *Academy of Management Journal*, Vol. 43, No. 5, pp. 974-993. <https://doi.org/10.2307/1556422>

Mollick, E. (2014). The dynamics of crowdfunding: An exploratory study. *Journal Of Business Venturing*, Vol. 29, No. 1, pp. 1-16. <http://dx.doi.org/10.1016/j.jbusvent.2013.06.005>

Mount, M. K., & Barrick, M. R. (1995). The Big Five personality dimensions: Implications for research and practice in human resources management. In K. M. Rowland and G. Ferris, eds., *Research in personnel and human resources management*, Vol. 13, pp. 153–200. Greenwich, CT: JAI Press.

Mueller, S., & Thomas, A. (2001). Culture and entrepreneurial potential: A nine country study of locus of control and innovativeness. *Journal Of Business Venturing*, Vol. 16, No. 1, pp. 51-75. [https://doi.org/10.1016/S0883-9026\(99\)00039-7](https://doi.org/10.1016/S0883-9026(99)00039-7)

Ozgen, E. (2012). The effect of the national culture on female entrepreneurial activities in emerging countries: An application of the Globe project cultural dimensions. *International Journal of Entrepreneurship*, Vol. 16, pp. 69–92. <https://doi.org/10.1016/j.sbspro.2014.09.094>.

Perry, J., Chand, M., & Ring, K. (2015). Cultural influences in the decision to invest in new ventures: an exploratory study. *Venture Capital*, Vol. 17, No. 3, pp. 237-262. <http://dx.doi.org/10.1080/13691066.2015.1051738>

PricewaterhouseCoopers. (2016). *Financial Services Technology 2020 and Beyond: Embracing disruption*. Available at: <https://www.pwc.com/gx/en/financial-services/assets/pdf/technology2020-and-beyond.pdf>

PricewaterhouseCoopers. (2017). *Global FinTech Report 2017*. Available at: <https://www.pwc.com/gx/en/industries/financial-services/assets/pwc-global-fintech-report-2017.pdf>

Prim, A., Filho, L., Zamur, G., & Di Serio, L. (2016). The Relationship Between National Culture Dimensions And Degree Of Innovation. *International Journal of Innovation Management*, Vol. 21, No. 1. <https://dx.doi.org/10.1142/S136391961730001X>

Puschmann, T. (2017). Fintech. *Business & Information Systems Engineering*, Vol. 59, No. 1, pp. 69-76. <http://dx.doi.org/10.1007/s12599-017-0464-6>

Rao, H. (2004). Institutional activism in the early Americana automobile industry. *Journal of Business Venturing*, Vol. 19, No. 3, pp. 359-384. [https://doi.org/10.1016/S0883-9026\(03\)00036-3](https://doi.org/10.1016/S0883-9026(03)00036-3)

Rauch, A., & Frese, M. (2007). Let's put the person back into entrepreneurship research: A meta-analysis on the relationship between business owners' personality traits, business creation, and success. *European Journal of Work and Organizational Psychology*, Vol. 16, No. 4, pp. 353-385. <https://doi.org/10.1080/13594320701595438>

Ray, D., & Turpin, D. (1990). Factors Influencing Japanese Entrepreneurs in High-Technology Ventures. *Journal of Business Venturing*, Vol. 5, No. 2, pp. 91-102. [https://dx.doi.org/10.1016/0883-9026\(90\)90002-B](https://dx.doi.org/10.1016/0883-9026(90)90002-B)

Rusu, C. (2014). Culture – Moderator of the relationship between contextual factors and entrepreneurial outcomes. *Managerial Challenges of the Contemporary Society*, Vol. 7, pp. 63–67.

Schulman, D. (2017). PayPal CEO: Fintech will change more in the next 5 years than it has in the last 30. (J. Cramer, Interviewer). Available at: <https://www.cnbc.com/2017/11/06/paypal-ceo-fintech-to-change-more-in-next-5-years-than-in-the-last-30.html>

Schumpeter, J. A. (1976). *Capitalism, socialism, and democracy*. New York: Harper and Brothers. (Original work published 1942).

Schwaab, B., Koopman, S., & Lucas, A. (2011). *Systemic Risk Diagnostics: Coincident Indicators and Early Warning Signals*. European Central Bank Working Paper No. 1327. Available at: <https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1327.pdf>

Shane, S. (1993). Cultural Influences on National Rates of Innovation. *Journal of Business Venturing*, Vol. 8, No. 1, pp. 59-73. [https://dx.doi.org/10.1016/0883-9026\(93\)90011-S](https://dx.doi.org/10.1016/0883-9026(93)90011-S)

Shane, S., Cherkas, L., Spector, T., & Nicolaou, N. (2010). Genetics, the Big Five, and the Tendency to Be Self-Employed. *Journal of Applied Psychology*, Vol. 95, No. 6, pp. 1154–1162. <https://dx.doi.org/10.1037/a0020294>

Shinnar, R., Giacomini, O., & Janssen, F. (2012). Entrepreneurial Perceptions and Intentions: The Role of Gender and Culture. *Entrepreneurship Theory and Practice*, Vol. 36, No. 3, pp. 465-493. <http://dx.doi.org/10.1111/j.1540-6520.2012.00509.x>

Simón-Moya, V., Revuelto-Taboada, L., & Guerrero, R. (2013). Institutional and economic drivers of entrepreneurship: An international perspective. *Journal of Business Research*, Vol. 67, pp. 715-721. <http://dx.doi.org/10.1016/j.jbusres.2013.11.033>

Stewart, H., & Jürjens, J. (2017). Data security and consumer trust in FinTech innovation in Germany. *Information & Computer Security*, Vol. 26, No. 1, pp. 109-128. <https://doi.org/10.1108/ICS-06-2017-0039>

Stewart, W., Watson, W., Carland, J. C., & Carland, J. W. (1999). A Proclivity For Entrepreneurship: A Comparison Of Entrepreneurs, Small Business Owners, And Corporate Managers. *Journal of Business Venturing*, Vol. 14, No. 2, pp. 189-214. [https://doi.org/10.1016/S0883-9026\(97\)00070-0](https://doi.org/10.1016/S0883-9026(97)00070-0)

Thiessen, J. (1997). Individualism, Collectivism And Entrepreneurship: A Framework For International Comparative Research. *Journal of Business Venturing*, Vol. 12, No. 5, pp. 367–384. [https://dx.doi.org/10.1016/S0883-9026\(97\)81199-8](https://dx.doi.org/10.1016/S0883-9026(97)81199-8)

- Thornton, P., Ribeiro-Soriano, D., & Urbano, D. (2011). Socio-cultural factors and entrepreneurial activity: An overview. *International Small Business Journal*, Vol. 29, No. 2, pp. 105–118. <https://doi.org/10.1177/0266242610391930>
- Tushman, M. (1977). Special boundary roles in the innovation process. *Administrative Science Quarterly*, Vol. 22, 587-605. <https://doi.org/10.2307/2392402>
- United Nations. (2019). *Methodology: standard country or area codes for statistical use*. Retrieved May 4, 2019, from: <https://unstats.un.org/unsd/methodology/m49/>
- Van de Ven, A. (2007). *Engaged Scholarship: A Guide for Organizational and Social Research* (Chapter 6). Minneapolis: Oxford University Press.
- Wang, M., Rieger, M., & Hens, T. (2016). How time preferences differ: Evidence from 53 countries. *Journal of Economic Psychology*, Vol. 52, pp. 115–135. <http://dx.doi.org/10.1016/j.joep.2015.12.001>
- Wang, J-H., Chang, C-C., Yao, S-N, & Liang, C. (2016). The contribution of self-efficacy to the relationship between personality traits and entrepreneurial intention. *Higher Education*, Vol. 72, No. 2, pp. 209-224. <https://doi.org/10.1007/s10734-015-9946-y>
- Wennekers, S., Thurik, R., Van Stel, A., & Noorderhaven, N. (2007). Uncertainty avoidance and the rate of business ownership across 21 OECD countries, 1976–2004. *Journal of Evolutionary Economics*, Vol. 17, No. 2, pp. 133–160. <https://doi.org/10.1007/s00191-006-0045-1>
- Woodside, A., Bernal, P., & Coduras, A. (2016). The general theory of culture, entrepreneurship, innovation, and quality-of-life: Comparing nurturing versus thwarting enterprise start-ups in BRIC, Denmark, Germany, and the United States. *Industrial Marketing Management*, Vol. 53, pp. 136–159. <http://dx.doi.org/10.1016/j.indmarman.2015.11.003>
- World Economic Forum. (2017). Beyond Fintech: A Pragmatic Assessment Of Disruptive Potential In Financial Services. Available at: [http://www3.weforum.org/docs/Beyond_Fintech - A Pragmatic Assessment of Disruptive Potential in Financial Services.pdf](http://www3.weforum.org/docs/Beyond_Fintech_-_A_Pragmatic_Assessment_of_Disruptive_Potential_in_Financial_Services.pdf)

Wright, M., Pruthi, S., & Lockett, A. (2005). International venture capital research: From cross-country comparison to crossing borders. *International Journal of Management Reviews*, Vol. 7, No. 3, pp. 135–165. <https://doi.org/10.1111/j.1468-2370.2005.00113.x>

York, J., & Lenox, M. (2014). Exploring the sociocultural determinants of de novo versus de alio entry in emerging industries. *Strategic Management Journal*, 35, 1930-1951.
<https://doi.org/10.1002/smj.2187>

Zhao, H., & Seibert, S. (2006). The Big Five Personality Dimensions and Entrepreneurial Status: A Meta-Analytical Review. *Journal of Applied Psychology*, Vol. 91, No. 2, pp. 259-271.
<https://doi.org/10.1037/0021-9010.91.2.259>

Zhao, H., Seibert, S., & Lumpkin, G.T. (2010). The Relationship of Personality to Entrepreneurial Intentions and Performance: A Meta-Analytic Review. *Journal of Management*, Vol. 36, No. 2, pp. 381-404. <https://doi.org/10.1177/0149206309335187>

9. Appendix

TABLE 1: LIST OF COUNTRIES IN DATA SET

Ranking	UN country code	Country	N° of new fintechs 2009-2017	Ranking	UN country code	Country	N° of new fintechs 2009-2017
1	USA	United States	7 956	43	TUR	Turkey	38
2	GBR	UK	1 725	44	COL	Colombia	37
3	IND	India	861	45	PHL	the Philippines	35
4	ISR	Israel	650	46	HUN	Hungary	34
5	DEU	Germany	557	47	LVA	Latvia	25
6	CAN	Canada	451	48	MYS	Malaysia	25
7	FRA	France	411	49	THA	Thailand	25
8	NLD	the Netherlands	392	50	SVK	Slovakia	22
9	SGP	Singapore	355	51	TWN	Taiwan	20
10	AUS	Australia	351	52	VNM	Vietnam	19
11	ESP	Spain	293	53	BGR	Bulgaria	18
12	CHN	China	289	54	GRC	Greece	18
13	BRA	Brazil	215	55	MLT	Malta	18
14	SWE	Sweden	207	56	KEN	Kenya	16
15	ITA	Italy	194	57	SVN	Slovenia	12
16	CHE	Switzerland	146	58	BLR	Belarus	10
17	RUS	Russia	140	59	GIB	Gibraltar	10
18	IRL	Ireland	136	60	JOR	Jordan	9
19	MEX	Mexico	121	61	CYM	Cayman Islands	7
20	DNK	Denmark	108	62	LBN	Lebanon	7
21	FIN	Finland	104	63	HRV	Croatia	6
22	ZAF	South-Africa	103	64	PER	Peru	6
23	POL	Poland	97	65	BHR	Bahrain	5
24	LTU	Lithuania	87	66	EGY	Egypt	5
25	BEL	Belgium	85	67	BGD	Bangladesh	4
26	ARE	Arabic Emirates	80	68	PAK	Pakistan	4
27	EST	Estonia	77	69	URY	Uruguay	4
28	IDN	Indonesia	77	70	CRI	Costa Rica	3
29	AUT	Austria	71	71	GGY	Guernsey	3
30	LUX	Luxembourg	64	72	PAN	Panama	3
31	JPN	Japan	63	73	BRB	Barbados	2
32	CZE	Czech Republic	58	74	GHA	Ghana	2

33	KOR	South-Korea	57	75	IMN	Isle of Man	2
34	UKR	Ukraine	57	76	SYC	Seychelles	2
35	ARG	Argentina	55	77	TZA	Tanzania	2
36	HKG	Hong Kong	53	78	UGA	Uganda	2
37	CHL	Chile	51	79	BMU	Bermuda	1
38	PRT	Portugal	49	80	MMR	Myanmar	1
39	NZL	New Zealand	46	81	RWA	Rwanda	1
40	ROU	Romania	44	82	ZWE	Zimbabwe	1
41	CYP	Cyprus	39	83	DMA	Dominica	0
42	NOR	Norway	38	84	DOM	Dominican Republic	0
				85	TTO	Trinidad and Tobago	0

TABLE 2: DEFINITION OF VARIABLES

Variable name ¹⁰	Definition
Dependent variables:	
<i>New fintech</i>	The number of fintech startup formations launched in a given year and country. <i>Source: Dealroom.</i>
<i>New VC-backed fintech</i>	The number of new fintech startups that are backed by venture capitalists in a given year and country. <i>Source: Dealroom</i>
Independent variables:	
<i>Power distance index</i>	Hofstede dimension of national culture given in a range of 0 (low) - 100 (high). This dimension expresses the degree to which the less powerful members of a society accept and expect that power is distributed unequally. <i>Source: Hofstede Insights database and Professor Geert Hofstede</i>
<i>Individualism</i>	Hofstede dimension of national culture given in a range of 0 (low) - 100 (high). The high side of this dimension, called individualism, is defined as in which individuals are expected to take care of only themselves and their immediate families. <i>Source: Hofstede Insights database and Professor Geert Hofstede</i>
<i>Masculinity</i>	Hofstede dimension of national culture given in a range of 0 (low) - 100 (high). The masculinity side (high score) of this dimension represents a preference in a competitive society for achievement, heroism, assertiveness, and material rewards for success. <i>Source: Hofstede Insights database and Professor Geert Hofstede</i>
<i>Uncertainty avoidance</i>	Hofstede dimension of national culture given in a range of 0 (low) - 100 (high). The uncertainty avoidance index conveys the degree to which the members of a culture feel uncomfortable with uncertainty and ambiguity.

¹⁰ All transformed variables, as mentioned in the methodology, are named after Ln (variable name) if the transformation of Ln (X+1) has been applied.

	<p><i>Source: Hofstede Insights database and Professor Geert Hofstede</i></p>
<i>Long-term orientation</i>	<p>Hofstede dimension of national culture given in a range of 0 (low) - 100 (high). This dimension is referred to as being (short term) normative versus being (long term) pragmatic.</p> <p><i>Source: Hofstede Insights database and Professor Geert Hofstede</i></p>
Control variables:	
<i>Deposits to GDP</i>	<p>The ratio of demand, time and saving deposits in deposit money banks as a share of GDP in local currency.</p> <p><i>Source: International Financial Statistics, IMF</i></p>
<i>VC availability</i>	<p>Response to the survey question: "In your country, how easy is it for entrepreneurs with innovative but risky projects to find venture capital?" [1 = extremely difficult; 7 = extremely easy].</p> <p><i>Source: Global Competitiveness Report, World Economic Forum</i></p>
<i>GDP per capita</i>	<p>GDP per capita is the gross domestic product per capita in USD.</p> <p><i>Source: World Development Indicators database</i></p>
<i>Investor protection</i>	<p>An index which indicates the strength of investor protection in a particular country and year on a 0 (little to no protection) to 10 (greater investor protection) scale. It is an average of 3 indices: the extent of disclosure index, the extent of director liability index and the ease of shareholder suit index.</p> <p><i>Source: Global Competitiveness Report, World Economic Forum</i></p>
<i>Ease of access to loans</i>	<p>Response to the survey question: "In your country, how easy is it to obtain a bank loan with only a good business plan and no collateral?" [1 = extremely difficult; 7 = extremely easy].</p> <p><i>Source: Global Competitiveness Report, World Economic Forum</i></p>
<i>Secure internet servers</i>	<p>The variable measures the number of distinct, publicly-trusted servers using encryption technology per one million people in a country.</p> <p><i>Source: Netcraft Secure Server Survey (server data) and World Bank (population data)</i></p>
<i>Mobile subscriptions</i>	<p>Mobile cellular subscriptions by country per 100 people. The indicator includes the number of post-paid subscriptions, and the number of active prepaid accounts (i.e. that have been used during the last three months) and applies to all mobile cellular subscriptions that offer voice communications. It excludes subscriptions via data cards or USB modems, subscriptions to public mobile data services, private trunked mobile radio, telepoint, radio paging and telemetry services.</p> <p><i>Source: International Telecommunication Union's World Telecommunication/ICT Development report and database.</i></p>
<i>Availability of latest technologies</i>	<p>Response to the survey question: "In your country, to what extent are the latest technologies available?" [1 = not at all; 7 = to a great extent].</p> <p><i>Source: Global Competitiveness Report, World Economic Forum</i></p>
<i>Credit market regulations</i>	<p>The variable measures the extent to which regulation limits the freedom of exchange in credit markets in a specific country. The variable ranges from 0 to 10, with higher ratings indicating that countries have less control over interest rates, the private credit sector and ownership of banks.</p> <p><i>Source: the Fraser Institute Database</i></p>
<i>Labour market regulations</i>	<p>The variable measures the extent to which regulation limits the freedom of exchange in labour markets in a specific country. The variable ranges from 0 to 10, with higher ratings indicating that countries have less control over hiring and firing regulations, minimum wage, centralized collective bargaining, hours regulations, mandated cost of worker dismissal and conscription.</p>

	<i>Source: the Fraser Institute Database</i>
<i>Business regulations</i>	The variable measures the extent to which regulation limits the freedom of exchange in business markets in a specific country. The variable ranges from 0 to 10, with higher ratings indicating that countries have less control over administrative requirements, bureaucracy costs, licensing restrictions, tax compliance, the startup of businesses and extra payments/bribes/favouritism in that country. <i>Source: the Fraser Institute Database</i>
<i>Strength of legal rights</i>	Strength of legal rights index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. The index ranges from 0 to 12, with higher scores indicating that these laws are better designed to expand access to credit. <i>Source: World Bank, Doing Business Project</i>
<i>Labour force</i>	Labour force comprises people ages 15 and older who supply labour for the production of goods and services during a specified period. It includes people who are currently employed and people who are unemployed but seeking work as well as first-time job-seekers. Not everyone who works is included, however. Unpaid workers, family workers, and students are often omitted, and some countries do not count members of the armed forces. <i>Source: World Development Indicators database</i>
<i>Rule of law</i>	Indicator of perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. The variable ranges from -2,5 (weak governance performance) to 2,5 (strong governance performance). <i>Source: Worldwide Governance Indicators project, World Bank</i>

TABLE 4 – PANEL B: SUMMARY STATISTICS OF INDEPENDENT VARIABLES

Panel B: Split of cultural dimensions. This table describes all countries that have a “low” or “high” score on the cultural dimensions combined with data over the fintech startups and its VC financing activity. The column “new fintech startups per 1M capita” describes the amount of fintech startups per one million inhabitants in a country over the entire nine-year sample period. “New VC-backed fintech startups per 1M capita” is calculated by applying the same methodology but for the VC-backed fintech startups. Both ratios are computed by dividing the fintech startup data from Dealroom with population figures per one million people. The population data is retrieved from the World Bank’s World Development Indicators database. The “ratio VC-backed fintech startups over fintech startups per 1M capita” in column (6) is calculated by dividing the aforementioned computed variables. The column (2) and (4) are described under panel A of table 3 but are here calculated for the separate countries with the lower (0-25) or upper (75-100) score of the power distance/individualism/masculinity/long-term orientation or uncertainty avoidance dimensions.

Country	(1) Scale Hofstede dimensions	(2) N° fintech startups	(3) New fintech startups per 1M capita	(4) N° VC-backed fintech startups	(5) New VC-backed fintech startups per 1M capita	(6) Ratio (5) / (3)
POWER DISTANCE INDEX						
<i>PD score lowest (0-25):</i>						
Austria	11	71	0.92	15	0.19	21.05%
Israel	13	650	8.78	111	1.52	17.35%
Denmark	18	108	2.13	50	0.98	46.16%
New Zealand	22	46	1.14	7	0.17	15.14%
<i>PD score highest (75-100):</i>						
Malaysia	100	25	0.09	10	0.04	39.99%
Slovakia	100	22	0.45	7	0.14	31.81%
Panama	95	3	0.09	1	0.03	33.33%
Philippines	94	35	0.04	13	0.01	36.99%
Russia	93	140	0.11	78	0.06	55.72%
Ukraine	92	57	0.14	10	0.02	17.50%
Arabic Emirates	90	80	0.99	15	0.18	18.51%
Romania	90	44	0.24	6	0.03	13.68%
Mexico	81	121	0.11	32	0.03	26.65%
Bangladesh	80	4	0.00	0	0.00	0.00%
China	80	289	0.02	184	0.02	63.65%
Ghana	80	2	0.01	0	0.00	0.00%
Indonesia	78	77	0.03	20	0.01	25.62%
India	77	861	0.07	248	0.02	28.75%
Lebanon	75	7	0.14	4	0.08	56.68%
INDIVIDUALISM						
<i>Individualism score lowest (0-25):</i>						
Panama	11	3	0.09	1	0.03	33.33%
Colombia	13	37	0.09	9	0.02	24.36%
Indonesia	14	77	0.03	20	0.01	25.62%
Pakistan	14	4	0.00	2	0.00	48.44%
Costa Rica	15	3	0.07	1	0.02	33.20%

Ghana	15	2	0.01	0	0.00	0.00%
Peru	16	6	0.02	1	0.00	17.15%
Trinidad and Tobago	16	0	0.00	0	0.00	0.00%
Taiwan	17	20	0.10	8	0.04	39.91%
South-Korea	18	57	0.13	5	0.01	8.75%
Bangladesh	20	4	0.00	0	0.00	0.00%
China	20	289	0.02	184	0.02	63.65%
Singapore	20	355	7.28	113	2.32	31.84%
Thailand	20	25	0.04	9	0.01	35.98%
Vietnam	20	19	0.02	4	0.00	20.67%
Chile	23	51	0.33	12	0.08	23.54%
Arabic Emirates	25	80	0.99	15	0.18	18.51%
Egypt	25	5	0.01	1	0.00	20.22%
Hong Kong	25	53	0.82	22	0.34	41.63%
Kenya	25	16	0.04	6	0.01	36.51%
Tanzania	25	2	0.00	0	0.00	0.00%
Ukraine	25	57	0.14	10	0.02	17.50%
Individualism score highest (75-100):						
USA	91	7 956	2.80	2 931	1.03	36.81%
Australia	90	351	1.67	44	0.21	12.54%
United Kingdom	89	1 725	2.98	623	1.07	36.00%
Canada	80	451	1.42	58	0.18	12.87%
Hungary	80	34	0.38	12	0.14	35.36%
The Netherlands	80	392	2.58	99	0.65	25.27%
New Zealand	79	46	1.14	7	0.17	15.14%
Italy	76	194	0.36	84	0.15	43.24%
Belgium	75	85	0.84	35	0.35	41.13%
MASCULINITY						
Masculinity score lowest (0-25):						
Sweden	5	207	2.38	123	1.41	59.33%
Norway	8	38	0.83	25	0.54	65.17%
Latvia	9	25	1.39	11	0.61	43.73%
The Netherlands	14	392	2.58	99	0.65	25.27%

Denmark	16	108	2.13	50	0.98	46.16%
Lithuania	19	87	3.32	14	0.53	15.99%
Slovenia	19	12	0.65	6	0.32	50.01%
Costa Rica	21	3	0.07	1	0.02	33.20%
Masculinity score highest (75-100):						
Slovakia	100	22	0.45	7	0.14	31.81%
Japan	95	63	0.05	43	0.04	68.27%
Hungary	88	34	0.38	12	0.14	35.36%
Austria	79	71	0.92	15	0.19	21.05%
UNCERTAINTY AVOIDANCE						
UA score lowest (0-25):						
Singapore	8	355	7.28	113	2.32	31.84%
Denmark	23	108	2.13	50	0.98	46.16%
UA score highest (75-100):						
Greece	100	18	0.18	6	0.06	33.24%
Portugal	99	49	0.52	7	0.07	14.29%
Uruguay	99	4	0.13	1	0.03	24.77%
Malta	96	18	4.59	5	1.27	27.60%
Russia	95	140	0.11	78	0.06	55.72%
Ukraine	95	57	0.14	10	0.02	17.50%
Belgium	94	85	0.84	35	0.35	41.13%
Poland	93	97	0.28	22	0.06	22.69%
Japan	92	63	0.05	43	0.04	68.27%
Romania	90	44	0.24	6	0.03	13.68%
Slovenia	88	12	0.65	6	0.32	50.01%
Peru	87	6	0.02	1	0.00	17.15%
France	86	411	0.69	221	0.37	53.75%
Spain	86	293	0.70	121	0.29	41.30%
Chile	86	51	0.33	12	0.08	23.54%
Argentina	86	55	0.14	14	0.04	25.66%
Panama	86	3	0.09	1	0.03	33.33%
Costa Rica	86	3	0.07	1	0.02	33.20%

South-Korea	85	57	0.13	5	0.01	8.75%
Bulgaria	85	18	0.28	4	0.06	22.03%
Turkey	85	38	0.05	18	0.03	46.89%
Hungary	82	34	0.38	12	0.14	35.36%
Mexico	82	121	0.11	32	0.03	26.65%
Israel	81	650	8.78	111	1.52	17.35%
Croatia	80	6	0.16	5	0.13	82.39%
Colombia	80	37	0.09	9	0.02	24.36%
Egypt	80	5	0.01	1	0.00	20.22%
Arabic Emirates	80	80	0.99	15	0.18	18.51%
Brazil	76	215	0.12	43	0.02	20.09%
Italy	75	194	0.36	84	0.15	43.24%
LONG-TERM ORIENTATION						
<i>LT score lowest (0-25):</i>						
Ghana	4	2	0.01	0	0.00	0.00%
Egypt	7	5	0.01	1	0.00	20.22%
Dominican Republic	13	0	0.00	0	0.00	0.00%
Colombia	13	37	0.09	9	0.02	24.36%
Trinidad and Tobago	13	0	0.00	0	0.00	0.00%
Lebanon	14	7	0.14	4	0.08	56.68%
Zimbabwe	15	1	0.01	1	0.01	100.00%
Jordan	16	9	0.12	4	0.05	43.34%
Rwanda	18	1	0.01	0	0.00	0.00%
Argentina	20	55	0.14	14	0.04	25.66%
Australia	21	351	1.67	44	0.21	12.54%
Mexico	24	121	0.11	32	0.03	26.65%
Ireland	24	136	3.23	50	1.19	36.83%
Uganda	24	2	0.01	0	0.00	0.00%
Peru	25	6	0.02	1	0.00	17.15%
<i>LT score highest (75-100):</i>						
South-Korea	100	57	0.13	5	0.01	8.75%
Taiwan	93	20	0.10	8	0.04	39.91%
Japan	88	63	0.05	43	0.04	68.27%
China	87	289	0.02	184	0.02	63.65%
Germany	83	557	0.76	234	0.32	42.02%

Belgium	82	85	0.84	35	0.35	41.13%
Estonia	82	77	6.49	21	1.77	27.30%
Lithuania	82	87	3.32	14	0.53	15.99%
Russia	81	140	0.11	78	0.06	55.72%
Belarus	81	10	0.12	2	0.02	20.02%
Slovakia	77	22	0.45	7	0.14	31.81%

TABLE 5: SUMMARY STATISTICS

Variable	N° Obs.	Mean	Median	Std. Dev.	Min.	Max.
Dependent variables:						
Ln (new fintech)	429	2.12	1.95	1.49	0.00	7.07
Ln (new VC backed)	429	1.31	1.10	1.28	0.00	6.22
Independent variables:						
Power distance index	429	58.91	64.00	21.02	11.00	100.00
Individualism	429	45.80	39.00	23.02	13.00	91.00
Masculinity	429	48.04	49.00	19.04	5.00	100.00
Uncertainty avoidance	429	64.79	65.00	22.23	8.00	100.00
Long-term orientation	429	46.44	47.00	21.58	4.00	87.00
Control variables:						
Ln (deposits to GDP)	429	4.12	4.10	0.64	2.46	5.99
VC availability	429	3.03	2.90	0.73	1.70	4.82
Ln (GDP per capita)	429	9.51	9.54	1.21	6.56	11.58
Investor protection	429	5.96	5.90	1.37	2.70	9.70
Ease of access to loans	429	3.33	3.26	0.86	1.57	5.47
Ln (secure Internet servers)	429	5.54	5.81	2.34	0.18	10.09
Ln (mobile subscriptions)	429	4.76	4.78	0.25	3.82	5.49
Availability of latest technologies	429	5.38	5.43	0.81	3.56	6.87
Credit market regulations	429	8.64	9.09	1.25	4.00	10.00
Labor market regulations	429	6.53	6.46	1.20	4.15	9.38
Business regulations	429	6.84	6.74	1.09	3.48	9.27
Strength of legal rights	429	5.33	5.00	2.61	0.00	12.00
Ln (labour force)	429	16.11	16.02	1.65	12.17	20.48
Rule of Law	373	0.61	0.57	0.94	-0.93	2.10

TABLE 6: PEARSON CORRELATIONS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Ln (new fintech)	(1) 1									
Ln (new VC-backed fintech)	(2) 0.912**	1								
Power distance index	(3) -0.354**	-0.305**	1							
Individualism	(4) 0.605**	0.559**	-0.652**	1						
Masculinity	(5) 0.107*	0.091	0.130**	0.058	1					
Uncertainty avoidance	(6) -0.226**	-0.279**	0.152**	-0.125**	-0.054	1				
Long-term orientation	(7) 0.285**	0.280**	-0.009	0.245**	-0.027	-0.043	1			
Ln (deposits to GDP)	(8) 0.332**	0.315**	-0.258**	0.387**	0.125**	-0.169**	0.184**	1		
VC availability	(9) 0.458**	0.449**	-0.276**	0.267**	-0.125**	-0.501**	0.172**	0.493**	1	
Ln (GDP per capita)	(10) 0.506**	0.461**	-0.619**	0.685**	-0.036	-0.056	0.253**	0.600**	0.419**	1
Investor protection	(11) 0.273**	0.240**	-0.136**	0.05	-0.037	-0.270**	-0.146**	0.221**	0.376**	0.207**
Ease of access to loans	(12) 0.229**	0.192**	-0.182**	0.199**	-0.091	-0.372**	0.124*	0.420**	0.736**	0.351**
Ln (secure Internet servers)	(13) 0.459**	0.391**	-0.584**	0.697**	-0.104*	-0.067	0.309**	0.538**	0.406**	0.877**
Ln (mobile subscriptions)	(14) 0.094	0.028	-0.193**	0.132**	-0.112*	0.043	0.253**	0.264**	0.186**	0.455**
Availability of latest technologies	(15) 0.506**	0.469**	-0.614**	0.629**	-0.106*	-0.243**	0.201**	0.597**	0.597**	0.814**
Credit market regulations	(16) 0.148**	0.103*	-0.235**	0.278**	-0.119*	-0.148**	0.303**	0.122*	0.352**	0.356**
Labour market regulations	(17) 0.194**	0.217**	-0.086	0.341**	0.235**	-0.376**	0.072	0.406**	0.214**	0.235**
Business regulations	(18) 0.375**	0.358**	-0.482**	0.443**	-0.182**	-0.336**	0.191**	0.528**	0.627**	0.688**
Strength of legal rights	(19) 0.310**	0.253**	-0.149**	0.265**	0.039	-0.239**	0.094	-0.041	0.222**	0.204**
Ln (labour force)	(20) 0.336**	0.358**	0.338**	-0.170**	0.229**	-0.109*	-0.013	-0.305**	-0.01	-0.447**
Rule of law	(21) 0.489**	0.447**	-0.664**	0.696**	-0.164**	-0.226**	0.248**	0.574**	0.541**	0.859**

	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Investor protection	(11) 1										
Ease of access to loans	(12) 0.273**	1									
Ln (secure Internet servers)	(13) 0.217**	0.434**	1								
Ln (mobile subscriptions)	(14) 0.052	0.194**	0.486**	1							
Availability of latest technologies	(15) 0.291**	0.470**	0.728**	0.259**	1						
Credit market regulations	(16) 0.224**	0.383**	0.432**	0.268**	0.429**	1					
Labour market regulations	(17) 0.276**	0.205**	0.315**	0.104*	0.290**	0.264**	1				
Business regulations	(18) 0.398**	0.518**	0.675**	0.352**	0.774**	0.535**	0.366**	1			
Strength of legal rights	(19) 0.356**	0.162**	0.315**	0.140**	0.141**	0.390**	0.418**	0.344**	1		
Ln (labour force)	(20) 0.029	-0.117*	-0.469**	-0.382**	-0.372**	-0.270**	-0.220**	-0.374**	0.003	1	
Rule of law	(21) 0.237**	0.450**	0.832**	0.354**	0.879**	0.456**	0.333**	0.817**	0.265**	-0.428**	1

**correlation is significant at the 0.01 level (2-tailed)

* correlation is significant at the 0.05 level (2-tailed)

TABLE 7 – PANEL B: ROBUSTNESS CHECK MODEL I

Panel B: Robustness check for the output of model I about impact of culture on fintech startups formation using the dependent variable *Ln (new VC-backed fintech startup)* instead of *Ln (new fintech startup)*. This table represents a random effect regression model. Columns (1)-(5) describe the main effect of the separate Hofstede dimensions on the number of new fintech startups with all significant mediators according to Haddad and Hornuf. Column (6) describes the effect of all cultural dimensions and additionally two interaction terms on the dependent variable. The variables are defined in Table 2. All regressions include a constant and year fixed effect (not reported due to space considerations). Further, column (1)-(6) all report goodness of fit indicators including the p-value of the joined test on named regressors (null hypothesis indicates that the aggregated effect of all coefficients is zero); Hausman test (null hypothesis indicates no correlation between the random effect and the effect of other regressors) and Breusch-Pagan test (null hypothesis indicates that the variance of the unit-specific error is zero).

Dependent variable: Ln (new VC-backed fintech startup)	(1) PDI	(2) IND	(3) MASC	(4) UA	(5) LTO	(6) FULL
Power distance index	0.002	—	—	—	—	0.009
Individualism	—	0.008	—	—	—	-0.004
Masculinity	—	—	-0.001	—	—	-0.003
Uncertainty avoidance	—	—	—	-0.005	—	-0.010
Long-term orientation	—	—	—	—	0.006	-0.009
IND * (-UA)	—	—	—	—	—	0.000
IND * LTO	—	—	—	—	—	0.000
Ln (deposits to GDP)	-0.333	-0.335	-0.329	-0.340	-0.336	-0.354
VC availability	0.006	0.010	0.007	0.004	0.007	0.004
Ln (GDP per capita)	0.755***	0.698**	0.747***	0.750***	0.735***	0.730**
Investor protection	0.144***	0.143***	0.144***	0.143***	0.144***	0.144***
Ease of access to loans	-0.040	-0.040	-0.040	-0.041	-0.040	-0.040
Ln (secure Internet servers)	-0.018	-0.025	-0.019	-0.018	-0.021	-0.024
Ln (mobile subscriptions)	0.399	0.415	0.400	0.401	0.398	0.409
Availability of latest technologies	0.067	0.065	0.066	0.066	0.066	0.067
Credit market regulations	0.065	0.065	0.066	0.065	0.064	0.064
Labour market regulations	-0.006	-0.009	-0.005	-0.010	-0.006	-0.015
Business regulations	-0.103	-0.101	-0.103	-0.107	-0.103	-0.107
Strength of legal rights	0.010	0.009	0.010	0.009	0.010	0.009
Ln (labour force)	0.616***	0.614***	0.621***	0.607***	0.612***	0.602***
Rule of Law	0.323	0.299	0.316	0.305	0.315	0.293
Fixed time effects	Yes	Yes	Yes	Yes	Yes	Yes

<i>Random country effects</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Log likelihood</i>	-528.59	-516.84	-528.05	-522.11	-523.48	-504.96
<i>AIC</i>	1101.17	1077.69	1100.09	1088.23	1090.95	1065.92
<i>SIC</i>	1190.52	1167.04	1189.45	1177.58	1180.31	1179.64
<i>Joint test on regressors (p-value)</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Hausman test (p-value)</i>	0.987	0.989	0.987	0.988	0.988	0.993
<i>Breusch-Pagan test (p-value)</i>	0.000	0.000	0.000	0.000	0.000	0.000
<i>Observations</i>	429	429	429	429	429	429

Significance levels: *p < 0,10; **p < 0.05; ***p < 0.01

TABLE 8 – PANEL B: ROBUSTNESS CHECK MODEL II

Panel B: Robustness check for the output of model II about impact of culture on fintech startups formation using the dependent variable *Ln (new VC-backed fintech startup)* instead of *Ln (new fintech startup)*. This table represents a random effect regression model. Columns (1)-(5) describe the main effect of the separate Hofstede dimensions on the number of new VC-backed fintech startups with the suggested mediators by Frese, Rauch and Zhao. Column (6) describes the effect of all cultural dimensions and two additional interaction terms on the dependent variable. The variables are defined in Table 2. All regressions include a constant and year fixed effect (not reported due to space considerations). Further, column (1)-(6) all report goodness of fit indicators including the p-value of the joined test on named regressors (null hypothesis indicates that the aggregated effect of all coefficients is zero); Hausman test (null hypothesis indicates no correlation between the random effect and the effect of other regressors) and Breusch-Pagan test (null hypothesis indicates that the variance of the unit-specific error is zero).

Dependent variable: Ln (new VC-backed fintech startup)	(1) PDI	(2) IND	(3) MASC	(4) UA	(5) LTO	(6) FULL
Power distance index	0.001	—	—	—	—	0.013
Individualism	—	0.019**	—	—	—	0.046*
Masculinity	—	—	0.006	—	—	0.003
Uncertainty avoidance	—	—	—	-0.015**	—	-0.002
Long-term orientation	—	—	—	—	0.010	0.019
IND* (-UA)	—	—	—	—	—	0.000
IND * LTO	—	—	—	—	—	0.000
Ln (GDP per capita)	0.543***	0.313*	0.528***	0.543***	0.491***	0.378**
Business regulations	-0.036	-0.039	-0.029	-0.084	-0.039	-0.067
<i>Fixed time effects</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Random country effects</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Log likelihood</i>	-658.41	-627.79	-654.85	-637.71	-650.10	-593.38
<i>AIC</i>	1336.83	1275.58	1329.706	1295.41	1320.20	1218.76
<i>SIC</i>	1377.44	1316.19	1370.321	1336.03	1360.82	1283.74

<i>Joint test on regressors (p-value)</i>	0.000	0.000	0.000	0.000	0.000	0.000
<i>Hausman test (p-value)</i>	0.674	0.242	0.590	0.673	0.745	0.371
<i>Breusch-Pagan test (p-value)</i>	0.000	0.000	0.000	0.000	0.000	0.000
<i>Observations</i>	429	429	429	429	429	429

Significance levels: *p < 0,10; **p < 0.05; ***p < 0.01