

WHAT EXPLAINS IPO UNDERPRICING ACROSS COUNTRIES?

The Influence of Country Characteristics on the IPO Underpricing Anomaly

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Abstract

This paper examines why the average first-day returns on initial public offerings vary across countries. The average first-day returns for countries vary from around -2% to around 76% in this study. I examine 2028 IPOs from 36 countries of different continents over the period 2009-2018. I provide support for the country-risk, the legal environment, and the culture hypothesis. Countries that have more technology firms and higher litigation risk experience more IPO underpricing. These results are robust to time effects and changes in the sample. Sub samples show that internet firms increased the level of underpricing in an earlier period.

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I. INTRODUCTION

What explains the differences in the underpricing of initial public offerings across different countries over the world? In this study, I examine the question by studying at 2028 IPOs issued after the financial crisis (2009-2018). I include 36 countries from several continents to explain why some countries experience more severe underpricing than others. The data shows that the average level of underpricing for a country varies from -2% to 76%.

This paper examines which country characteristics affect the underpricing of initial public offerings. This study contains relevant information for researchers, who are interested in the underpricing phenomenon. This study is also relevant for investors who want to participate in the IPO market. Since this study examines why some countries observe more underpricing than others, it can help investors to choose which countries to include in their investments regarding IPOs.

To analyse the variation of underpricing, I develop and test four hypotheses based on the existing literature: the country-risk hypothesis, the emerging markets hypothesis, the legal environment hypothesis, and the culture hypothesis. The country-risk hypothesis states that countries with relatively more risky firms, for example technology firms, internet firms, and younger companies have higher levels of first-day returns. Emerging markets are expected to experience higher levels of IPO underpricing, due to the previous empirical evidence in the literature. The legal environment in a country affects the level of underpricing according to the third hypothesis. For example, the type of law implemented, civil law or common law, or the litigation risk in a

country can affect the level of underpricing. Finally, the culture hypothesis argues that the culture of a country affects the IPO underpricing anomaly as well. Religion is used in this paper as a proxy for culture.

To obtain a more intuitive perspective on the explanatory factors of the level of underpricing, I present univariate sorts. The data is sorted for different variables, for example for the age of companies and whether a company is a technology firm or not. From the univariate sorts, we see that older companies experience higher levels of IPO underpricing than younger companies, contrary to the existing literature. Technology stocks seem to observe more underpricing. This is consistent with the country-risk hypothesis. Emerging markets do not experience more underpricing than other countries. We also see that the countries using civil law have higher levels of underpricing than countries that implement common law. Countries that have a high number of lawyers per capita also experience significantly more underpricing. Finally, countries with more atheists and countries that are less risk averse have higher levels of underpricing.

To test for the hypotheses in more detail and to examine marginal effects for the variables, I run multivariate regressions on the initial returns of all IPOs. The regression contains independent variables that could explain underpricing differences across countries. Hence, not only do the variables explain the IPO underpricing, they also vary for each country specifically. First I run a regression on the first-day return with all the variables of interest. Thereafter I run a regression without the variables that contain missing values to ensure the number of observations are maximized. Moreover, I run regressions with variables related to their specific hypothesis. I include variables that could be causing these differences in line with the literature.

The variables to test for the country-risk hypothesis are an internet stock dummy, a technology stock dummy, and the age of a company. I add the GDP per capita and the GDP growth rate of a country as a variable to test for the emerging markets hypothesis, as well as a dummy variable for an emerging market. To test for the legal environment hypothesis, I add a dummy variable indicating whether a country uses civil law or common law, and a proxy for litigation risk, namely the natural logarithm of the number of attorneys per capita in a country. I use a dummy variable representing countries that are predominantly atheist and finally, I use the relative the risk-aversion index from Gandelman (2015) to proxy for cultural effects. After obtaining the first regression results, I apply robustness checks by testing for time effects and by excluding countries that are less representative for the sample size. Finally, I run the first regression models again with sub samples to examine the change of the influences of the variables over time.

The results presenting the multivariate regressions show that the technology dummy is significantly positive, also at the 1%-level. This is consistent with the univariate sorts. Therefore, I do not reject the country-risk hypothesis stating that countries with more risky companies are more underpriced. Technology firms experience more IPO underpricing. Furthermore, the GDP growth rate and the GDP per capita do not affect the level of underpricing. The result for the emerging market dummy is ambiguous since the dummy is significantly positive for one model, but significantly negative for other models. Since the univariate sorts shows there is no difference between emerging markets and other countries in terms of IPO underpricing, I reject the emerging markets hypothesis.

As regards to the legal environment hypothesis, the regression results show that the civil law dummy is significantly positive. Also, we take into account that the countries implementing civil law have more IPO underpricing on average according to the univariate sorts. The significance of the coefficient of the civil law dummy dissipates however after the variable reflecting litigation risk is included in the models. This shows that it is in fact the litigation risk that affects the level of IPO underpricing. The coefficient for litigation risk is significant at the 1%-level and when the number of attorneys per capita increases with 1%, the first-day returns increase with almost 10%. This outcome is in line with univariate sorts, where the countries with high litigation risk observe more IPO underpricing. Based on these results, the legal environment hypothesis is not rejected. The legal environment in a country affects the level of underpricing. The culture hypothesis, which states that the culture of a country has a significant effect on the IPO underpricing anomaly, is also not rejected based on the regression results. We observe from the regression results that countries that are predominantly atheist have lower first-day returns, in contrast with the univariate sorts. Risk-averse countries also tend to have lower first-day returns.

As a concluding remark towards the multivariate regression results, I reject the emerging markets hypothesis, while I do not reject the country-risk hypothesis, the legal environment hypothesis, and finally the culture hypothesis. Additional robustness checks do not alter the results. Sub samples show that internet firms significantly affected the level of underpricing in an earlier period, but this effect dissipates in the most recent period.

This paper presents empirical evidence that differences in the level of IPO underpricing across countries can be partially explained by differences in country characteristics. Researchers can further study why and how culture influences the IPO market. Moreover, they can further examine the effect of emerging markets or other explanations. Finally, for investors willing to partake in IPOs, it should be more attractive to invest in countries with more technology firms and higher litigation risk.

This study contributes to the existing literature since previous studies regarding IPOs primarily focus on the explanations of the underpricing of IPOs in general or on the changes of underpricing over time, while I examine the underpricing anomaly across countries.

Additionally, I present relatively new variables that possibly explain IPO underpricing, for example litigation risk and risk-aversion at the country level.

The remainder of this paper is structured as follows. Section II contains a literature review. In Section III, the hypotheses for this study are discussed. Section IV explains the data I include to examine the hypotheses. In Section V, I describe the methodology implemented to obtain the results. Subsequently, in Section VI I present the results of multivariate regressions, and thereafter results regarding robustness checks are presented. Section VII contains a discussion. The appendix includes information regarding the data and the results.

II. LITERATURE REVIEW

Within the existing literature of finance, IPOs are generally known to have positive initial returns on average. This phenomenon is also known as the underpricing anomaly (Ibbotson & Jaffe, 1975). Van Hoeijen and Van der Sar (1999) find underpricing of 8% on average on the Amsterdam Stock Exchange, while Ibbotson, Sindelar, and Ritter (1994) and Levis (1993) even find higher levels of underpricing for respectively the US and the United Kingdom.

The most popular and accepted explanation for the underpricing anomaly is the winner's curse due to information asymmetry. Rock (1986) explains that the uninformed investor who subscribes to all IPOs end up with the more expensive offerings, since the cheaper ones are acquired by the institutional investors. This is the winner's curse. Retail investors thus have an informational disadvantage but take this into account as well when deciding whether to participate in an initial public offering or not. Within the rational framework, the uninformed investor does not partake in the IPO market due to the winner's curse, unless there is a sufficient premium. This could be a discount on the price of an IPO stock, which is the cause of the underpricing phenomenon. Beatty and Ritter (1986) also argue that uncertainty plays a role in IPO underpricing. They claim that uncertainty about the market value of an IPO and the level of underpricing are positively related. Furthermore, the findings of Megginson and Weiss (1991), Michaely and Shaw (1994), Koh and Walter (1989) and Hanley (1993) support the idea that information asymmetry, and thus uncertainty, influences the underpricing phenomenon significantly.

Aggarwal, Krikman, and Womack (2002) argue that market momentum can also affect the IPO market in the sense that an increase in the demand for the stocks, due to increased attention for example, lead to higher first-day returns.

Loughran and Ritter (2004) study the change in underpricing over time. They test three hypotheses that can explain this. The first hypothesis is the changing risk composition hypothesis, where the IPOs become more uncertain over time, due to for example a rise in technology stocks, which tend to be riskier than other stocks. (Ritter, 1984). Another explanation for the IPO underpricing is that of reduced CEO ownership, explained in the realignment of incentives hypothesis, composed by Ljungqvist and Wilhelm (2003). The final hypothesis argues that the underwriter prestige and the level of underpricing are positively correlated, due to analyst lust and spinning.¹

The underpricing anomaly is observed globally and varies per country according to the study of Loughran, Ritter, and Rydqvist (1994). The authors examine that Malaysia, South Korea, and Brazil had the highest level of underpricing, while countries such as the Netherlands and France had the lowest level of underpricing. The researchers argue that the variation of the

¹ The realignment of incentives hypothesis states that due to characteristics of ownership of a company, for example CEO ownership, determines the incentives of the issuing firm regarding IPOs and influences the level of underpricing. The changing issuer objective function consists of the spinning and the analyst lust theory. Spinning is the situation where issuers receive side payments to influence their decision on which underwriter to use. These underwriters making side payments are known to underprice more heavily. The analyst lust hypothesis states that underwriters are chosen based on their expected analyst coverage. These underwriters with high analyst coverage are also known to underprice more heavily.

level of underpricing for different countries is due to the different characteristics of firms going public and the amount of government interference. In the concluding section, they mention that the differences in IPO underpricing across countries need more research and that more descriptive information should be included in these studies.

Several other studies can provide more detail for differences in IPO underpricing for various countries. In line with the theory regarding uncertainty and underpricing, Boulton, Smart, and Zutter (2017) argue that accounting conservatism² leads to less uncertainty and therefore less underpricing. Ibbotson (1975) argues that companies that take part in an IPO accept underpricing because they can attenuate the risk of possible lawsuits from shareholders that have an overoptimistic view of the stock. Tinic (1988) agrees and proves the implicit insurance hypothesis, where underpricing is used as a hedge against legal liability. Similarly, Lowry and Shu (2002) test and provide evidence for the litigation risk hypothesis, where firms with higher litigation risk underprice their IPOs with a greater amount. The researchers measure litigation risk by the number of class-action lawsuits filed for IPOs. Djankov et al. (2002) report that the legal and institutional environment could have an impact on informational barriers in financial markets and could therefore affect the level of underpricing per country. Furthermore, Guiso et al. (2006) study the importance of the culture of a country and its effect on economic outcomes.

² Accounting conservatism is a method of accounting that ensures a high level of confirmation and certainty, for example by deferring the revenues until it is certain that the company will actually receive these revenues.

III. HYPOTHESES

To analyse the variation of underpricing, I develop and test four hypotheses based on the existing literature: the country-risk hypothesis, the emerging markets hypothesis, the legal environment hypothesis, and the culture hypothesis.

The first hypothesis argues that the level of underpricing increases when a country has more companies that are considered riskier, for example internet and technology firms. This is consistent with the study of Beatty and Ritter (1986), in which the authors present support for a positive relationship between uncertainty and underpricing. Risk can also be reflected in for example the age of a company, whereby younger companies are riskier. Venture capital-backed firms are known to be riskier as well. The country-risk hypothesis is defined as follows:

1. Countries with relatively more risky companies experience more IPO underpricing.

The second hypothesis argues that emerging markets³ experience more underpricing in the IPO market. Most studies regarding IPO underpricing examine the IPO markets of the US (Ritter, 1984; Tinic, 1988;), the UK (Levis, 1993), and Canada (Jog and Riding, 1987). Less studies examine the underpricing phenomenon for emerging markets, but Aggarwal et al. (1993) and Dawson (1987) observe the underpricing anomaly for developing countries as well. The study of Loughran, Ritter, and Rydqvist (1994) also shows that developing countries seem to experience

³ Emerging markets are countries that aren't regarded as a fully developed market, but experience a high level of GDP growth. Countries like Brazil, Russia, India and China are seen as typical emerging markets with high GDP growth.

more underpricing than developed countries. In this paper, the emerging markets hypothesis is defined as follows:

2. Emerging markets experience a higher level of IPO underpricing.

The legal environment hypothesis is based on the papers of Ibbotson (1975), Tinic (1988), and Djankov et al. (2002). These studies show that the legal environment affects the degree of underpricing per country. Ibbotson and Tinic provide evidence that issuing firms underprice deliberately to attenuate the risk of lawsuits from investors that are disappointed when the returns of an IPO aren't as high as they expect. Lowry and Shu (2002) prove the litigation risk hypothesis, where firms with higher litigation risk experience more underpricing. The researchers proxy litigation risk with the number of IPO lawsuits. In this paper, I proxy litigation risk as the number of attorneys in a country per capita. When the number of attorneys per capita increases, the litigation risk also rises. The most straightforward characteristic to distinguish legal environments for different countries is whether a country implements civil law or common law.⁴ This paper studies whether a country implements civil law or common law influences the level of underpricing. Thus, I define the third hypothesis as:

3. The legal environment of a country influences the degree of IPO underpricing.

⁴ The main difference between common law and civil law is that within common law, the jurisprudence, which are the previous rulings during cases, are mainly driving the cases in the present, whereas in civil law, judges have more freedom to interpret what is written in the law. Common law is therefore also regarded as more predictable.

The final hypothesis this paper examines is the culture hypothesis. The origin of this hypothesis is the study of Guiso et al. (2006). This study observes the importance of the culture of a country and its effect on economic outcomes. The authors define culture as follows in their paper:

“customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation.” I examine whether the culture of a country also affects IPO

underpricing. The influence of culture on IPOs can be caused by the circumstance that some countries are more risk-averse on aggregate than other countries. When investors in a country are more risk-averse, they need a higher premium before they want to take part in subscribing IPOs.

The culture of a country and whether a country is more risk-averse can be partly measured by the most popular religion in the country. Countries in which religion plays a very important role in daily life could be more risk-averse, due to for example their disapproval towards gambling, whereas atheist countries could be more risk-averse. Finally, the culture hypothesis is stated as follows:

4. The culture of a country has a significant effect on the IPO underpricing anomaly.

In this paper, I study whether the composition and characteristics of firms in a country, emerging markets, the legal environment, and the culture of a country significantly affect the underpricing of initial public offerings. This study contributes to the existing literature since previous studies regarding IPOs primarily focus on the explanations of the underpricing of IPOs in general or on the changes of underpricing over time, while I examine the underpricing anomaly across countries. Moreover, I discuss relatively new variables that possibly explain IPO underpricing, such as litigation risk and risk-aversion at the country level. This study contains relevant

information for researchers, who are interested in the underpricing phenomenon, as well as for investors who are willing to partake in the IPO market. Since this study tries to explain why some countries observe more underpricing than others, it can help investors decide on what IPO markets to partake in or not.

IV. DATA

A. Data Collection

In this paper, I examine the IPO underpricing anomaly using IPO data of 2028 IPOs over the period 2009-2018 for 36 countries from several continents. The vast majority of the data originates from the Thomson One financial database. From the Thomson One data, I have made several alterations and added more information to the data to ensure a more detailed research.

The IPOs used in the research all have an offer price of at least \$5.00 per share, to ensure that the issuing firms are also of interest to institutional investors. This is corresponding to the idea of Loughran and Ritter (2004).

From Thomson One I collect IPO data, such as the SEDOL codes, founding dates, offer dates, stock prices at the close of the first trading day, and the industry of an issuing firm. IPOs with missing data are given more information manually.

The variables I include in this research are: The first-day return of an IPO, the age of a company, dummy variables indicating whether the IPO is an internet stock or a technological stock, a dummy variable reflecting an emerging market, the GDP per capita (measured in US \$), the GDP growth rate, categorical variables indicating the law type and the most popular religion of a country, risk-aversion, and finally litigation risk.

The first-day return is calculated by subtracting the offer price from the first-day closing price and by dividing that number with again the offer price. The age of a company at the time of the IPO is determined by looking at the founding date of a company and the issuing date. Dummy variables reflecting internet stocks and technology stocks are made after investigating the industry an issuing firm is partaking in. This can be found on Thomson One. Whether a country is an emerging market or not can be found in the list of the IMF. Data of the GDP per capita and the GDP growth rate for each country is obtained from the database of the World Bank. The type of law a country implements as well as the most popular religion of a country can be found on the website of Nation Master. The coefficient for relative risk aversion of a country is obtained for 19 countries from the study of Gandelman and Murillo (2015).⁵ The litigation risk is measured for 17 countries by using the number of attorneys in a country per capita. The number of attorneys in a country be found on the website of CCBE, and this is divided by the population of the country found on the website of Worldometers. Using the number of attorneys per capita to measure litigation risk can be accurate, although more information should be used when the data is available. For example, the number of lawsuits per capita and the number of IPO lawsuits per IPO can also help estimate the litigation risk.

⁵ Gandelman and Murillo estimate the coefficient for relative risk aversion for 75 countries with reports regarding personal well-being. The researches found that the coefficient varies around 1, wherby a higher coefficient means that a country is more risk-averse.

B. Descriptive Statistics

After collecting the data, I exclude countries that have an average overpricing of IPOs and less than 5 IPOs in those countries, since they are not representative for the study. The final dataset contains 2028 IPOs over 36 countries. The list of the countries and their average underpricing level is illustrated in figure 1. Some characteristics of the countries and the data can be found in the appendix.

Figure 1. The average underpricing per country. The graph presents the first-day returns of 36 countries included in the study. This study contains 2028 IPOs from the period 2009-2018. The first-day returns are displayed on the Y-axis. The countries are presented on the X-axis.

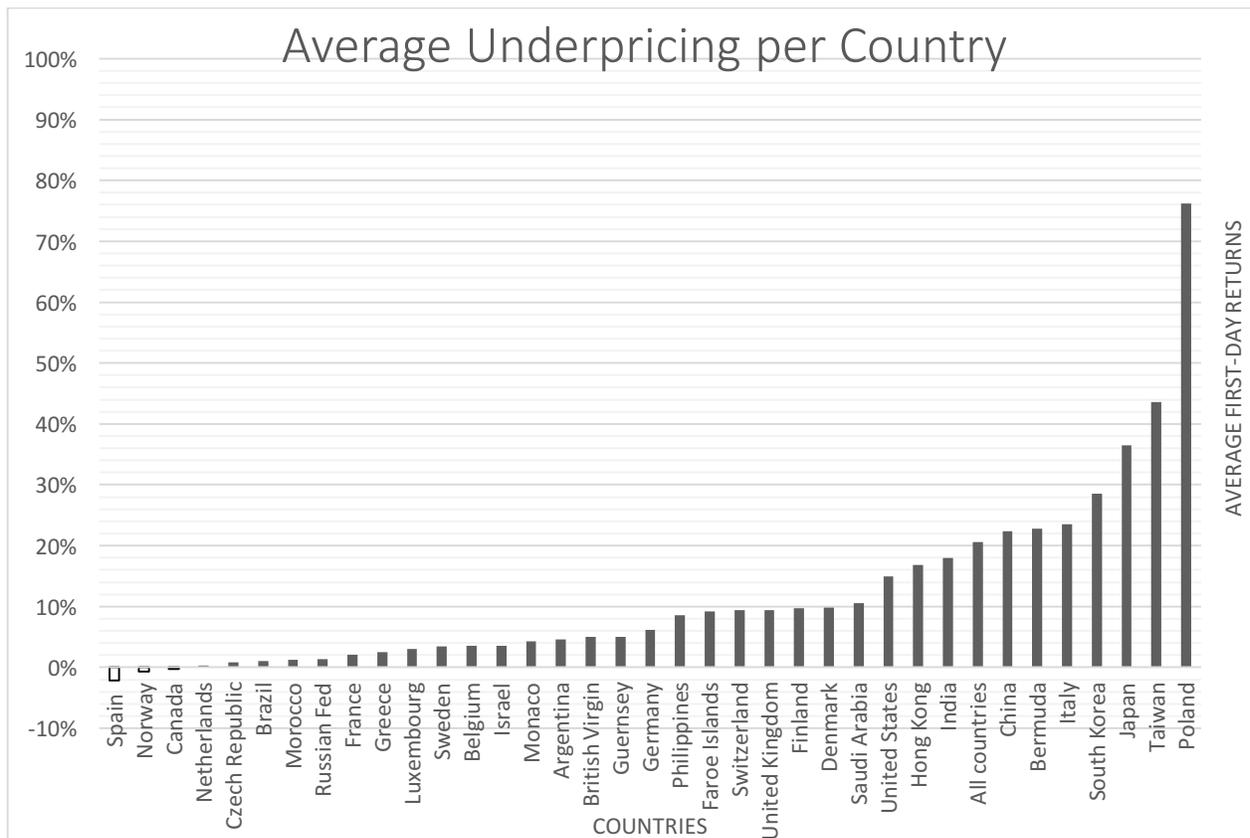


Figure 1 shows that Poland experiences the highest level of underpricing, namely around 76%, while Spain experiences around 2% IPO overpricing on average. Furthermore, from the data 41% consists of technology stocks, 92% of the IPOs are from countries that implements civil law, and the majority of our sample originates from North America and Asia. This is illustrated in the pie charts in the appendix.

Table 1. Descriptive statistics for various variables. The variable presented are the number of IPOs per country, first-day returns, risk aversion index, age, and the lawyers per capita. The number of observations, the mean, standard deviation, minimum and maximum are illustrated in the table.

<i>Variable</i>	<i>Observations</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Minimum</i>	<i>Maximum</i>
<i>Number of IPOs per country</i>	36	56.33	140.89	1	690
<i>First-day Returns</i>	2,028	20.8%	39%	-99.9%	353.5%
<i>Risk Aversion index</i>	1,769	0.91	0.53	0.1	2.45
<i>Age</i>	2,028	14.5	16.5	0	109.8
<i>Lawyers per capita</i>	17	0.002	0.001	0.0004	0.006

In table I, I present the descriptive statistics from the data. We see that some countries only observe a single IPO, while another country, namely the US, observes 690 IPOs. We also see that the first-day returns of the IPOs vary widely, with a minimum of almost -100%, and a maximum of 353.5%. This wide spread is also the case for the age of companies and the lawyers per capita in a country. Finally, the lawyers per capita are relatively low. For this reason, I transform this variable into a natural logarithm for the regression models presented in Section IV.

C. Univariate Sorts

To see if firm and country characteristics explain the IPO underpricing anomaly, we first look at table 2 which provides univariate sorts. I report the first-day return of IPOs after sorting for different variables. I defined companies as “young”, when they existed for less than 8 years on the IPO date. This is similar to the study of Loughran and Ritter (2004). The GDP growth rate, litigation risk, and risk aversion are defined as “high”, when it was higher than the average within the data.

Table 2. Univariate sorts. The data is segmented by several variables that can explain the variation in IPO underpricing across countries. The number of observations for each subgroup and their first-day return average are presented in the table. The differences in return and its significance is also presented in the table. *** significant at 1%-level.

<i>Segmented by</i>		<i>N</i>	<i>Return in %</i>	<i>Difference in Return in % (P-value)</i>
Age	<i>Young (0-7)</i>	743	14.89	
	<i>Old</i>	1285	24.29	9.40*** (0.00)
Industry	<i>Tech</i>	828	25.21	
	<i>Non-Tech</i>	1200	17.84	7.37*** (0.00)
GDP Growth Rate	<i>High</i>	693	20	
	<i>Low</i>	1326	21.3	1.3 (0.43)
Emerging Markets	<i>Yes</i>	265	20.29	
	<i>No</i>	1763	20.93	0.64 (0.75)
Legal Environment	<i>Civil</i>	1865	22.05	
	<i>Common</i>	163	7.10	14.95*** (0.00)
Litigation Risk	<i>High</i>	769	14.15	
	<i>Low</i>	128	3.99	10.16*** (0.00)
Religion	<i>Believing</i>	1639	19.66	
	<i>Atheist</i>	389	25.83	6.17*** (0.01)
Risk Aversion	<i>High</i>	888	14.21	
	<i>Low</i>	875	28.14	13.91*** (0.00)
All		2028	20.85	

Looking at table 2, we observe that older companies seem to observe significantly more underpricing compared to younger companies, which is contrary to what is expected from the first hypothesis. Younger companies are more uncertain in general, which should lead to more underpricing. Furthermore, technology stocks seem to have significantly more underpricing as opposed to non-technology firms. This is in line with the uncertainty theory.

As regards to the emerging markets hypothesis, the dummy variable indicating whether a country is an emerging market and the GDP growth rate do not seem to influence the level of underpricing.

Looking at the legal environment hypothesis, we see that countries that implement civil law seem to experience significantly more underpricing than countries that follow common law. This difference is almost 15%, but we should take into account that the sample size for countries with civil law is a lot larger than the amount of countries with common law. Additionally, countries with a high number of attorneys per capita, which implies a higher litigation risk, experience significantly more underpricing as well. This is consistent with the studies of Tinic (1988) and Lowry and Shu (2002).

At last we see that countries dominated by atheists and countries with low risk aversion observe significantly more underpricing. This is in contrast with the idea behind the third hypothesis, which is that countries where religion plays a more important role and are more risk averse have more underpriced IPOs.

To give a more detailed explanation as to why IPO underpricing differences across countries, I run multivariate regression models and present these findings in section IV.

V. METHODOLOGY

To find explanations for the difference in IPO underpricing across different countries, I study IPOs for the past ten years for multiple countries from different continents.

I run multivariate ordinary least squares (linear-log) regressions on the initial returns of all IPO stocks. The regression should include independent variables that could explain underpricing differences across countries. Thus, not only should the variables be able to explain the IPO underpricing, they should also be able to vary for each country specifically. First I run a regression on the first-day return with all the variables of interest. Thereafter I run a regression without the variables that contain missing values, such as the natural logarithm of the litigation risk and the risk aversion, to ensure the number of observations are maximized. Moreover, I run regressions with variables related to their specific hypothesis. I include variables that could be causing these differences in line with the literature.

The variables to test for the country-risk hypothesis include an internet stock dummy, a technology stock dummy, and the age of a company. I add the GDP per capita and the GDP growth rate of a country as a variable to test for the emerging markets hypothesis, as well as a dummy variable for an emerging market. To test for the effect of the legal environment, I add a dummy indicating whether a country uses civil law or common law, and a proxy for litigation risk, namely the natural logarithm of the number of attorneys per capita in a country. I use a dummy variable representing countries that are predominantly atheist and finally, I use the relative risk-aversion index from Gandelman (2015) to proxy for cultural effects.

Before running a regression model, I perform a White test to check whether I need to use robust standard errors to compensate for heteroscedasticity. Subsequently, I use the model preferred by the White test, to present the results. The models have the following equation:

$$\textit{first-day return}_i = \alpha + \mathbf{B}X_i + \varepsilon_i, \quad (1)$$

where the *first-day return* reflects the initial-day IPO underpricing, α indicates the constant, X_i represents the vector of variables, and where ε_i is the error term.

The results of the model are presented in the following section. After running the regression, I apply several robustness checks, by for example adding dummy variables for the year an IPO is offered to the original regression models to examine whether there is an unobserved time effect influencing the results. Also, I exclude countries with the fewest IPOs and countries that are not representative for the global IPO market. Thereafter I run the first two models again with sub samples to examine the change of the influences of the variables over time. Finally, based on these regression results I discuss the outcomes.

VI. RESULTS

In table 2 regarding the univariate sorts, we observe that older companies seem to experience more underpricing compared to younger companies. Furthermore, we see that technology firms tend to be more underpriced as expected. The level of underpricing does not seem to vary between countries with high or low GDP growth and between countries that are emerging markets or not. Moreover, countries that implement civil law seem to have more IPO underpricing, as well as countries with more lawyers per capita. Finally, countries that are predominantly atheist or are more risk-seeking seem to experience more underpricing.

A. Multivariate Regression Results

These univariate sorts are however not detailed enough to draw a conclusion. Technology firms are for example also younger companies on average. To be able to draw more accurate conclusions and to examine marginal effects of the variables of interest, I present the multivariate regression results with the models as presented in the Methodology section in table 3.

Table 3. Multivariate regressions of First-Day Returns

All models in the table have the first-day return as the dependent variable. The model in the first row includes all the variables relevant in this paper. The variables include the age of a company, and dummy variables for internet and technology firms, emerging markets. The GDP growth rate and GDP per capita are also considered. Finally, the natural logarithm of the number of attorneys per capita, a dummy for countries that are mostly atheist, and the risk aversion are included. Since some issuing firms contain missing values, I exclude the variables Ln(litigation risk) and risk aversion in the second row to ensure the number of observations is maximized. In this model, 2028 IPOs are considered over the time period 2009-2018. The models in the third, fourth, fifth, and sixth row test for the country-risk, emerging markets, legal environment, and the culture hypothesis respectively. The t-statistics are presented in parentheses.

* significant at the 10%-level, **significant at the 5%-level, *** significant at the 1%-level

Model	AGE	INTER NET DUMMY	TECHNO LOGY DUMMY	EMERGING MARKET	GDP GROWTH RATE	GDP PER CAPITA	CIVIL LAW DUMMY	Ln(LITIGATION RISK)	ATHEIST DUMMY	RISK AVERSION	CONSTANT	ADJUSTED R ²	F- STATISTI C
All variables	0.001 (1.47)	0.024 (0.50)	0.086*** (4.62)	0.746*** (3.39)	-0.003 (-0.54)	0.000 (0.96)	0.032 (0.51)	0.099*** (4.99)	-0.172* (1.69)	-0.09 (-0.90)	0.675 (3.47)	0.06	0.000***
Full sample	0.000 (0.40)	0.06 (1.25)	0.062*** (3.43)	-0.197*** (-3.41)	0.004 (0.71)	-0.000*** (5.02)	0.122*** (3.76)	-	-0.035 (-1.26)	-	0.269*** (4.65)	0.03	0.000***
H1	0.000 (0.84)	0.060 (1.23)	0.072*** (4.02)	-	-	-	-	-	-	-	0.170*** (11.98)	0.01	0.000***
H2	-	-	-	-0.193*** (-4.13)	0.003 (0.7)	-0.000*** (-5.72)	-	-	-	-	0.394*** (10.45)	0.02	0.000***
H3	-	-	-	-	-	-	0.032 (0.60)	0.075*** (4.44)	-	-	0.529*** (4.63)	0.02	0.000***
H4	-	-	-	-	-	-	-	-	-0.061** (-1.7)	-0.157*** (-5.51)	0.367*** (10.16)	0.03	0.000***

Looking at the first two rows of table 3, we see that the age of a company does not seem to influence the level of IPO underpricing. The coefficients are not significant. Furthermore, whether a company is an internet firm or not also does not influence the underpricing, while the coefficient of the dummy variable representing the technology firms are positive and significant even at the 1%-level, indicating that technology firms experience significantly more IPO underpricing than non-technology firms. In the first model, technology firms cause an increased underpricing level of almost 9%.

The coefficient of the emerging markets variable is significantly positive in the first row and significantly negative in the second row, while the coefficient of the GDP growth rate is insignificant. The coefficient of the GDP per capita is significant in the second model, but the magnitude of the coefficient is however too low to conclude that the variable affects the level of IPO underpricing.

From the second model, we can examine that the countries that implement civil law observe more underpricing. Model 1 shows however that the significance of the coefficient of the civil law dummy dissipates when the variable reflecting litigation risk is included in the model. Instead, in the first model, the coefficient for the litigation risk is significant at the 1%-level.

The atheist dummy is significant at the 10%-level and negative for the first model. On the other hand, the coefficient for the risk aversion is insignificant for the first model.

When the models that examine the hypotheses separately are observed, there seems to be empirical evidence for the country-risk hypothesis, since the technology firms are still significantly more underpriced as compared to non-technology firms in the third model. For the emerging markets hypothesis, the emerging market dummy is significant and negative and the GDP per capita is significant, but the magnitude of its coefficient is negligible. For the legal environment hypothesis, the civil law variable has no significance, contrary to the results of model 2. The litigation risk is however significant, indicating that the influence of the legal environment on the level of underpricing is affected by the number of attorneys per capita in a country. The final model testing the culture hypothesis shows that countries that are predominantly atheist have lower first-day returns regarding IPOs. Also, the countries that are more risk-averse seem to have lower first-day returns.

From most models, we can see that constant is significant. This implies that the independent variables in our models do not explain all of the first-day returns and that other factors could be causing these returns as well. We should also take into account that the adjusted R^2 is relatively low, ranging from 0.01 to 0.06. This also indicates that the variables I use to explain the first-day return do not explain the return completely. These factors however do not mean that the results of the multivariate regressions should not be interpreted, since in this paper I examine which variables causes IPO underpricing to vary across countries. These variables are relatively new and should be able to differ for each country as well, and it seems reasonable that these variables are not necessarily the best predictors of the level of underpricing. They can however show us that they also affect the level of underpricing to a certain extent, also given the fact that all the F-

statistics are significant at the 1%-level. Therefore, these variables can give us an indication as to why different countries experience different levels of IPO underpricing.

The results presented in table 3 show that the technology dummy is significantly positive, even at the 1%-level. This is consistent with the univariate sorts. Therefore, I do not reject the country-risk hypothesis stating that countries with more risky companies are more underpriced.

Technology firms are causing more IPO underpricing. Furthermore, the GDP growth rate and the GDP per capita do not affect the level of underpricing. The result for the emerging market dummy is ambiguous since the dummy is significantly positive for the first model, but significantly negative for the other models. Since the univariate sorts shows there is no difference between emerging markets and other countries in terms of IPO underpricing, I reject the emerging markets hypothesis.

As regards to the legal environment hypothesis, table 3 shows that the civil law dummy is significantly positive in the second model. Also, we consider that the countries implementing civil law have more IPO underpricing on average according to the univariate sorts. The significance of the coefficient of the civil law dummy dissipates however after the variable reflecting litigation risk is included in the models. This shows that it is in fact the litigation risk that affects the level of IPO underpricing. The coefficient for litigation risk is significant at the 1%-level and when the number of attorneys per capita increases with 1%, the first-day returns increase with almost 10% according to model 1. This outcome is in line with univariate sorts, where the countries with high litigation risk observe more IPO underpricing. Based on these results regarding the legal environment hypothesis, I do not reject this hypothesis, which argues that the legal environment in a country affect the level of IPO underpricing.

Looking at the culture hypothesis, which states that the culture of a country has a significant effect on the IPO underpricing anomaly, we observe from the regression results that countries that are predominantly atheist have lower first-day returns, contrary to the univariate sorts. Risk-averse countries also tend to have lower first-day returns. While the sign of the effect of culture is different from expected, I can still not reject the culture hypothesis, since it seems that the culture does at least affect the IPO underpricing anomaly.

As a concluding remark towards the multivariate regression results, I reject the emerging markets hypothesis, while I do not reject the country-risk hypothesis, the legal environment hypothesis, and finally the culture hypothesis. Countries that have more technology firms and higher litigation risk experience more IPO underpricing.

B. Robustness Checks

To check whether the results alter under different conditions, I present additional multivariate regression results in table 4. In this table, I report the results of 10 models. The first six models are similar to the previous models, except for that I additionally test for the year effects over time. The six models thereafter are also the same as the first models, but I exclude countries in the dataset with less than 5 IPOs, since they can be non-representative for the rest of the IPO market. The countries that are thus excluded are Czech Republic, Morocco, Russia, Greece, Monaco, Argentina, British Virgin, Guernsey, Philippines, Faroe Islands, Finland, Denmark, Hong Kong, and Poland.

Table 4. Multivariate regressions of First-Day Returns including Year-effects and with altered Sample

The models in the table are similar to the original models, but in this table also the year-effects are considered by adding dummy variables for the year of the IPOs. Also, the sample size is reduced by excluding countries that are less representative for the study. The t-statistics are presented in parentheses.

* significant at the 10%-level, **significant at the 5%-level, *** significant at the 1%-level

<i>Model</i>	<i>AGE</i>	<i>INTERNET DUMMY</i>	<i>TECHNOLOGY DUMMY</i>	<i>EMERGING MARKET</i>	<i>GDP GROWTH RATE</i>	<i>GDP PER CAPITA</i>	<i>CIVIL LAW DUMMY</i>	<i>Ln(LITIGATION RISK)</i>	<i>ATHEIST DUMMY</i>
All variables	0.001 (1.47)	0.023 (0.48)	0.087*** (4.63)	0.662** (2.92)	0.021* (1.22)	0.000 (0.15)	0.016 (0.26)	0.079*** (3.49)	-0.081 (-0.79)
Full sample	0.000 (0.55)	0.063 (1.41)	0.064*** (3.52)	-0.271*** (-4.26)	0.015** (2.23)	-0.000*** (-6.77)	0.125*** (5.59)	-	-0.057** (-1.81)
H1	0.000 (0.78)	0.064 (1.39)	0.075*** (4.16)	-	-	-	-	-	-
H2	-	-	-	-0.240*** (-4.76)	0.0133** (2.14)	-0.000*** (7.16)	-	-	-
H3	-	-	-	-	-	-	0.023 (0.43)	0.07*** (3.99)	-
H4	-	-	-	-	-	-	-	-	-0.042 (-1.21)
All Variables (smaller sample)	0.001 (1.67)	0.024 (0.51)	0.089*** (4.78)	-	-0.007 (-0.93)	0.000 (1.1)	0.006 (0.09)	0.106*** (5.23)	-0.026 (-0.23)
Full Sample	0.000 (0.52)	0.06 (1.25)	0.062*** (3.44)	-0.214*** (-3.54)	0.005 (0.89)	-0.000*** (-5.09)	0.123*** (3.73)	-	-0.039 (-1.35)
H1	0.001 (0.93)	0.059 (1.21)	0.072*** (3.98)	-	-	-	-	-	-
H2	-	-	-	-0.203*** (-4.44)	0.004 (0.8)	-0.000*** (-6.73)	-	-	-
H3	-	-	-	-	-	-	0.026 (0.50)	-0.088 (-5.00)	-
H4	-	-	-	-	-	-	-	-	-0.058 (-1.6)

Table 4. Continued

<i>RISK AVERSION</i>	2010	2011	2012	2013	2014	2015	2016	2017	2018	Constant	Adjusted R ²	F-Statistic
-0.068 (-0.65)	-0.261** (-2.24)	-0.215* (-1.71)	-0.173 (-1.59)	-0.149 (-1.31)	-0.198* (-1.54)	-0.173 (-1.44)	-0.208* (-1.75)	-0.159 (-1.27)	-0.217 (-1.48)	0.733*** (3.51)	0.06	0.000***
-	-0.138** (-2.11)	-0.159** (-2.53)	-0.032 (-0.52)	-0.025 (-0.41)	-0.045 (-0.72)	-0.032 (-0.53)	-0.058 (-0.93)	0.126* (1.82)	0.040 (0.48)	0.327*** (4.84)	0.06	0.000***
-	-0.070 (-1.34)	-0.123** (-2.39)	-0.031 (-0.56)	-0.023 (-0.45)	-0.048 (-0.94)	-0.002 (-0.04)	-0.032 (-0.59)	0.123** (2.05)	0.008 (0.11)	0.193*** (3.90)	0.04	0.000***
-	-0.135** (-2.08)	-0.151** (-2.41)	-0.027 (-0.45)	-0.024 (-0.41)	-0.034 (-0.55)	-0.025 (-0.42)	-0.056 (-0.89)	0.124* (1.76)	0.032 (0.39)	0.434*** (7.57)	0.05	0.000***
-	-0.141** (-2.44)	-0.084 (-1.32)	-0.045 (-0.78)	-0.032 (-0.60)	-0.05 (-0.97)	-0.033 (-0.61)	-0.088 (-1.5)	-0.015 (-0.27)	-0.049 (-0.60)	-1.373*** (-3.57)	0.03	0.000***
-0.150*** (-5.42)	-0.048 (-0.8)	-0.066 (-1.09)	0.018 (0.3)	0.048 (0.84)	0.023 (0.41)	0.049 (0.85)	-0.017 (-0.28)	0.162*** (2.47)	0.065 (0.82)	0.327*** (5.4)	0.05	0.000***
-0.013 (-0.11)	-	-	-	-	-	-	-	-	-	0.643*** (3.27)	0.05	0.000***
-	-	-	-	-	-	-	-	-	-	0.273*** (4.65)	0.03	0.000***
-	-	-	-	-	-	-	-	-	-	0.17*** (11.84)	0.01	0.000***
-	-	-	-	-	-	-	-	-	-	0.398*** (11.38)	0.02	0.000***
-	-	-	-	-	-	-	-	-	-	0.604*** (5.16)	0.03	0.000***
-0.155*** (-5.43)	-	-	-	-	-	-	-	-	-	0.365*** (10.07)	0.03	0.000***

Looking at table 4, we observe that the year effect is indeed present. In several models, the coefficient for the years 2010, 2011, 2016, and 2017 are significant. We also notice that the dummy variable for emerging markets is omitted due to collinearity. This is caused by the high correlation of the emerging markets variable and the GDP growth rate.

Furthermore, we see that the results from table 4 do not seem to influence the primary conclusions regarding the hypotheses. The coefficient for age and internet stocks are still insignificant, while the technology dummy remains significantly positive. The coefficient of the emerging markets variable is still ambiguous and the magnitude of the GDP per capita coefficient remains negligible. The GDP growth rate however becomes significantly positive in the first three models. The dummy for civil law is also still positive and significant in the second model, and the litigation risk persists to be significant in the other models. Finally, the results regarding the atheist dummy and the risk-aversion variable also do not alter the conclusions.

Once again, we therefore reject the emerging markets hypothesis, while we do have to note that the coefficient for GDP growth becomes significant in the additional models. The country-risk, legal environment, and the culture hypotheses are not rejected.

C. Sub Samples

To be able to determine whether the influences of the variables change over time, we look at table 5 that includes the first two models as presented in table 3. The sample is however split in two periods, namely from 2009-2013 and 2014-2018.

The results of the models presented in table 5 are for the most part similar to the previous results. The technology dummy is still positively significant in all four models. Also, the litigation risk is positive and significant in the models. The coefficients for the emerging market dummy is ambiguous yet again. We do notice however that the empirical evidence for the culture hypothesis dissipates in the four models of table 5.

Regarding the changes over time, we see that in the period of 2009-2013, internet firms experienced higher levels of IPO underpricing, but this effect has disappeared in the past 5 years. Furthermore, technology firms seem to cause even more underpricing in the period 2014-2018. Emerging markets caused overpricing in the first period, but then cause high levels of underpricing in the latter period. Finally, the legal system a country implements seems to have gained importance over the years, since the coefficient from the fourth model is higher than the coefficient from the second model.

Table 5. Multivariate regressions of First-Day Returns in Sub Samples

The models in the table are similar to the original models, but in this table the models are run for the periods 2009-2013 and 2014-2018 separately, so that the changes over time can be examined. The t-statistics are presented in parentheses.

* significant at the 10%-level, **significant at the 5%-level, *** significant at the 1%-level

Model	AGE	INTER NET DUMMY Y	TECHNO LOGY DUMMY	EMERGI NG MARKET	GDP GROWTH RATE	GDP PER CAPITA	CIVIL LAW DUMMY	Ln(LITIGA TION RISK)	ATHEIST DUMMY	RISK AVERSI ON	CONSTAN T	ADJUSTE D R ²	F- STATIS TIC
All Variables 2009 -2013	0.001 (1.56)	0.11* (1.73)	0.057** (2.2)	0.011 (0.03)	-0.009 (-1.22)	0.000 (0.54)	-0.016 (-0.17)	0.095*** (3.31)	0.004 (0.03)	-0.001 (-0.01)	0.607** (2.19)	0.03	0.01**
Full Sample 2009 -2013	0.000 (0.51)	0.16** (2.6)	0.057** (2.43)	-0.238*** (-3.58)	0.011 (2.07)	-0.000*** (3.29)	0.081 ** (1.96)	-	-0.042 (-1.12)	-	0.235*** (2.97)	0.04	0.000***
All Variables 2014 -2018	0.000 (0.69)	-0.038 (-0.54)	0.11*** (4.19)	1.398*** (4.26)	0.009 (0.27)	0.000 (0.45)	0.09 (0.94)	0.093** (2.35)	-0.249 (-1.38)	-0.185 (-1.15)	0.713 (1.64)	0.10	0.000***
Full Sample 2014 -2018	-0.000 (- 0.21)	-0.04 (-0.55)	0.07*** (2.59)	-0.007 (-0.05)	-0.017 (-1.04)	-0.000*** (-3.52)	0.185*** (3.55)	-	-0.18 (- 0.4)	-	0.307*** (3.56)	0.03	0.000***

VII. DISCUSSION

What explains the differences in IPO underpricing across countries? In this paper, I examine four hypotheses to explain this question. Based on the multivariate regression results, I reject the emerging markets hypothesis. The country-risk, legal environment, and the culture hypotheses are not rejected. Especially when a country has relatively more technology companies the level of underpricing increases. Technology firms are namely more underpriced compared to other companies. Also, number of attorneys per capita in a country influences the first-day returns. Countries with a higher litigation risk experience more IPO underpricing. These results are not altered by the robustness checks for time effects and a different sample. The sub samples show that the effect of internet firms on the level of underpricing disappeared over time.

I fail to find evidence that the age of company, and whether a country has relatively more internet firms affect the first-day returns. This outcome is in contrast with the existing literature, since it is assumed that younger companies and internet firms are riskier. Due to uncertainty, investors would only be willing to partake in these IPOs when they receive a high enough premium, in the form of an underpriced IPO. There is however no evidence for it in this study. Internet firms however did seem to increase the level of underpricing in the period 2009-2013. For technology firms, we can conclude that they do increase the level of underpricing of IPOs, in line with the uncertainty theory.

Furthermore, the emerging markets do not seem to have more underpriced IPOs compared to other countries. This is also in contrast with previous studies, where researchers find that

emerging markets have more underpriced IPOs. The fact that the coefficient of the emerging market dummy is significant should however be considered. The sign of the dummy is ambiguous since it is positive in the first model, but negative in the models thereafter. Further research should be done to get a more accurate view of the relationship between emerging markets and the IPO market.

The results in this paper provide support for the legal environment hypothesis. Countries with more lawyers per capita experience higher levels of IPO underpricing. This is consistent with the existing literature, which states that issuing firms underprice their IPO deliberately to attenuate the risk of lawsuits.

Although there is empirical evidence for the culture hypothesis, the sign of the coefficients of the risk aversion variable is different from expected. Based on the idea that risk-averse investors need a higher premium before taking part in an IPO market, it is expected that countries that are relatively more risk-averse experience more underpricing. In this paper, we observe that those countries have lower first-day returns compared to more risk-seeking countries. An explanation for this observation can be that in the countries that are more risk-seeking, the demand for the IPOs are higher causing an increase in the first-day returns. Further research should be done regarding the culture hypothesis to come to better conclusions.

This study observes over 2000 initial public offerings, but the majority of the observations are from the US. To obtain more accurate results, it is preferred that future research has a larger sample size with around the same observations for each country. Furthermore, the variables of

litigation risk and risk aversion contained missing values, which affects the outcome of the multivariate regressions. When there is more information available regarding these variables, the results from the regressions are more precise. For example, in this paper litigation risk is measured by the number of attorneys per capita in a country. Litigation risk can also be measured by the number of lawsuits per capita, or the number of IPO lawsuits per IPO. When more data is available, the proxy for litigation risk can be more precise, and thereby enhance the preciseness of the conclusions. A dummy for venture capital-backed firms can also be added to better identify the riskier IPOs. Future research should be done to explain the effect of emerging markets, and the risk aversion at the country level on the level of IPO underpricing. Alternative explanations for the variation of first-day returns across countries should also be considered. Future research can for example consider the differences in the effect of the underwriter prestige, accounting conservatism, and the ratio of CEO ownership for each country on the first-day returns of IPOs.

To conclude, in this paper I present empirical evidence that differences in the level of IPO underpricing across countries can be partially explained by differences in country characteristics. Researchers can further study why and how culture influences the IPO market. Furthermore, they can clarify the effect of emerging markets or examine alternative explanations. Finally, for investors willing to partake in IPOs, it should be more attractive to invest in countries with more technology firms and higher litigation risk. Countries with more technology firms and higher litigation risk experience more IPO underpricing.

APPENDIX

A. Tables

Table 6. Statistics per Country. The table contains information for the 36 countries included in the study.

Country	Underpricing Average in %	Age	% Tech Stock	Emerging Market	Law Type	Risk Aversion	Number of IPOs
Spain	-2,16	14,31	20,00	No	Civil Law	-	5
Norway	-0,66	15,55	0	No	-	1,16	5
Canada	-0,22	5,87	14,29	No	Common Law	0,83	70
Netherlands	0,33	15,22	42,86	No	Civil Law	0,1	14
Czech Republic	0,83	10	0	No	Civil Law	-	1
Brazil	1,00	23,93	5,26	Yes	Civil Law	0,63	19
Morocco	1,24	22	0	No	Civil Law	-	1
Russian Fed	1,33	27,75	0	Yes	Civil Law	0,65	3
France	2,06	15,54	62,07	No	Civil Law	1,43	87
Greece	2,51	6,68	25,00	No	Civil Law	1,08	4
Luxembourg	2,98	2,41	50,00	No	Civil Law	-	6
Sweden	3,39	23,31	44,44	No	Civil Law	-	9
Belgium	3,59	17,12	62,50	No	Civil Law	1,55	8
Israel	3,59	20,05	91,67	No	Common Law	-	12
Monaco	4,32	0,63	0	No	Civil Law	-	3
Argentina	4,55	24	0	Yes	Civil Law	1,2	1
British Virgin	5,00	0	0	No	Common Law	-	1
Guernsey	5,00	0	0	No	-	-	1
Germany	6,18	28,68	30,43	No	Civil Law	0,77	23
Philippines	8,57	50	0	Yes	-	-	1
Faroe Islands	9,16	42	0	No	Civil Law	-	1
Switzerland	9,36	15,41	75	No	Civil Law	1,21	8
Finland	9,73	11,72	33,33	No	Civil Law	0,57	3
Denmark	9,82	26,40	0	No	Civil Law	-	4
Saudi Arabia	10,55	29,73	20	No	-	-	5
United Kingdom	14,82	8,08	22,73	No	Common Law	1,03	22
United States	14,99	10,13	47,68	No	Civil Law	1,39	690
Hong Kong	16,85	2,14	0	No	Common Law	-	2
India	17,97	31,25	23,68	Yes	Common Law	0,92	38
China	22,42	11,08	40,30	Yes	Civil Law	-	201
Bermuda	22,83	5,64	33,33	No	Common Law	-	6
Italy	23,54	20,05	33,33	No	Civil Law	-	6
South Korea	28,50	14,91	47,69	No	Civil Law	0,27	346
Japan	36,52	22,21	27,59	No	Civil Law	0,44	395
Taiwan	43,59	9,87	60	No	Civil Law	2,45	25
Poland	76,21	24,24	0	Yes	Civil Law	0,38	2
All Countries	20,85	14,48	40,83	-	-	0,91	2028

B. Charts

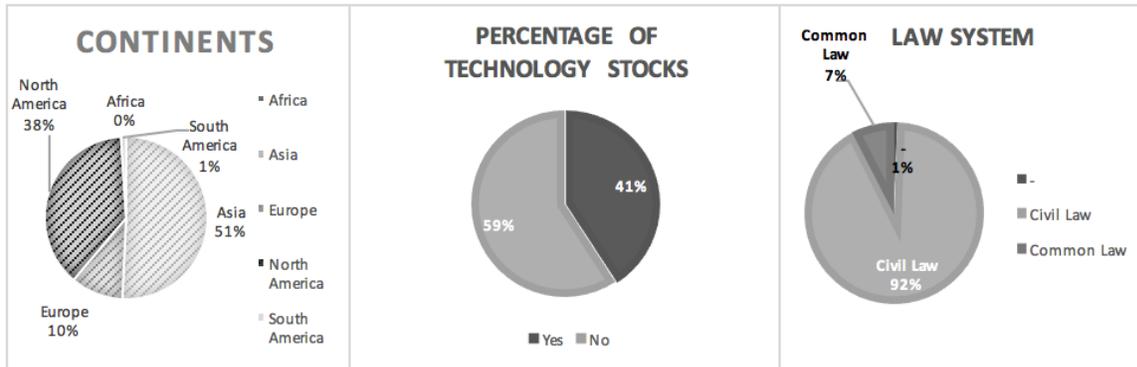


Chart 1. Pie Chart regarding the Continents the Issuing Firms originate from

Chart 2. Pie Chart regarding the Ratio between Technology Stock and Non-Technology Stocks

Chart 3. Pie Chart regarding the Legal System Countries implement

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