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MSc Accounting Auditing and Control

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Competition, Information Asymmetry, and the Cost of Capital

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ABSTRACT

This paper investigates what kind of impact, an increase in competition as well as information asymmetry, can have on the weighted average cost of capital of the firm. By identifying significant reductions in the import tariff rates, I assume that competition increases for that specific industry that the firm examined operates in. Additionally, I consider the impact of information asymmetry on the weighted average cost of capital. Information asymmetry following prior literature is defined as the dispersion in the analysts' earnings per share forecasts, scaled by the absolute value of actual earnings per share. By employing a large sample from different databases, consisting of data for firm characteristics, analysts' earnings per share forecasts, as well as import tariff rates per industry for firms listed in the United States, I ascertain the following. First, in line with expectations, I find that when competition increases, the weighted average cost of capital decreases. Secondly, in line with expectations as well as prior literature, I find that information asymmetry is positively associated with the weighted average cost of capital. Last but not least, in line with expectations as well as confirmed through prior literature, I identify that the interaction term of an increase in competition and information asymmetry is negatively correlated with the weighted average cost of capital, showing that when the direction of the relation is driven from the import tariff rate reductions and verifying prior findings that propose that when product market competition tends to be perfect, information asymmetry has no separate effect on the cost of capital.

Keywords : Weighted Average Cost of Capital (WACC), Information Asymmetry, Competition, Import Tariffs, Agency Theory

JEL classification : D24, D41, D82

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1. Introduction

1.1 Introduction and Research Problem

One of the most crucial elements for a vast variety of corporate decisions is a firm's cost of capital. Researchers and academics have been studying the influence of information on the cost of capital for many years, but still findings regarding this topic are inconsistent. The cost of capital is not only used as an indicator to determine the minimum return of a new investment project, but also influences the composition of firm's capital structure. The cost of capital refers to the cost of funds used for the financing of businesses covered by an entity. This cost is dependent upon the financing structure that an entity is following. Consequently, some entities may decide to finance all their businesses and activities solely through equity financing however, the most commonly used way of financing is a mixture-combination of equity and debt. Thus, every company strives to reach the optimal mixture of financing from different sources. Debt financing on the one hand, has the advantage of interest expense deductibility, since dividends and common shares must be paid to the investors after-tax, but on the other hand, too much debt may increase leverage in such levels that lenders may impose higher interest rates in order offset the risk of default. Therefore, it can be understood that the overall importance of the cost of capital in influencing the profitability of a company, as well as the importance for firms to keep this cost as low as possible. The complication is that there is no conclusive answer to this broad question: What influences a firms' cost of capital? In my thesis, I would like to investigate the impact of an exogenous shock, that is, an increase in competition, as well as the effect of information asymmetry on the weighted average cost of capital. On the one hand, intensity of competition in the product market is one of the strongest forces that affect companies and their environment, and on the other hand, information asymmetry which stands for the information differences that exist among the users of the financial statements.

One of the underlying theories that my thesis is based upon, is the agency theory. A common characteristic of modern developed economies is the separation between ownership and control of companies. This implies an explicit distinction between those who have the decision-making rights (agents-managers) and those who bear the risk of investment by providing the capital known as the principal. Since the

performance of the agents-managers is not always clearly visible to those that provide the funds, that is the principal, the principal demands information and insights to appraise their performance. In other words, managers must share information about the performance of the company with other stakeholders such as shareholders, debtors, the government etc. Such business communication is achieved by various means, yet the most widely used one is the annual report. Even though the agents are obliged to report to the principal, there may be moral hazard concerns whether the represented information is truthful and not manipulated due to the misalignment of interest between the involved parties. Managers have compensation incentives to manipulate information, either to meet their targets or to meet/beat analysts' forecasts and expectations. On the other hand, principals use the provided information to assess the risk taken regarding their capital, as well as the return they require for bearing this risk. Such situations lead to information asymmetry problems.

Information asymmetry according to Healy & Palepu (2001) is a long live problem that exists from information difference and conflicting incentives between insiders and outsiders. The more and better information provided to outside stakeholders, the less risky their investment is and thus, the returns they require are lower meaning that the cost of capital is also lower. Academia also proposes that the better the information environment is the lower the cost of capital could be. However, in the extended existing literature on this subject because there are various methods used to measure the relation between information asymmetry and the cost of capital, the results provided are quite mixed.

Moreover, competition is one of the strongest forces that affect the overall strategy of a company, as well as the environment that the company operates. Competition can influence various aspects of strategy such as the information environment and the cost of capital. The relation between capital providers and managers is affected by the competition as well. On the one hand, agents, are daily involved in the business of the company while, the principal is obtaining the information through publications made by the management. This information difference between these parties has been known as information asymmetry. Companies many times design their disclosure policy towards stakeholders in such manner not to harm their competitive advantage. If competition increases, the company is presumed to publish less information to avoid harming its competitive position in the market and thus, by decreasing the disclosed

information theoretically the information asymmetry between managers and capital providers increases. On the other hand, it can also be said that since competition increases companies might decide to disclose more details in order to keep their cost of financing low and to be able to increase their investing activities, something that will also increase their competitive advantage. When there is higher information asymmetry, there is more risk for the capital providers who will ask for a greater return for their contribution in the company and therefore the cost of capital increases, Healy & Palepu (2001). This risk causes capital providers to increase the cost of capital because they are not sure whether the company can repay its debts/loans (Healy & Palepu, 2001; Meek, Roberts, & Gray, 1995). Nevertheless, it is still not clear whether significant decreases in the import tariff rates have a direct relation with information asymmetry identified through dispersion of analysts' earnings per share forecasts.

Nevertheless, managers in general want to keep the cost of capital low and to achieve so, they have incentives to provide more information to stakeholders. According to Admati (1985), a firm's private information is relevant for the determination of its cost of capital and this is in accordance with the findings of O'Hara (2003), Easley & O'Hara (2004) and Hughes, Liu, & Liu (2007), who find a positive relation between the information asymmetry and the cost of capital. Easley & O'Hara (2004), argue that less informed traders recognize that they are at an information disadvantage and consequently hold fewer assets. This in turn sinks the prices of securities with presumed high degree of private information and therefore increasing the cost of capital for these firms. Contrary to Easley & O'hara (2004), Wang (1993), concluded that when the percentage of informed investors in an economy increases, the cost of capital gets lower.

In addition to the aforementioned, regulators are also interested in amending the issue of information asymmetry. Foster (2003) insist that "more information always results in less uncertainty, and people pay more for certainty". In the same direction, Arthur Levitt, former chairperson of the Securities and Exchange Commission (SEC), suggested that high quality accounting standards reduce the cost of capital. The SEC enacted the Regulation Fair Disclosure (Reg FD), which prevents companies from disclosing information to selected groups of investors and analysts. Selective disclosure as argued, creates greater information asymmetry that in turn leads to higher risk premiums demanded from the side of investors and hence, in a higher firm cost of capital (Levitt, 1998). On the contrary, there are those that argue that regulations such

as Reg FD, could suffocate corporate disclosure, and instead of decreasing the cost of capital for firms, it could increase it. Therefore, it is profound that standard setters are also keen on emphasizing the importance of this issue.

The recent economic crisis together with past business scandals, such as Ahold, seem to have influenced investors' and other stakeholders' confidence in financial reporting. Many investors during the crisis saw the price of their shares immerse in many cases leading to loses of their savings. Facts such as the one mentioned above make investors more conscious of the risks involved in an investment, something that drives to the demand of more information about the firm and its performance before proceeding to an investment. Furthermore, technology and globalization result in the formation of more complex corporate environments making it more demanding for investors to assess a firm's business operations.

1.2 Research Question and Methodology

Based on the preceding analysis, the research question that aims to shed more light in the rich but still growing literature concerning a firm's cost of capital is:

- ✓ **Does an increase in product market competition in a firm's environment and information asymmetry impact firms cost of capital?**

Resulting from the research question, the following sub-questions will be addressed:

- ✓ What are a firm's cost of capital, information asymmetry, and product market competition and how they relate to each other?
- ✓ How information asymmetry affects a company's cost of capital when competition is regarded as an interaction term?
- ✓ What are the statistical relations between the cost of capital, information asymmetry and the increase in the level of competition?

Due to the different financial scandals occurred in the past like those of Enron and Ahold, investors started losing trust and confidence in public firms. To build up confidence and trust between investors and firms, the firms must be able to provide investors with relevant, useful, and sufficient information. However, when competition changes, companies may decide to provide less information so as not to lose their competitive advantage over rivalry.

To address the aforementioned research topics, I will examine the constructs both theoretically as well as quantitatively. The theoretical part provides extensive theoretical background with reference to existing literature that discusses the relation between the examined variables. Furthermore, I examine the quantitative relations between the cost of capital and the information asymmetry in conjunction with the competition as a moderator in the equation as well as other control factors that should be considered within the same framework.

1.3 Most Important Findings

To provide answer to the research questions, I deploy my analysis through a sample consisting of firms listed in the United States of America for the years between and including years 2005 to 2015 excluding firms that operate in the finance and utilities sectors. Following, I describe in short, the most important findings and evidence within the context provided from the sample described above.

First of all, in this research thesis I examine whether solely an increase in competition has an effect in a firm's cost of capital. However, from the first regression analysis performed there were no conclusive answers provided since the findings were statistically insignificant.

Secondly, I test whether a significant reduction in the import tariff rates that also indicates an increase in competition for the firm's industry, has a correlation that is statistically significant with information asymmetry. The outcome of this regression analysis also provides non-statistically significant evidence regarding the correlation between an increase in competition and the information asymmetry over a firm's financial information captured through the standard deviation of analysts' earnings per share forecasts. Therefore, no conclusive answer can be withdrawn from this regression, however it provides evidence that an increase in competition is not correlated with information asymmetry within the context of this paper.

Lastly, with the third regression analysis, I test whether both an increase in competition, information asymmetry, as well as the interaction effect of the aforementioned two, have a correlation with firms weighted average cost of capital. From this test I find that first of all, when both information asymmetry and the reduction of import tariff rates are considered in the same model, then the increase competition de-

scribed through the operationalization of reductions in import tariff rates has a negative correlation with the weighted average cost of capital. Moreover, the results suggest that the correlation between information asymmetry and the weighted average cost of capital is positive and statistically significant. This is in line with prior literature where different researchers find that information is a parameter that has a direct impact to the costs that a firm faces to finance its activities. Finally, I find that when the interaction term of an increase in competition and information asymmetry is considered, it has a negative correlation with the weighted average cost of capital, showing that the direction of the relation is driven by the significant import tariff rate reductions rather than from information asymmetry.

1.4 Contribution

Prior research studies assessing the impact of information asymmetry on the cost of capital find either inconsistent results or, they do not address this research question directly. It is important to address this research topic because not only solely information factors may play significant role in the determination of a firms cost of capital, but there may also be other related influences acting at the same time. In my research, this influence is the increase of competition in a firm's environment. Therefore, a key contribution of my thesis on top of past literature, is to analyse the interaction effect between an increase in competition and information asymmetry, on the cost of capital.

1.5 Structure

The remainder of the thesis is structured as follows. Chapter 2 discusses the theoretical part and the related literature concerning the cost of capital, the information asymmetry, and the competition as well as the relation in-between them. Chapter 3 illustrates the hypotheses developed and to be tested. Chapter 4 explains the variables and introduces the research design followed as well as the sample used. Chapter 5 includes the empirical results and the analysis. Chapter 6 contains the conclusions together with contribution to prior literature, limitations, as well as implications and suggestions for further research.

2. Background Theory & Prior Literature Review

2.1 Introduction

In this chapter, I discuss the background theories involved, as well as prior literature developed overtime, with respect to the relations between the cost of capital, competition and information asymmetry. At the basis of corporate decision making stands the firms cost of capital and in many cases managers of firms strive to keep it low, as a lower cost of capital can be beneficial for them. Moreover, I suggest the discussed division of academics with respect to the factors that influence the cost of capital since one stream of literature accepts the influence of information related factors in the cost of capital while the second one does not recognize the influence of information related factors. Prior literature suggests that information asymmetry has a major influence in the determination of the cost of capital. In this part, I will focus on presenting the theoretical framework in which prior studies capture and explain the question: Why information asymmetry has influence on the cost of capital? Moreover, in this part, I further analyse competition as an important moderating factor in the relation between the cost of capital and information asymmetry among users. Thereafter, I will further expand in literature related to the influences of information asymmetry and competition on the cost of capital. However, what overall findings suggest is that there is no clear consensus on how to estimate the cost of capital and thus, such think could contribute in the contradicting findings.

2.2 Agency Theory

In the context of modern developed economies, there is a distinct separation between ownership and control of the organizations, implying that those that are making the decisions (agents-managers) differ from those providing the capital for the financing, which is the principal (Andersson & Selander, 2009). However, agency theory is not something new. It dates back in '60s and '70s when researchers studied the concept of risk sharing among different parties involved in businesses (Wilson, 1968). The authors insisted that the risk-sharing problem is caused because each of the parties involved in the transactions has different attitude towards risk. In fact, the principal-agent problem arises in conditions of incomplete and asymmetric information environments. Typically, investors do not intend to play an active role in the management and thus, they delegate this role to agents. What agency theory suggests in practice, is that the role of the principal is to supply capital, meaning that the principal is

bearing the risk of the investment, and at the same time, should give profound incentives to the hired agents to align their interests.

However, hired by the principal agents-managers have their own incentives and different way of thinking towards risk (Wright et al. 1996). Furthermore, prior research studies such as those of Easterbrook (1984), Jensen (1986), and Jensen & Meckling (1976) propose that the agency cost problem arise due to the conflict of interest between shareholders-principal and managers-agents. Specifically, they discuss that managers take decisions regarding the organization in the best way to satisfy their own interests and not in the most optimal way with respect of satisfying the shareholders' interests. Thereafter, the focus of agency theory models is twofold, the positivist and the principal-agent research. The first one is acting as a governance mechanism in cases of conflicts to limit the self-serving behaviour of agents. For example, Fama & Jensen (1983) suggest that a board of directors could act as an information system for stakeholders. The second one, not only covers the employee-employer relations but also the relation between agents like buyer-supplier or client-lawyer. In such occasions, the point of convergence is regarded as the design of optimal contracts to solve problems like adverse selection in the hiring process, information asymmetry and moral hazard (Eisenhardt, 1989). According to Kreps (1990), optimal contracts between the agents and the principals provide incentives for full disclosure of private information, something that helps towards the direction of mitigating the misevaluation risk, since these contracts require the agents to disclose relevant information to investors/principals. On the same direction, another potential solution for mitigating the information asymmetry risk, is regulation that requires from managers full disclosure of any private information (Healy & Palepu, 2001), but such thing could have negative consequences because of the competitive advantage the company may lose due to the disclosure of private information. In such cases, someone should consider the costs and the benefits regarding the provision of any kind of information.

As observed in prior literature, principal is trying to reduce the agency costs. One of the most common ways to decrease the agency costs, discussed by Easterbrook (1984), is by giving dividend incentives to the managers. The payment of dividends to agents transfer piece of the ownership to the them, resulting in pressure to raise capital in financial markets more, than in the case of not giving any dividend incentives at all. Moreover, Easterbrook (1984) states that dividends may force managers not to take

actions that would compromise the payment of their share. In practice, managers tend to be risk averse and prefer to minimize the risk exposure of the firm and respectively their risk and that, is usually performed through external financing of activities and thus by increasing leverage.

With respect to above aforementioned, the information environment within an organization plays a crucial role. Since the performance of the agents is not directly observable from the principal, the principal requests information from the management in order to assess the firm's performance. There are several ways in communicating and sharing information about a firm's financial performance between agents (managers) and principals (shareholders), and the most common one considered is the annual report. However, sometimes, due to the misalignment of interest between managers and the outside stakeholders there are moral hazard problems that arise about whether the report gives a truthful representation of the company's performance or whether the results are manipulated in order to meet expectations-targets. To mitigate these moral hazard problems an independent third party, an external auditor, hired to assess the quality of the information represented not only in the annual report, but also in other type of corporate publications. Through this mechanism, the principals can have a more certain view about a company's performance and thus, they can assess the risk that their capital may be in, and how much they want in return for bearing that risk. Effectively, the better the quality and the more the quantity of information provided the less the risk regarding the information and thus more certainty on the side of stakeholders that due to the mitigated risk will demand less return on their investment, which means lower cost of capital.

2.3 Information Risk

Within the finance theory, risk is defined via two components namely; the systematic risk and the specific risk. The first component is non-diversifiable, which means that is inherent to investments in general. The second component on the other hand, is diversifiable and can be eliminated by well-diversified portfolio (Brealey, Myers, & Allen, 2013). Easley & O'hara (2004) and Francis et al. (2005) in their studies show that information risk is part of the non-diversifiable part of the risk. Consequently, diversification will not eliminate either the information risk or, the classification of risk as a price risk factor (Easley & O'Hara, 2004). However, modern pricing models do not take the information component into account (Easley & O'Hara, 2004).

2.4 Cost of Capital

Someone may ask what is the content of the term cost of capital. It depicts the price that a firm is paying for the use of its capital. However, this is not its sole purpose for a firm. Most of the corporate decisions in modern times are based on the rate that a firm can attract capital. Moreover, as stated by Easley & O'hara (2004), investment decisions are made, and cash flows are discounted based on the Weighted Average Cost of Capital (WAAC). The form of capital that firms hold is twofold, debt and shareholders' equity and the costs for these different costs of capital respectively interest and dividend. Yet, the prices of these different forms of financing differ as well. In general, the costs of debt are lower of that of equity. The reasoning behind this is that the risk the distributors are exposed is lower compared to the risk of equity distributors. Thus, it can be inferred that the cost of capital reflects the risk taken from investors.

As discussed more extensively in section 2.2, agency theory is the foundation behind information risk. There is information gap that exists between the agent and the principal. The principal requires the agent to reduce this gap by conveying high quality information. However, this is not always the case since principal has inherent difficulties assessing the full image of the firm and therefore, cannot judge the quality if of the information conveyed. Francis et al. (2005) supports the aforementioned, and states that firm specific information related to and applicable for pricing decisions of investors is of poor quality.

2.4.1 Cost of Capital Structure

A firm's capital structure choices and decisions have been extensively discussed since the Modigliani and Miller (M&M)[1] theorem. As aforementioned, debt costs less relatively to equity. Before the research study of M&M, debt was regarded as unavoidable and interest (cost of debt) was regarded as a cost, therefore, there was no sense in managing a firms' capital structure. However, M&M's notion was based in a world with no taxes and transaction costs. When taxes are also considered, companies can take advantage of expensing their interest payments which leads in reducing the company's taxable income. These reductions resulting from tax liability are also known as "tax shields" and serve in preserving the company's total value as well as the generated cash

[1] Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. The American economic review, 261-297.

flows. Therefore, when considering the effect of the elements in the equation, capital structure becomes a factor that creates possibilities for firms to take advantage of it. Yet, firms have restrictions on their capital ratios and these restrictions are intended to eliminate the possible transfer of wealth between the debt holders and the equity holders. According to Wald (1999), dividend restrictions are intended to maximize firm value and not the value of equity, otherwise, debt holders would not grand any debt to firms, as firms would prefer to pay-out dividend. Thus, firms are striving for the optimal ratio between debt and equity.

2.4.2 Cost of Equity

As stated before, firms cost of equity is the rate of return that it pays out to its equity investors, thereafter dividend. This is the cost a firm must pay to its investors for bearing the risk of investing their funds. However, not always equity holders receive a dividend. Which means that the share price accounts for zero dividend pay-out. This is a strategy followed by management when the dividend pay-out is less than expected since, in such occasions, markets react with discontent. In turns, less dividend pay-out alters the expected returns from investors. This latter one is one of the reasons that cost of equity is higher than the cost of debt. Furthermore, cash flows related to return on equity are less certain than respectively the interest payment for the cost of debt.

2.4.3 Cost of Debt

Cost of debt refers to the rate that a company must pay on its borrowings, therefore, interest. As equity holders bear the risk of their investment, debt holders also face other risks. When firms issue debt, risks such as the one of discontinuity, are been proportionally shared between equity and debt holders. The more debt, the more risk is shifted upon the debt holders. Thus, in a world with no restrictions, a rational mind would expect firms to finance their activities solely from debt. Moreover, a distinction should be made at this point between the cost of short-term debt and the cost of long-term debt. Since the cost of debt refers to the interest payment, and interest is a term that involves risk, needed to bear in mind is that long-term interest rates are higher than the short-term ones, ceteris paribus. For example, a 20-year U.S. bond has greater risk, and thus, higher interest rates than for example a 5-year note. However, one more aspect that should be considered for the cost of debt is its dependence upon the phase of the economic cycle. Firstly, there is the case of expansion of the economy

in which the cost of short-term debt is lower than the cost of long-term debt. Secondly, there is the case that the economy is heading to a recession phase and, in this case, the short-term debt is more expensive than the long-term debt. Finally, yet importantly, there is the case that interest rates for both short and long-term debt are very close to each other and this indicates that the economy is transiting from one phase of the economic cycle to another.

2.5 Cost of Capital and Information

There is a considerable number of studies until today that is focused on the relationship between the cost of capital and information. In the market-based economy models, the role of information according to Beyer, Cohen, Lys & Walther (2010) is twofold; ex-ante and ex-post. On the one hand, the ex-ante role of information stands for the fact that, managers hold more private information about the investment opportunities as well as for the potential returns of those investments and thus, they can better determine expected profitability than outside stakeholders. In fact, this information asymmetry prevents investors from having a clear view of their investments and respectively puts more difficulty in their assessment between high and low profitable investment opportunities. In 1970, Akerlof (1970) conducted a research widely known as the "Lemons Problem", in which was discussed the fact the agents have incentives to inflate numbers so as the investment opportunities seem more profitable and thus, to attract more funds from external financing sources. In such cases, investors and fund providers will under-evaluate high profitable investment opportunities and respectively over-price low investment opportunities. To mitigate this problem, what he suggested was that companies should in general disclose information, and in particular accounting information. However, by disclosing private information either through the annual report or in any other possible mean, a company may lose competitive advantage against rivalry, which is why I also expect that when competition is more intense, some companies may not disclose all available information to public. Leuz & Verrecchia (2007) in their research mention that "information asymmetry creates costs by introducing adverse selection into transactions between buyers and sellers of firms' shares". The adverse selection results in undesired occasions when both buyer and seller have asymmetric information. Therefore, they conclude that, more disclosures decrease the cost of capital by decreasing the information asymmetry. Other studies in the same stream of research indicate similar results regarding

the effect of information asymmetry on either cost of capital or/and the cost of equity (Francis et al., 2005; Fu, Kraft & Zhang, 2012).

On the other hand, the separation of ownership and control in modern economies is implying a distinction between the providers of capital who are taking the risk of investing their money, and the decision makers on the provided capital, namely agents or managers. Capital providers like investors, are not taking all the decisions that may affect their investment and therefore, specific contracts should be in place in order to protect investors from potential risk on the decision-making that managers may take on the invested capital. Such contracts require the disclosure of information regarding the correct use as well as the misuse of capital and decisions taken on investing the money and finally the return realized on investments. Consequently, investors value this information ex-post and this can lower the rate of return ex-ante, when the information will be available (Beyer et al., 2010). Moreover, in their research paper Diamond & Verrecchia (1991) insist that corporate disclosures decrease information asymmetry and thus, improve a firm's future securities liquidity something that will lead in the attraction of larger investors and subsequently reduce its cost of capital. Results from Diamond and Verrecchia's study indicate that for large firms the effect of reduced information asymmetry is even larger, and in this way, these firms attract a bigger piece of the market. Less information asymmetry will give even more freedom to large investors, since the market becomes more liquid. In addition, they also suggest that for smaller firms' cost of capital is less dependent on large investors since they do not have the ability to attract a large market.

The disclosed information should be included in practice in the disclosures, but in fact, not all-privately held information from the agents is exposed. Much research conducted on the stream of share price value maximization, which states that a firm that wants to maximize its share price discloses all available private information, as long as the following criteria are fulfilled (Grossman, 1981; Grossman & Hart, 1980; Milgrom, 1981; Milgrom & Roberts, 1986):

1. Disclosure is costless to the company;
2. Investors recognize that the firm has indeed private information;
3. All existing investors and potential ones explain the firm's disclosure in the in same manner and on the other hand that the firm knows how investors interpret that disclosure information;

4. The company can plausibly disclose the withhold private information;
5. The company cannot pledge ex-ante to a certain disclosure policy.

The above suggested, indicate why in fact there is less disclosure – one or more of the premises discussed above is not fulfilled.

The first asset-pricing models did not include the information factor as a determinant of the cost of capital. However, Fama and French (1992 & 1993) argued that there is possibly something more than merely the market risk that may affect the required returns, but also these factors did not incorporate the importance of information. Looking at the Capital Asset Pricing Model (CAPM), the discount rate is likely to be seen as the sum of the equity risk premium (r_P) and the risk-free rate. The risk premium is not directly observable and therefore it is can be inferred ex-post from realized returns or ex ante from the current price and expectations of future dividends (Gode & Mohanram, 2003). Following the ex-ante approach, one derives the risk premium from the current price and future expected dividends. Nevertheless, market expectations of future dividends are not publicly noticeable. However, one of the publicly observable proxies for market expectations are earnings estimates from sell-side analysts. In addition to the aforementioned, analysts only report the upcoming one-year-ahead earnings per share, two-year-ahead earnings per share, and sometimes the expected earnings over a five-month course. However, in my model I use weighted average cost of capital as the proxy for the determination of the cost of capital.

Most asset pricing models are constructed in order to develop proxies for the determination of the cost of capital, which in turn are correlated with the risk measure of interest. However, due to the nature of the results of these models it is not clear which economic risks underlie in the findings. To be more specific, Petkova (2006) in order to build theoretical risk constructs is using empirical proxies proposed by individual asset pricing models like the conditional consumption capital-pricing model and the intertemporal capital-asset pricing model, which in turn are used to assess whether Fama-French returns capture these risk constructs. Thus, it can also be valid to say that factors developed by Fama-French also incorporate and reflect the "information risk".

In order to assess the aforementioned "information risk", Lambert et al. (2007), constructed a model consistent with the CAPM and examined whether and how ac-

counting information manifests in its firms cost of capital, despite the forces of diversification. Their findings suggest that the direct effect exists because higher quality of disclosures affect the firm's assessed covariances with other firms' cash flow, which is not diversifiable. They also indicate that there is an indirect effect as well, that occurs because higher quality of disclosures affects a firm's real decisions, something that probably alters a firm's ratio of the expected future cash flows to the covariances of these cash flows with the sum of all the cash flows in the market.

Considerable empirical studies provide evidence that either disclosure or information quality measures are negatively correlated to a firm's cost of capital when it is calculated as the discount factor implied by market prices and forecasted future cash flows. Botosan (1997) explained that the effect of disclosure level on the cost of equity capital is of direct interest to the research community, even though it is not very well established and at the same time is quite difficult to be quantified. She found that for firms with low analyst following, greater disclosure is associated with lower cost of capital. In addition to the aforementioned, another relative stream of research indicates that better information can reduce the rate of return demanded by investors. This according to Merton (1987) can happen by enlarging the firm's investor base because of the improved risk sharing among investors. However, both Merton (1987) and Easley and O'Hara (2004), argue that the effect of the investor base is affected by arbitrage. Moreover, according to Clarkson, Guedes & Thompson (1996), the verifiability and pricing of the estimation risk is also well debatable. Thereafter, is reasonably questionable whether the established effects are likely to explain the empirical evidence already drawn.

Lambert et al. (2007) built a model in order to depict the interaction between firms and investors in equity markets and the fundamental role of information in facilitating firms' capital allocation and investment decisions. Intuition behind this is that better information quality improves the coordination between firms and investors with respect to capital investment decisions. Decoding this effect indicates that the higher the information quality is the lower risk premium the investors will demand as a lower rate of return. Bad information drives to misallocation of investments something that investors anticipate on and price and thus they discount on the expected cash flows at a higher rate of return. Therefore, the aforementioned studies provide

evidence that information influences the cost of capital by means of utilizing capital asset pricing models as indicators.

2.6 Information Asymmetry

Information asymmetry exists when different parties have different information about a topic, transaction etc. A clear definition of information asymmetry is stated in the research paper of Fields, Lys & Vincent (2001), who quoted that "information asymmetries generally are associated with the relation between better informed managers and less well informed investors". Information asymmetry has always been a subject of extensive discussion and concern, both for securities regulators and individual researchers. The Securities and Exchange Commission (SEC), recently enacted the Regulation Fair Disclosure (Reg FD) in an attempt to equalize information across investors by preventing companies from disclosing particular information only to a specific sub-set of investors and analysts. In this way, what they try to achieve is to avoid selective disclosure to some individuals, something that was argued by the SEC in 2000 as well. Selective disclosure "gives advantage to those who hold private information about a company, and can make a profit, or avoid loses at the expense of those that do not hold any private information". Information asymmetry exists in financial statements as well. Generally Accepted Accounting Principles (GAAP), require managers to make estimates regarding several aspects of a firm because of the rule-based concept of these principles. For example, such estimates are the economic life of an asset, the allowance for doubtful debts and estimates on the depreciation rates. According to Fields et al. (2001), these estimates about a firm's features reveal information about the firm that can decrease the information asymmetry.

In information asymmetry models, it is assumed that at least one party over one transaction has information that is more relevant compared to information held by other parties involved in the same transaction. Moral hazard, as well as adverse selection models, propose that capital providers will rationally expect managers to take advantage over the information they possess and consequently, they reduce the amount of capital provided (Frederickson & Hilary, 2010). However, what prior literature suggests is that there are different points of view on information asymmetry.

Several researchers (Barry & Brown, 1985; Clarkson & Thompson, 1990) have examined the link between information asymmetry and cost of capital. Even though they test different assumptions in their research, a common characteristic in their

studies is that the estimation risk with respect to a firm's payoff distribution, which is a risk that is non-diversifiable, meaning that, it is a risk that is priced by investors. Therefore, when increased information is provided in financial disclosures, reduces the cost of capital for the reason that it reduces the estimation risk. Easley and O'Hara (2004) throughout their research are trying to provide a link between firm's information structure and its cost of capital related to public and private information. Their findings suggest that the cost of capital is increasing when (partial) information is only available to private investors due to the fact that when information alters from being publicly available to privately available, the uninformed investors need to put more effort in distinguishing the noise in trading, therefore the cost of capital increases (Clinch & Lombardi, 2011). Hughes et al. (2007), nonetheless, propose that the cross-sectional effect of asymmetric information on the cost of capital may be fully diversified away in a pure exchange economy with a large number of assets.

Another stream in literature examines the indirect link between the information asymmetry and firm's cost of capital through market liquidity. Lambert et al. (2007) and Verrecchia (2001) indicate that a firm's commitment to disclosure reduces the information asymmetry across investors something that leads in excess liquidity in equity markets. However, liquidity-based models do not provide such a link. Thus, it is unclear through this stream whether a reduction in the information asymmetry also reduces the cost of capital. Diamond & Verrecchia (1991) have found that revealing information to reduce information asymmetry can reduce the firm's cost of capital by attracting increased demand from large investors due to increased liquidity of its securities. In these occasions, uninformed investors foresee that they may confront an imminent liquidity shock, something that steers them to sell shares to potentially better-informed investors. This adverse selection problem reduces the willingness of uninformed investors to transact in firm shares and decreases the amount they bid for the shares (Lambert et al., 2007).

2.7 Competition

In 1979, Porter (Porter, 1979) in his research paper gave probably one of the most widely known definitions of competition, determined mainly by five sources:

1. Threat of entry
2. Threat of suppliers
3. Competitive rivalry

4. Bargaining power of suppliers
5. Bargaining power of customers

Valta (2012) reasons competition as the continuous striving for customers and market shares while, Li, Lundholm & Minnis (2013) use a definition that is mostly used in the industrial organization literature, defining competition as the degree of product marker differentiation. In the same research paper (Li et al., 2013), I encounter another -more formal- definition of competition, stated as: "the cross-elasticity of demand-competition is more intense if a firm's products are more ready substitutes for another firm's products". Thus, competition is one of the most influential forces that affect both entities and their environment. The environment that firms are operating in is dynamic, rather than static, meaning that firms are not alone in the market. There is a constant competition among firms that demand in any way a piece of the market pie, meaning more customers and greater piece of the market shares (Valta, 2012). The intensity of competition plays of course one of the most important roles and suggests what affects most of the firms strategic operating decisions, as well as the riskiness regarding their involvement with business in that very same environment. There is already enough recent research evidence supporting that the intensity of competition has great imputations for the firm's cash flows and stock returns (Gaspar & Massa, 2006; Hoberg & Phillips, 2010; Hou & Robinson, 2006; Irvine & Pontiff, 2009; Valta, 2012). Moreover, Valta, (2012) with his paper provides evidence that firms that operate in competitive environments have significant higher costs of debt financing. On one hand, debt is the most widely used source of external financing for firms, giving them the flexibility to assess new investing opportunities as well as to maintain their existing ones. Competition in general arises when there are many firms that want to sell their products to the same customers. On the other hand, the customers have limited money or time to buy these products. Whenever there is a new entry of supplier of same product as the one a well-established firm offers, the competition becomes more intense. Since competition affects firms and thereafter managers of those firms, it also affects the other stakeholders of those firms. It is an undoubtable fact that all parties that are involved in transactions are affected and thus, the pricing strategy followed from those parties is well influenced. To understand better how it works a good example could be the following. When competition within a market increases then it can also be assumed that banks will increase the interest rates when it comes to debt financing for the company that gets the loan, because of the increase in the demand of

loans due to the entry of more potential competitors and since the number of capital providers remains the same. Thus, it is essential to understand that a change in the intensity of competition will also influence capital providers and other stakeholders of the company (Healy and Palepu, 2001). Also, Clinch & Verrecchia (1997) and Verrecchia (1990) point out that in industries that the competition is more intense among participants, exists less disclosure, since in such conditions the proprietary cost of disclosure is higher.

3. Hypothesis Development

3.1 Introduction

In this chapter, I will discuss the hypotheses developed and researched in this thesis. All previous theories and concepts discussed in the previous sections are considered for the determination and development of the hypotheses. The objective of the tests performed in this thesis is to examine and assess the association between the constructs operationalized, thus, the cost of capital, competition as well as the association between the cost of capital and the information asymmetry when the later one is determined by the competition.

3.2 Hypothesis Development

As previously discussed, competition can have both, a direct and an indirect effect on the cost of capital. In a market, competition increases when there are more suppliers offering similar products and services. Valta (2012) indicates that competition has a direct effect on the operating decisions of a company and influences the riskiness of the business environment. His results also suggest that firms in more competitive environments face higher costs of debt. Therefore, it is clear that competition not only affects a firm's strategy but also its stakeholders and other potential stakeholders since their pricing strategy is affected as well. Valta (2012) in his paper also point out that the competitive environment in the product market could be a very important determinant on a firm's decision to issue equity, bank debt or public debt. Healy & Palepu, (2001), find that an increase in competition extents its effect on capital providers and other stakeholders. Thus, the first hypothesis that is formulated is the following.

H1: There is a negative relation between an increase in competition and the weighted average cost of capital.

A negative relation is expected, because an increase in competition due to the reduction in import tariff rates will require companies to invest more to stay competitive and therefore they will try to optimize their capital structure in order to be able to finance their activities, but also, lower import tariff rates will result in lower costs for domestic firms as well. Every company strives for capital structure optimization since this will allow not only to efficiently finance its activities, but also to provide a higher

return on the invested capital, which ultimately will provide higher returns in terms of dividend.

Moreover, as discussed also above, there is a distinct separation between the ownership and the management of firms. Due to this separation of ownership and control, managers who are in charge for the daily operations of the firm possess information and knowledge advantages related to the firm. Following what agency theory suggests, managers' nature is opportunistic, and their tendency is to put emphasis on their private interest (Jensen & Meckling, 1976). In this case, the problem of information asymmetry arises. Recent studies give profound emphasis in the role of information as a determinant of the cost of capital. However, the effect of information asymmetry on the cost of capital is dependent upon product market competition. On the one hand, prior literature suggests that in perfect competition settings, information is not a separate factor for the determination of the cost of capital (Hughes et al., 2007; Lambert et al., 2007). On the other hand, when equity markets are imperfectly competitive, information asymmetry can have a separate effect on firms' cost of capital (Armstrong, Core, Taylor & Verrecchia, 2011). As firms have incentives not to harm their competitive position it is more likely that they will also disclose less information to stakeholders when competition becomes more intense. Therefore, the first part of the second hypothesis insists that an increase in competition will have a positive effect on information asymmetry. Thus, concluding from the aforementioned, in my study I expect to find positive correlation between information asymmetry and the cost of capital. Therefore, based on prior literature, and specifically on the articles of Diamond & Verrecchia (1991), Easley & O'hara (2004), and Francis et al. (2005) the first part of the second hypothesis (H2a) that I derive is the following.

H2a: ***An increase in competition due to significant decreases in the import tariff rates will have a positive effect on the information asymmetry.***

The second part of the second hypothesis examines the effect of both, an increase in competition, and information asymmetry, on the cost of capital. In line with the paper of Armstrong, Core, Taylor & Verrecchia (2011), I expect to identify that when competition increases, information asymmetry does not have any separate effect on the weighted average cost of capital. Therefore, the second part of the second hypothesis is the following:

H2b: ***The interaction term between an increase in competition and information asymmetry will have a negative effect on the weighted average cost of capital of the firm.***

3.3 Validity Framework

In advance of conducting the research validity has to be assessed. Validity is going to be appraised in three types, namely *construct validity*, *external validity and internal validity* and the predictive validity framework is presented through the Libby boxes.

To begin with, construct validity refers to the degree the measures operationalized in the research are able to capture the majority of the underlying and unobservable theoretical constructs. With respect to the research method applied in this research, it follows the research methods used in existing literature on the cost of capital, information asymmetry and product market competition. For the determination of the cost of capital, the model I use is consistent with prior literature on the determination of the Weighted Average Cost of Capital (WACC). Furthermore, to derive the measure for information asymmetry, the standard deviation of analysts' earnings per share forecasts scaled by the absolute actual earnings per share is used, as suggested as well by prior literature. Moreover, in order to derive the dummy variable that identifies the increases of competition, I use the six-step model suggested by Fresard (2010) and Valta (2012). Therefore, considering the validity of the models used in this study, the construct validity of this study is considered to be safeguarded, since in prior studies these models capture the effects that researchers wanted to detect.

On the one hand, the external validity refers to the extent that the results can be generalized in terms of application to other settings. With respect to this study, external validity can be deemed considerably insured, and this is because the sample taken involves companies listed in the entire United States, as well as the import tariff rates that are imposed in one of the most major markets in the world right now, are taken only into account. However, there are unique characteristics in the United States such as the local GAAPs, which really differ from International Financial Reporting Standards (IFRS) standards used in most regions worldwide. Even though there is a tendency of convergence between U.S GAAP and the International Financial Reporting

Standards (IFRS) the outcome cannot be generalized to other settings with principle-based accounting settings. Therefore, the outcome can only be generalized to the rest of the companies operating within the United States and not considered in the study because of missing data in the databases.

On the other hand, internal validity attributes to the credibility of a study to detect the causal relation between the dependent and the independent variables after eliminating all alternative hypotheses (Modell, 2005). In this research thesis the internal validity is quite safeguarded by the use of the specific models discussed above, since prior literature suggests that these models capture the effects discussed in this research as well. Nonetheless, there are additional external factors that affect the variables examined that cannot be controlled. To control for those effects, I include the fixed effects in the regression model. Moreover, to mitigate the concern of any correlated-omitted variables, in the regression models examined I incorporate control variables. These control variables have been already identified to have an effect when examine the main variables and thus, their effect should be considered in the model as well. The predictive validity framework of this study is also presented through the Libby boxes attached in Appendix 2.

4. Methodology

4.1 Introduction

In this research, I examine how an increase in competition affects the cost of capital, as well as the combined effect of an increase in competition and information asymmetry on the cost of capital. Furthermore, I investigate whether an increase in competition affects the information asymmetry over a firm's financial information. The current chapter presents the variables used, the empirical models and the outlines of the sample.

4.2 Variables

The breakdown of this section involves three sub-sections that discuss respectively the dependent variable, that is the cost of capital, the independent variables, namely, information asymmetry and increase in competition, and last but not least the control variables used in the model which are, firm size, financial leverage, the number of the analysts who are following the firm, and return on a firm's assets.

4.2.1 Weighted Average Cost of Capital (WACC)

As stated by Damodaran (2016), in its most basic form, the cost of capital is the weighted average of the costs of raising funding for in investment or business, with the funding taking either the form of debt of equity. The weighted average cost of capital (WACC) is the rate that a company is expected to pay on average to all its security holders to finance its assets. In order to calculate the cost of capital I used the outcome of the calculations for the cost of debt and the cost of equity. To calculate WACC, I multiplied the cost of each capital component by its proportional weight and took the sum of the results. The method for calculating WACC can be expressed by the following formula:

$$WACC_{i,t} = \frac{TD_{i,t}}{E_{i,t} + TD_{i,t}} COD_{i,t} + \frac{E_{i,t}}{E_{i,t} + TD_{i,t}} COE_{i,t} \quad (1)$$

Where:

WACC = Weighted average cost of capital for firm *i* in year *t*.

$TD_{i,t}$ = Debt for firm *i* in year *t*, equals the *Total Debt* reported at fiscal year-end.

$E_{i,t}$ = Equity for the firm *i* in the year *t*, as the outcome of *Total Assets* minus *Total Liabilities*.

$COD_{i,t}$ = Cost of debt for the firm *i* in the year *t*.

$COE_{i,t}$ = Cost of equity for the firm *i* in the year *t*.

4.2.2 Cost of Debt

The measure used for the determination of the cost of debt capital is the interest expense for a year, divided by the firm's total debt. Consequently, the calculation is deriving from the following formula:

$$COD_{i,t} = \frac{IE_{i,t}}{TD_{i,t}} \quad (2)$$

Where:

$COD_{i,t}$ = Cost of debt for firm *i* in year *t*.

$IE_{i,t}$ = *Interest Expense* for firm *i* in year *t*.

$TD_{i,t}$ = *Total Debt* (current and non-current) for firm *i* in year *t*.

Thus, the estimate for the cost of debt is a historic pre-tax interest rate.

4.2.3 Cost of Equity

Prior studies have shown that there are many alternative ways when it comes to the computation of the cost of equity. In an "*efficient market*" model, the capital asset pricing model (CAPM) evaluates the relation between risk on investment and required return. Thus, assuming that the market is efficient, the formula in order to determine the cost of equity based on the capital asset pricing model (CAPM) is the following:

$$COE_{i,t} = RF_t + (MR_t - RF_t) * BETA_{i,t} \quad (3)$$

Where:

$COE_{i,t}$ = Cost of equity for the firm *i* in year *t*.

RF_t = the expected return of the risk-free investment in year *t*.

MR_t = the market return in the year *t*.

$BETA_{i,t}$ = the price of the β (Beta) factor of the stock of firm *i* at year *t*.

Below I further explain each of the components used in deriving to the calculation for the cost of equity.

Risk-Free Rate

As defined by Damodaran (2016), the risk-free rate is the conceptual return of an investment with no risk of default, no volatility and a beta of zero. Alternatively, the risk-free rate denotes what would have been the expected return over an investment without bearing any risk. The risk-free rate was retrieved from Prof K. R. French's site.

Equity Risk Premium

As further defined by Damodaran (2016), equity risk premium is the premium that investors demand in return of their investment in equities relatively to risk free rate. To put it differently, the equity risk premium suggests the compensation that investors demand in return to the volatility and risk of their investment, which matches that of the whole market. In the equation above the risk premium is defined as the risk-free rate subtracted from the market rate of return. The market return is also compiled from Prof K. R. French's site.

Company Beta

Beta is defined as a measure for stock's volatility in relation to the market. The rating of individual stocks results from its deviation from the market beta, which equals to 1. When a stock's price waves more in comparison to the market over-time, has a beta above 1. Accordingly, in cases that a stock fluctuates less than the market over-time has consequently a beta smaller than 1. Due to the nature of market, higher beta stocks are riskier and thus, provide higher return potential relatively to the low beta stocks that provide scaled-down returns but less risk as well. Beta is an integral part of capital asset pricing models. Gode & Mohanram (2003) indicate that there is association between the beta and the risk premium. Beta is derived from CRSP database.

4.2.4 Information Asymmetry

For the determination of the information asymmetry metric in my study, I used the dispersion among analysts about a consensus estimate of the forecasted earnings per share scaled by the absolute value of actual earnings per share. This measure indicates the existence of information asymmetry, since disagreement and variations among analysts' estimates demonstrate possible unavailability of information about the firm. Analysts are considered as mediators between management and investors.

Therefore, it is made explicit that where the dispersion levels among analysts' consensus estimates of the forecasted earnings per share scaled by the absolute actual earnings, are relevantly high I expect that information asymmetry is greater as well as compared to situations that analysts' estimates are close to each other. I measured the information asymmetry as the natural logarithm[2] of the standard deviation of analysts' earnings per share forecasts divided by the absolute actual earnings per share, to mitigate the skewness, and derives from the following formula:

$$IA_{i,t} = ln\left(\frac{SdEPS_{i,t}}{|AcEPS_{i,t}|}\right) \quad (4)$$

Where:

$IA_{i,t}$ = Information asymmetry for firm *i* in year *t*.

$SdEPS_{i,t}$ = Standard deviation of all analysts' earnings per share for firm *i* in year *t*.

$/AcEPS_{i,t}/$ = The absolute price of the actual earnings per share for firm *i* in year *t*.

Data regarding analysts' earnings per share forecasts are gathered from I/B/E/S database. However, a limitation of the aforementioned measure should be outlined, and this is that forecast errors can be biased. Thus, it is important to make the explicit assumption that analysts produce unbiased information for investors.

4.2.5 Competition

In my study, the measure used for competition is the United States. import tariff rate reductions, which is consistent with Fresard (2010) and Valta (2012). The import tariff rate reductions are calculated each year for each specific industry and indicate whether the import tariff rate for an industry declined. A decline in the import tariff rates reduces the costs for the entrance of new competitors in the market. In such conditions the trading barrier is reduced something that leads to an increase in the products and services from foreign rivals in the existing market. Therefore, in line with Fresard (2010) and Valta (2012), the competition in the domestic market is increased due to the decreased import tariff rates.

[2] Normalization through the use of the natural logarithm is necessary compromise due to the nature of the underlying data.

Other studies use different measure for the determination of competition. For example Armstrong et al. (2011) are using the number of shareholders. However, this method has several constraints. Firstly, since this measure is taken out of the annual financial statements of the firm is available only once per year. Secondly, it is requiring "approximately the number of shareholders of record"; if this number of shareholders is held in street names, it does not list the shareholders individually (Armstrong et al., 2011). Distribution of import tariff rate reductions per industry through time can be identified in Figure 2 attached in the Appendix 2.

In order to calculate whether an industry has an import tariff rate reduction the U.S. import data are compiled through Schott's database (Schott, 2008). In line with Valta (2012), in order to compute the import tariff rate reductions, I used the six-step approach also used in his paper. The steps are as follows:

1. Calculate the import tariff rates per industry per year as the *duties collected* at U.S. Customs divided by the Free-On-Board custom value of imports.
2. Calculate the average per industry.
3. Identify the "competitive shocks" as these shocks vary enough from the average of an industry.
4. Identify all industries in which the largest tariff rate reduction is as large as, or larger than, three times the median of that industry.
5. Exclude the import tariff rate reductions that are prior or followed by equivalently large tariff rate increases, to eliminate transitory changes.
6. Creating the dummy variable *Competition (DOC)*; this dummy variable will be equal to 1 if an import tariff rate reduction took place by time *t* or will be equal to 0 otherwise.

To understand the aforementioned, when the dummy variable takes the value 1, an import tariff rate reduction occurred for that year *t* in the specific industry which indicates that competition for the firm in that industry also increased for that year.

4.2.6 Firm Size

Firm size can be a proxy for many influences (Ball & Foster, 1982). According to Li (2008), firm size captures a wide range of aspects of a firm's operation and business environment. Moreover, larger firms have greater analyst following, better information environments, potentially more complex operations, and greater demand for information advice (Lehavy, Li & Merkley, 2011). Large and more complex firms are

expected to have a more diversified pool of shareholders, resulting in higher agency costs. However, Suijs (2007) and Wagenhofer (1990) in their studies showed that this might not be the case per se. Some empirical studies found a negative association between firm size and the cost of capital. The proxy used in order to account for firm size is the logarithm of total assets, to mitigate skewness in the distribution.

4.2.7 Leverage

The use of financial leverage as a control variable is also consistent with prior literature (King & Wadhwani, 1990). The logic behind the use of financial leverage as a control factor is that, the greater the financial leverage is, the higher the agency costs arising from managerial discretion to shift resources away from debt-holders, and the greater the demand for disclosure and supervision. Financial leverage in my study is measured as the ratio of the sum of short-term and long-term debt to total assets. Firms that in their capital structure have more debt also face higher agency costs because potential funds transfer from debt-holders to shareholders and managers increases with leverage (Meek et al., 1995). When a firm increases its financial leverage, at the same time increases its probability of default and therefore, debt-holders will demand a higher compensation due to the increased risk bearing. On the other hand, when a firm's performance is positive its cost of capital may decrease.

$$LEV_{i,t} = \frac{TD_{i,t}}{TA_{i,t}} \quad (5)$$

Where:

$LEV_{i,t}$ = Financial leverage for firm i in year t.

$TD_{i,t}$ = Total debt for firm i in year t.

$TA_{i,t}$ = Total assets for firm i in year t.

4.2.8 Number of Analyst Following

Consistent with Chung, McInish, Wood & Wyhowski (1995), the number of analysts following can have impact on the precision of estimates of components in the cost of capital calculation and determination, as well as at the dispersion, which is used as measure to capture the information asymmetry. Chung et al. (1995) also came up with the conclusion that there is a positive relationship between analysts' coverage and the level of asymmetric information. Former studies also indicate that financial analysts may be a source of managerial monitoring. More specifically Chatfield, Moyer &

Sisneros (1989), as well as Chung et al. (1995), find evidence that the number of financial analysts following a firm has a negative impact on agency costs. However, Rediker & Seth (1995) argument that the expected sign of the impact of number of analysts following can be either positive or negative. Data for this variable are retrieved from I/B/E/S database as well.

4.2.9 Return on Assets (ROA)

Finally, in my study I included the return on assets as a control variable. As indicated further below as well, return on assets (ROA) is defined as the net income generated divided by the firm's total assets. To make it simpler is a rate that illustrates how efficiently a firm uses its assets to generate income. Therefore, the higher the return on assets is, the lower the risk of default is. The coefficient for this variable is expected to be negative, since when the cost of capital is decreased for a firm, then for the same firm a higher net income is expected for the same amount of assets put into use, and consequently the return on assets would increase.

$$ROA_{i,t} = \frac{NI_{i,t}}{TA_{i,t}} \quad (6)$$

Where:

$ROA_{i,t}$ = The Return on Assets for the firm i in the year t.

$NI_{i,t}$ = The Net Income for the firm i in the year t.

$TA_{i,t}$ = The Total Assets for the firm i in the year t.

4.3 Research Design

My first goal is to examine the effect of an increase in competition on the cost of capital. For this relation, a negative effect is expected because an increase in competition is expected to result in a decrease in the cost of capital. My second goal is to capture the relation between information asymmetry and increase in competition. This relation is examined as well, in order to further determine the combined effect of information asymmetry and an increase in competition to the cost of capital, as indicated in the first part of the second hypothesis. The expected effect is negative. If competition increases, then information asymmetry decreases, since management is likely to provide additional information to satisfy low cost of financing. Lastly, the third goal is to examine the effect of information asymmetry on the cost of capital, where information

asymmetry is also determined by the increase in competition. A positive effect is expected for the relation between information asymmetry the cost of capital. With respect to the outcome of the interaction term the expectation is that, the direction of the relation of macroeconomic variable will drive the result and hence it is expected to be negative. The study requires an exogenous shock, which in my study is the increase in competition. Since the company does not regulate the import tariff rates yet an external factor does so, this is the government; they are considered an exogenous shock in my study. Following the study Balakrishnan, Billings, Kelly & Ljungqvist (2014), I also assume that the exogenous shock has no correlation or other factors that may influence the measures of other variables of interest like the measures for information asymmetry and the cost of capital. The change in import tariff rate reductions is included as a dummy variable in the regression analysis.

To achieve the aforementioned goals, I have designed three regression models which are reported below.

Firstly, in order to identify the impact of competition on the cost of capital I estimate the equation 7:

$$WACC_{i,t} = \beta_0 + \beta_1 DOC_{k,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 NAF_{i,t} + \beta_5 ROA_{i,t} + \varepsilon_{i,t} \quad (7)$$

Where:

$WACC_{i,t}$ = Weighted Average Cost of Capital for firm *i* in year *t*.

$DOC_{k,t}$ = Dummy variable that equals *1* if the 3-digit SIC code classified industry *k* experienced an import tariff rate reduction in year *t*, and *0* otherwise.

$SIZE_{i,t}$ = The natural logarithm of Total Assets for the firm *i* in year *t*.

$LEV_{i,t}$ = Total Debt deflated by Total Assets for firm *i* at the end of fiscal year *t*.

$NAF_{i,t}$ = The Number of Analyst following the firm *i* in the year *t*.

$ROA_{i,t}$ = The Return on Assets for firm *i* in year *t*.

Secondly, the effect of competition on the information asymmetry is explained by the following equation:

$$IA_{i,t} = \beta_0 + \beta_1 DOC_{k,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 NAF_{i,t} + \beta_5 ROA_{i,t} + \varepsilon_{i,t} \quad (8)$$

Where:

$IA_{i,t}$ = The information asymmetry for firm *i* at year *t*.

$DOC_{k,t}$ = Dummy variable that equals *1* if the 3-digit SIC code classified industry *k* experienced an import tariff rate reduction in year *t*, and *0* otherwise.

$SIZE_{i,t}$ = The natural logarithm of Total Assets for firm *i* in year *t*.

$LEV_{i,t}$ = Total Debt deflated by Total Assets for firm *i* at the end of fiscal year *t*.

$NAF_{i,t}$ = The Number of Analyst following firm *i* in year *t*.

$ROA_{i,t}$ = The Return on Assets for firm *i* in year *t*.

The estimate for the effect of the information asymmetry on the cost of capital, when information asymmetry is determined by an increase in competition is defined by the following equation 9:

$$WACC_{i,t} = \beta_0 + \beta_1 DOC_{k,t} + \beta_2 IA_{i,t} + \beta_3 (DOC_{k,t} * IA_{i,t}) + \beta_4 SIZE_{i,t} + \beta_5 LEV_{i,t} + \beta_6 NAF_{i,t} + \beta_7 ROA_{i,t} + \varepsilon_{i,t} \quad (9)$$

Where:

$WACC_{i,t}$ = Weighted Average Cost of Capital for firm *i* in year *t*.

$IA_{i,t}$ = The information asymmetry for firm *i* at year *t*.

$DOC_{k,t}$ = Dummy variable that equals *1* if the 3-digit SIC code classified industry *k* experienced an import tariff rate reduction in year *t*, and *0* otherwise.

$SIZE_{i,t}$ = The natural logarithm of Total Assets for the firm *i* in year *t*.

$LEV_{i,t}$ = Total Debt deflated by Total Assets for firm *i* at the end of fiscal year *t*.

$NAF_{i,t}$ = The Number of Analyst following firm *i* in year *t*.

$ROA_{i,t}$ = The Return on Assets for firm *i* in year *t*.

4.4 Sample Selection and Data

The sample consists of companies that are listed in the United States of America for the periods between and including 2005 and 2015. From the sample were excluded firms that operate in the financial industry which were financial institutions, since they involve different accounting and reporting rules and operate within a special framework. In addition, utilities firms were also excluded, due to the heavy regulated corporate environment they operate in. The above two aforementioned industries were excluded from the final sample because these firms are non-comparable with other firms. I retrieved these data sets from COMPUSTAT and I/B/E/S databases.

Furthermore, for the calculation of the import tariff rate reduction I used data compiled from Schott's database[3] (Schott, 2008), providing the data for the duties collected by U.S. customs in addition to the free-on-board values of import.

The risk-free rate and the market return data are from the Prof K. R. French site[4].

After merging the data from all four databases and creating the variables discussed in my study, I eliminated the upper and lower 1% of the variables to control for outliers to mitigate any bias resulting from them. Outliers might affect the outcome of the study and hence, I excluded them. As discussed further in my thesis, normal distribution of the data is an important regression assumption and excluding outliers improves the distribution of the data. To further enhance the quality of my sample I kept only firms with at least 9 firm-years observations. The process of sample selection can be found in Table 1 attached to the Appendix 1.

[3] http://faculty.som.yale.edu/peterschott/sub_international.htm
[4] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/variable_definitions.html

5. Empirical Results and Analysis

5.1 Introduction

In this chapter of my study, I am illustrating the empirical results. In section 5.2 I exhibit the main regression assumptions related to the multivariate regression analyses that follows. To further define the aforementioned regression assumptions, these are, the normal distribution of standard errors, non-perfect multicollinearity, and homogeneity of variance. In order to scrutinize these assumptions, I am performing a series of tests and I am presenting the results in the respective tables. These tests and tables include descriptive statistics, Pearson and Spearman correlation matrix, variance inflation matrix, as well as Levene's test of homogeneity of variance. In the next section, 5.3 I present and comment on the results of my study and further link these results to prior literature.

5.2 Regression Assumptions

In order to perform the regression analysis, according to Fields et al. (2001) I have to test the statistical assumptions with respect to the sample used and the data population examined. The aforementioned implies that the data, should have no perfect multicollinearity, should be homoscedastic and finally should be free from outliers.

5.2.1 Descriptive Statistics

In Table 1: Process of Sample Selection

Data concerns US listed firms for the years 2005-2015.

Total firms' years from I/B/E/S for the years 2005 to 2015	(1)	44,773
Total firms' years from COMPUSTAT for the years 2005 to 2015	(2)	76,319
Merging (1) and (2) =	(3)	28,747
Removing based on industry	(4)	(6,106)
IA firm year from I/B/E/S for the years 2005 to 2015	(5)	46,661
(3)-(4) merging with (5)		
Removing outliers		(2,132)

Final sample for testing the Hypotheses	**19,223**

Table 2 incorporated in Appendix 1 of this study, I illustrate the descriptive statistics of the variables included in my study. These statistics refer namely to the number of observations, mean, standard deviation, minimum, 25th percentile, median, 75th percentile, maximum, skewness, and kurtosis. The sample comprised of 19.223 firm-year observation for the period between and including 2005 and 2015. The selection of this period is depended upon the data compiled for competition, as from Schott's database I can only export data up until 2015. Descriptive statistics are represented for seven out of the eight variables used in this research and this is because the measure for competition is not included since it a dummy variable.

Initially, concerning variable WACC that stands for the metric of the weighted average cost of capital I see that the mean is 8.48. This implies that for everyone dollar raised in capital either in the form of equity or debt, investors require in return on average 8.48 cents.

I observe that the mean of SIZE (7.08) is relatively high when compared to the maximum value (11.8). This indicates that within the sample examined there are relatively more, large firms. However, this is expected since more data is available for large firms compared to smaller ones.

Moreover, with respect to variable LEV that stands for the determination of firm's leverage, it can be observed that its mean of 0.50 is relatively low. The aforementioned implies that many out of the sample's firms have leverage of zero or close to zero, which means that their composition of capital has less debt.

Concerning variable NAF, which stands for the number of analysts following a firm, I calculated a mean of 11.19 that, in comparison to the maximum value for this measure that is 68.00 is relatively low. Yet, this great deviation between the mean and the max is well explained since not all firms attract the same amounts of analysts, meaning that some firms are of greater importance to the public and thus, there is more focus on their performance.

Additionally, with respect to the skewness of the data I see that variables WACC, IA, SIZE, LEV, and NAF have a positively skewed distribution, which means a positive asymmetry, where the mean is also higher than the median. Whereas, ROA follow a

negatively skewed distribution, which respectively indicates a negative asymmetry since, values for skewness are negative and the mean is lower than the median. To have a symmetrical distribution the values for skewness should be zero or close to zero. As far as it can be seen, all variables are skewed either positively or negatively. However, it is worth noting that variables WACC, IA, SIZE, and LEV tend to have skewness close to zero and thus are leaning to normal distribution whereas, variables ROA and NAF are highly skewed.

Furthermore, with regards to the kurtosis I observe that variables IA, SIZE and LEV tend to follow normal distributions as their kurtosis values are bellow three (<3). On the other hand, variables WACC, ROA, and NAF illustrate kurtosis values above three (>3) which indicates that are following a leptokurtic distribution. Leptokurtic distributions have two major characteristics. On the one hand, variables following a leptokurtic distribution are inclined to have less major fluctuations than either normal or platykurtic distributions. On the other hand, leptokurtic distributions produce less extreme outliers. Therefore, combining the aforementioned it can be noted that variables IA, SIZE and LEV tend to follow the normal distribution since their skewness values (0.36, 0.27 and 0.32 respectively) and kurtosis values (2.46, 2.61, and 2.89 respectively) are close to the thresholds of normal distribution that is, zero for skewness and three for kurtosis. In addition to the aforementioned, I should mention at this point that in order to have distributions closest to the normal, I calculated the natural logarithm of variables IA, SIZE and LEV.

5.2.2 Correlation Analysis

Variance inflation factor (VIF) is a useful measure of the degree of multicollinearity among predictors in a model. VIF gives us an indication of how much a variable is contributing to the standard error in the regression. By other means, VIF suggests how much the coefficient of each variable is inflated due to the collinearity that exists among the variables. Rule of thumb is that VIF exceeding four (4) warrants further investigation, while VIF exceeding ten (10) gives signs of serious multicollinearity requiring correction. Condition number (or condition indices) is as well a measure of the existence and scale of multicollinearity in a model. Condition number derived by the eigenvalues and the Eigen vector, which are part of the principal component analysis. Conventionally, condition number greater than 50 (30 for in a more conservative approach) indicates significant multicollinearity.

Table 3 attached into Appendix 1, exhibits the collinearity characteristics of the variables employed in this study. Variance inflation factors' values for all variables as well as the mean VIF are close to one (1), which indicates no correlation among variables and thus, the variance of the coefficients is not inflated. Furthermore, condition number is also significantly low (1,86), which also indicates that there is very low presence of multicollinearity.

Consecutively,

incorporated in Appendix 1, presents Pearson correlation matrix. In order to shape expectations with respect to the linear relation between the variables used in the regressions examined, I had to analyse the correlation coefficients and their significance levels. These coefficients indicate both the strength of the relationship as well as the direction.

Person correlation (PC) is presented in the lower-left part of Table 4. PC is a measure of the linear relation between two continuous variables. Linear relation exists when a change in one of the variables is linked to a proportional change in the other variable.

Firstly, it can be noticed through Table 4 that almost all correlation's coefficients are statistically significant. WACC and IA have a positive relation (0.04), which is in correspondence with our predictions in section 4.3. WACC is negatively related to the LEV (-0.32), as is well established through the literature that the cost of equity bared by the shareholders is greater than the cost of debt (which is represented by the leverage - LEV) which is bared by the debtholders, since the repayment of the debt is legally bonded, instead the dividends' payments.

In line with expectations, IA is negatively related to SIZE (-0.23), considering that bigger firms publicize more information and/or CEOs' guidance. Also, they are under more scrutiny from analysts and the public. Various studies have proved a positive relation between ROA and SIZE, suggesting that bigger firms tend to be more profitable, which can explain the negative relation between IA and ROA (-0.45) (similarly to SIZE). IA and NAF are related negatively (-0.23), which is obvious since the higher number of analysts following the firm, implies higher attention over the company's activities and prospective.

SIZE and NAF are strongly positively related (0.57), which is easily explained by the fact that bigger firms attract more attention from the analysts.

5.2.3 Homogeneity of Variances

One of the assumptions of the regression is the homogeneity of variances. This assumption can be tested by Levene's test of homogeneity of variance (W_0)[5], which shows whether there is homogeneity.

Brown and Forsythe[6] has proposed two other statistics that replace the mean in Leven's formula with alternative location estimators. The first alternative (W_{50}) replaces the mean with the median. The second alternative replaces the mean with the 10% trimmed mean (W_{10}) for involved group. These reformulations of Leven's test were demonstrated to be more robust than Levene's test when dealing with skewed populations.

In case the variance of each predictor is constant and Levene's test is insignificant (Levene's statistics have p-value>0.05) variance can be deemed equal and homoscedastic. As illustrated through Table 5 in Appendix 1, for LEV, IA, and ROA the *p*-values (at least for one of the tests) are greater than 0.05, thus it is assumed that there is homogeneity of variances. WACC and SIZE don't fulfill the criteria of the tests for homogeneity of variances, and therefore for these variables exists heterogeneity of variances. Both WACC and SIZE are related with other variables (ROA, LEV) and these interactions affect result in the existence of unobserved heterogeneity.

5.3 Regression Analysis

To test and examine the three hypotheses developed above, three regression analyses are deployed.

The results of the multivariate analyses that test the aforementioned hypotheses in section 3, are reported in Table 5, Table 6 and Table 7 which can be found in Appendix 1. More specifically, Table 5 presents the regression results for Equation 7, where the effect of an increase in the industry competition, measured through import

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5 Levene, Howard (1960). *"Robust tests for equality of variances"*. In Ingram Olkin; Harold Hotelling; et al. *Contributions to Probability and Statistics: Essays in Honour of Harold Hotelling. Stanford University Press. pp. 278–292.*

6 Brown, M., & Forsythe, A. (1974). Robust Tests for the Equality of Variances. *Journal of the American Statistical Association,69*(346), 364-367.

tariff rate reductions, over the weighted average cost of capital is examined. Furthermore, Table 6 presents the regression results of Equation 8, where the dependent variable captures the level of information asymmetry measured using the standard deviation of analysts' earnings per share forecasts. Finally, Table 8 presents the regression results of Equation 9, where the effect of both an increase in competition and information asymmetry are considered over the weighted average cost of capital.

The aforementioned regressions of the respective equations developed, together provide evidence with respect to the hypothesized associations more extensively discussed in Section 3 of this study. Thus, furtherly I discuss each of the regressions' results both separately and combinedly in overall.

To begin with, in order to provide an answer to the first hypothesis, I deploy the regression of equation 7, where I examine what effect an increase in competition in an industry can have on the weighted average cost of capital of firms that operate within this industry. Results regarding the first hypothesis illustrated in Table 6 in Appendix 1. The R-squared of the model is 0.538 indicating that 53.8% of the variation in WACC is captured. Therefore, the explanatory power of the first regression model is deemed to be significant. However, results deriving from this regression model, show no statistical significance for the coefficient of variable DOC. The aforementioned result nevertheless, tests solely the impact of an increase in competition on the weighted average cost of capital. Thereafter, no conclusions can be extracted with respect to the direction of the relation between an increase in competition and the weighted average cost of capital. Consequently, the first hypothesis is rejected when tested within the context of variables incorporated in this regression model. Control variables in this model show statistically significant correlation with variable WACC. The coefficients for variables SIZE and NAF show a positive correlation with WACC, whereas the coefficients for variables LEV and ROA indicate a negative and statistically significant correlation with WACC.

The purpose of the second regression model is twofold. First of all, serves to identify whether the two variables are statistically significantly correlated, and secondly to identify the direction of the relation in case of existence of statistical correlation between an increase in competition captured through import tariff rates reductions and information asymmetry. The aforementioned, will be needed in deriving more details regarding the validity of the interaction term that is tested in the third

regression model, which is tested in the second part of the second hypothesis. The results of the second regression are presented in Table 7 attached in Appendix 1. The R-squared of this regression model is 0.12 indicating that 12% of the variation in information asymmetry is explained by this regression model. Therefore, due to the relatively low explanatory power of this regression model, respective results should be interpreted with some caution.

The results of this study insist that there is no statistically significant correlation between the increase in competition as expressed through the import tariff rate reductions, and information asymmetry captured through the dispersion among analysts about a consensus estimate of the forecasts. Put differently, information asymmetry in the context measured and through the regression model examined shows no direct association with import tariff rate reductions which are also used as indicators of an increase in product market competition. Therefore, based on this regression model no conclusions can be derived with respect to the direction of the relation between the variables of interest. From the control variables incorporated in this regression model, SIZE, ROA and NAF show a negative and statistically significant at the 1% significance level correlation with information asymmetry. Lastly, in terms of variable LEV and its correlation with variable IA, no conclusions can be derived since there is no statistical significance. Thus, within the framework covered by this regression model the first part of the second hypothesis (H2a) is rejected since no correlation between the two variables is identified.

To the extent of providing an answer in the second hypothesis of my study, I deploy the regression of variables included in equation 9. Respectively, results for this regression model are presented in Table 8 included in Appendix 1 of this research study. The second hypothesis examines whether the combined effect of an increase in competition and information asymmetry have a negative effect in the weighted average cost of capital. The R-squared of this regression model is 0.6746 indicating that 67.46% of the variance in weighted average cost of capital is captured by the model, which indicates that the explanatory power of the regression model is at safeguarded levels.

From the results can be extracted that the coefficient of DOC in this regression model is negative and statistically significant at the 10% significance level. Put differently, in situations when companies are in an advantageous position from a business

perspective due to reduction in tariff rates, more opportunities in the industry occur leading to an increase in competition within the market, which on average reduces the weighted average cost of capital because the trading barriers are lower and the ground for new investments is more fertile. In addition, this result indicates that an increase in competition among industries, on average, decreases the weighted average cost of capital, in comparison with cases that there is a decrease of competition (i.e. increase in import tariff rate) or in cases when the decrease in the import tariff rates is lower than the one captured by variable DOC, and at the same time information asymmetry in not examined. This finding is in line with Valta (2012), who suggests that the competitive environment of firms needs to be considered when assessing the cost of debt financing. However, Valta (2012) in his research suggests that the more competitive the environment that a firm operates in is the higher the cost of debt financing. This finding, could also suggest that since the import tariff rates reduce the companies that already operate within the market also take advantage of the lower import tariffs. Therefore, reductions in import tariff rates will increase growth rates in trade and investments which in extend will reduce the weighted average cost of capital of the firm. This finding suggests that when information asymmetry is considered in the equation, an increase in competition standalone has a negative effect on the weighted average cost of capital which thereafter confirms the first hypothesis.

The coefficient of IA is positive ($\beta_2 = 0.24$) and statistically significant at the 1% significance level. This result indicates that the more information asymmetry exists among participants in the market, the higher the weighted average cost of capital of the providers of such information, in comparison with situations where no or very limited disagreement between these stakeholders exist and when reductions in import rate tariffs and therefore increase in competition is not considered. This finding is in line with the research of Leuz & Verrecchia's (2007), were they outline that information asymmetry is costly since it is introducing adverse selection criteria over the exchange of a firms shares. In addition, this finding confirms the intuition that derives from the research paper of Lambert et. al. (2007), which suggests that the better the information quality among participants in a market, the lower the risk premium investors will demand in return to their investments. Moreover, this finding is in line with the findings of the research studies conducted by Easley & O'Hara (2004) and Hughes, Liu & Liu (2007) who also find a positive relation between the information asymmetry and the cost of capital. As an extend to the aforementioned it can be said

that information asymmetry drives in misallocation of investments which thereafter is translated in the firms cost of capital.

The coefficient of the interaction variable of DOC and IA is negative (β_3 = -0.15) and statistically significant at the 10% significance level. This means that on average the weighted average cost of capital decreases when information asymmetry among market participants exists and when there is an increase in competition in comparison with situations with no indications of information asymmetry and decrease or not significant increase in competition. This finding indicates that the force that drives the direction of the relation is the reduction in import tariff rates, rather than information asymmetry. More specifically, the effect of the exogenous shock measured by a significant reduction at the import tariff rates determines the correlation with the weighted average cost of capital. This means that even in the event of high information asymmetry among participants in a market, when import tariff rates decrease, which implies an increase in product market competition, the latter determines the influence in the weighted average cost of capital. This finding is in line with the findings in the study conducted from (Armstrong, Core, Taylor & Verrecchia, 2011). More specifically they state that "when markets are characterized by perfect competition, information asymmetry has no separate effect on the cost of capital". Therefore, based on the findings and in line with prior literature, the assumption formed within the context of second part of the second hypothesis (H2b) can be accepted.

Furthermore, from the results I see that the coefficient of variable SIZE is positive (β_4 = 0.15) and statistically significant at the 1% significance level. The observed positive correlation with WACC for variable SIZE that captures size of the company and is reflected as the natural logarithm of total assets, is in line with expectations. The larger a company is in terms of total assets, the costlier it is to fund its operations and therefore, the higher the need for extra capital either in the form of equity or debt. In addition, I find that the coefficient of variable LEV is negative (β_5 = -13.70) and statistically significant at the 1% significance level. With respect to variable LEV, which is determined by the ratio of total debt to total assets, the strong negative association found with WACC can be explained from the fact that financial leverage is one of main methods used by investors to increase the yield on their invested capital and therefore, ultimately decreases the cost of capital. Moreover, with respect to variable ROA which represents the return on assets, the negative (β_6 = -1.16) and statistically significant

correlation with WACC at the 1% significance level, can be explained from the fact that, the more efficiently a firm uses its assets to generate revenue, the less need will be for equity capital injections or extra debt borrowings. Finally, i find that the coefficient of variable NAF is positive (β_7 = 0.03) and statistically significant at the 1% significance level indicating a positive correlation with WACC. This is in line with prior literature, that suggests that the number of analysts following a firm can have an impact on WACC. Chung, McInnis, Wood & Wyhowski (1995), suggest that the number of analysts following a firm can have impact on the precision of estimates components in the cost of capital calculation and determination.

5.4 Summary of Empirical Results and Analysis

Within the context of this chapter, the empirical part of the study was presented and analysed. As a starting point, the descriptive statistics of the variables incorporated in this study are presented and discussed. This allows to form a preliminary view on the sample set and how this can impact the results of the regression analyses that follow. In addition, the collinearity characteristics of the variables are tested through identifying the variance inflation factor of the variables. Moreover, Pearson correlation matrix is presented, where the linear relation between the continuous variables of the study is measured. Lastly, tests for the homogeneity of variances of the variables is tested.

In overall, the findings of this research study propose that both competition and information asymmetry are very important variable when considering their effect on the weighted average cost of capital. More specific it is identified that when only the increase in competition is considered in the regression model, no effect on the weighted average cost of capital can be confirmed through the first regression model and therefore, the first hypothesis developed is rejected when tested within the context of the variables incorporated in this model. However, what is observed is that when both competition and information asymmetry are considered in the same model is twofold. The first finding is that there is negative statistically significant correlation between the increase in competition identified through import tariff rate reductions stand alone and the weighted average cost of capital. Thus, within the context of the third model developed where the information asymmetry is considered as a factor, the first hypothesis developed can be accepted. Secondly, when the increase in competition is examined in conjunction with information asymmetry by testing the interaction

term of the two variables, a negative and statistically significant correlation is observed. Findings concerning the interaction term between an increase in competition and information asymmetry, in line with prior literature, suggest that when product market competition increases there is no separate effect of information asymmetry on the weighted average cost of capital. The later finding with respect to the interaction term is in line with the findings in the study conducted from (Armstrong, Core, Taylor & Verrecchia, 2011). More specifically they state that "when markets are characterized by perfect competition, information asymmetry has no separate effect on the cost of capital". Therefore, based on the findings and in line with prior literature, I accept the second part of the second hypothesis. On top of these results suggest that in line with prior literature information asymmetry is costly to the firm. Last but not least, no statistically significant correlation was found between information asymmetry and the increase in competition. Thereafter, the first part of the second hypothesis (H2a) is rejected when tested within the context of the second regression model developed.

5.5 Summary

To summarize, results based on the results described in the previous sections of this chapter propose that both the first hypothesis (H1), as well as the second part of the second hypothesis (H2b) are confirmed in this study. Therefore, the answer to the research question is that both an increase in competition as well as information asymmetry can have a major impact on the weighted average cost of capital of a firm. However, it should be outlined that the aforementioned relations are identified and confirmed when both competition as well as information asymmetry are considered in the same model.

6. Conclusion

6.1 Conclusions

Within the framework provided by the agency theory as well as corporate finance theory, first of all in this study I focus on describing the association between an increase in product market competition and the weighted average cost of capital. The motivation behind this investigation is to provide answer and evidence on whether a significant increase in product market competition, measured through reductions in the import tariff rates can have a direct effect for firms weighted average cost of capital. Put differently, I test whether an exogenous macroeconomic shock like reduction in import tariff rates can have a direct impact on the cost that companies face to raise capital either in the form of equity or that of debt to finance their assets. Results suggesting that only when information asymmetry is included in the same regression model with the increases in competition, the later one has a significant effect on the weighted average cost of capital in line with findings from regressions of equations 7 and 9. More specifically, I identify that there is a negative relation between the import tariff rate reductions and the weighted average cost of capital. This is showing that companies can take advantage of import tariff rates decreases due to the fact that they can import at lower cost. Secondly, I investigate whether an increase in competition has an effect in the information asymmetry. Here results suggest that there is no significant correlation between the two variables. Lastly, I test whether both the separate as well as the combined effect of information asymmetry and increase of competition has an effect in the cost of capital. When examining separately the correlation between information asymmetry and the weighted average cost of capital, I see that there is a positive relationship between the coefficients of the two variables. This finding is in line with prior literature suggesting that when information asymmetry is increasing, the cost of financing for a firm also increases. In terms of the combined effect of an increase in competition and information asymmetry, I identify that there is a negative relation between the coefficient of the interaction term and the weighted average cost of capital. This finding suggest that the direction of the relation is driven mainly by the import tariff rate reductions rather than from information asymmetry. This finding is in line with the study conducted by Armstrong, Core, Taylor & Verrecchia (2011), that suggest that when markets are characterized by perfect competition, information asymmetry has no separate effect on the cost of capital.

6.2 Limitations, Contribution, and Suggestion for Future Research

To begin with, one of the main limitations that can be identified in this study is inherent to the sample. The framework that I examine is limited to the setting in the United States due to the availability of data for all the variables incorporated. As mentioned above, in this study I deploy the effect of an exogenous shock, that is, an increase in product market competition captured through identification of significant import tariff rate reductions in the respective market. One thing that needs to be consider is that import tariff rates are driven by governments and therefore, this implies the fact that the effect on the weighted average cost of capital identified can also be driven by other political decisions next to the reduction of tariffs. However, in this study I assume that all other macroeconomic effects deriving from the strategy of politics are excluded. In addition, import tariff rate reductions that are used as proxy for an increase in competition can also have an effect in domestic companies that also have limited barriers to import products in lower cost. Therefore, the results discussed earlier only focus on the one side of the coin without capturing the effect of significant increases in the import tariff rates and their effect on the weighted average cost of capital.

Moreover, with respect to the dispersion of analysts' forecasts scaled by the absolute actual earnings per share, which is operationalized in this study as a proxy to capture information asymmetry, is often under criticism in literature due to the fact that forecast errors are typically biased. Therefore, a very important assumption that should be considered when using this metric and also applies in this study, is that analysts produce unbiased information which then investors can value accurately. Another important dimension that should be considered when using the aforementioned metric for information asymmetry is that forecast errors might capture the riskiness of a company due to the volatility of earnings and not due to higher levels of asymmetric information.

All in all, this research thesis provide evidence that there are multiple factors that can influence a firm's cost of capital. Two of these factors are competition and information asymmetry. Therefore, it contributes in the overall theory developed around the cost of capital. However, there is always space for further research. One of

the elements that could be further analysed is the analysis to be performed on an industry specific context. Furthermore, another suggestion for further research could be to apply the above setting in market different than the United States in order to confirm its application in different economic environments with different accounting standards and trade regulations.

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Appendix 1

Table 1: Process of Sample Selection

Data concerns US listed firms for the years 2005-2015.

Total firms' years from I/B/E/S for the years 2005 to 2015	(1)	44,773
Total firms' years from COMPUSTAT for the years 2005 to 2015	(2)	76,319
Merging (1) and (2) =	(3)	28,747
Removing based on industry	(4)	(6,106)
IA firm year from I/B/E/S for the years 2005 to 2015	(5)	46,661
(3)-(4) merging with (5)		
Removing outliers		(2,132)
Final sample for testing the Hypotheses		**19,223**

Table 2: *Descriptive statistics*

This table reports the descriptive statistics of the main variables used in my analysis. Data concern US listed firms for the years 2005-2015, for firms with available data for at least 9 firm years, after the elimination of the 1st and the 99th percentile, and of financial and utilities firms. Specifically, the mean, standard deviation, minimum, 25th percentile, median, 75th percentile, maximum, skewness, and kurtosis are given. Variables definition: WACC is the weighted average cost of capital of the firm in year t, SIZE is the logarithm of total assets at the end of the fiscal year t, LEV is the sum of long-term debt and notes payable deflated by total assets at the end of the fiscal year t, NAF is the number of the analysts following the firm at year t, IA is the information asymmetry for the year t equals the standard deviation of all analysts' earnings per share for the firm in the year t deflated by the actual earnings per share for the firm i in the year t.

	Obs	Mean	SD	Min	25%	Median	75%	Max	Skew	Kurt.
WACC	19,223	8.48	10.38	0,01	1.88	5.80	13.04	38.81	1.17	3.80
IA	19,223	-2.66	1.48	-5.57	-3.80	-2.79	-1.66	1.35	0.36	2.46
SIZE	19,223	7.08	1.71	3.20	5.82	7.00	8.22	11.80	0.27	2.61
LEV	19,223	0.50	0.22	0.07	0.34	0.50	0.64	1.27	0.32	2.89
ROA	19,223	0.02	0.13	-0.70	0.00	0.05	0.08	0.27	-2.35	10.36
NAF	19,223	11.19	8.58	1.00	5.00	9.00	15.00	68.00	1.41	5.22

Table 3: *Collinearity Diagnostics*

Variance inflation factor (VIF) is a measure of the degree of multicollinearity among predictors in the model. Condition number is, as well, an indicator of multicollinearity.

WACC	:	1.14
IA	:	1.12
SIZE	:	1.37
LEV	:	1.28
ROA	:	1.22
Mean VIF	:	1.27
Condition Number	:	1.86

Table 4: *Correlation matrix*

The table shows the correlation among the key used in the empirical analyses. Pearson correlations are found below the diagonal. Data concerns US listed firms for the years 2005-2015, for firms with available data for at least 9 firm years, after the elimination of the 1st and the 99th percentile, and of financial and utilities firms.

	WACC	IA	SIZE	LEV	ROA	NAF
WACC	1					
IA	0.04 ***	1				
SIZE	-0.08 ***	-0.23 ***	1			
LEV	-0.32 ***	-0.03 ***	0.41 ***	1		
ROA	0.04 ***	-0.45 ***	0.22 ***	-0.15 ***	1	
NAF	0.00 ***	-0.23 ***	0.57 ***	0.12 ***	0.18 ***	1

Table 5: *Variance-comparison tests*

The table presents different variance-comparison tests. Specifically, the W_0 Leven's test statistic, based on the mean of X in the i^{th} group. The W_{50} and W_{10} statistics proposed by the Brown and Forsythe, where the mean is being replaced by the median and the 10% trimmed mean respectively. The analysis is based in two groups, with 1, 19,221 degrees of freedom (df).

		Test's statistic	df1	df2[7]	P-value
WACC	W_0	38.43	1	19,221	0.00
	W_{50}	29.37	1	19,221	0.01
	W_{10}	37.12	1	19,221	0.00
SIZE	W_0	24.91	1	19,221	0.00
	W_{50}	23.58	1	19,221	0.00
	W_{10}	23.97	1	19,221	0.00
LEV	W_0	1.59	1	19,221	0.21
	W_{50}	1.60	1	19,221	0.21
	W_{10}	1.59	1	19,221	0.21
IA	W_0	0.74	1	19,221	0.39
	W_{50}	0.73	1	19,221	0.39
	W_{10}	0.75	1	19,221	0.38
ROA	W_0	16.76	1	19,221	0.01
	W_{50}	8.39	1	19,221	0.05
	W_{10}	9.22	1	19,221	0.06

[7] df_2= no. of observations – no. of groups

Table 6: *Regression results for Eq. 7*

In order to identify the impact of competition on the cost of capital, I formulate the following equation:

$$WACC_{i,t} = \beta_0 + \beta_1 DOC_{k,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 NAF_{i,t} + \beta_5 ROA_{i,t} + \varepsilon_{i,t} \quad (7)$$

The table reports the results of the regression for the aforementioned model. Data concerns US listed firms for the years 2005-2015, for firms with available data for at least 9 firm years, after the elimination of the 1st and the 99th percentile, and of financial and utilities firms. Variables definition: WACC is the weighted average cost of capital of the firm; DOC is a dummy variable that equals 1 if the firms belongs to an industry (in a 3-digit SIC code level) experiencing an import tariff rate reduction for a specific year, and 0 otherwise; SIZE is the logarithm of total assets at the end of the fiscal year; LEV is the sum of long-term debt and notes payable deflated by total assets at the end of the fiscal year; ROA is the return on assets for the firm; NAF is the number of the analysts following the firm.

	Coefficient		t-stat
Intercept	8.90		(46.09)
	(0.000)	***	
DOC	-0.15		(-1.98)
	(0.24)		
SIZE	0.14		(3.23)
	(0.00)	***	
LEV	-13.17		(-46.29)
	(0.00)	***	
ROA	-1.69		(-3.58)
	(0.00)	***	
NAF	0.01		(1.63)
	(0.10)	*	

Number of Obs	:	19,223
R-squared	:	0.538
F-Statistic	:	(0.000)***
Year FE	:	Yes

*** Significant at the 0.01 level; ** at the 0.05 level; * at the 0.10 level. Significance levels are based on two-tailed test.

Table 7: *Regression results for Eq. 8*

I use the following equation to explain the effect of competition on the information asymmetry:

$$IA_{i,t} = \beta_0 + \beta_1 DOC_{k,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 NAF_{i,t} + \beta_6 ROA_{i,t} + \varepsilon_{i,t} \quad (8)$$

The table reports the results of the regression for the aforementioned model. Data concerns US listed firms for the years 2005-2015, for firms with available data for at least 9 firm years, after the elimination of the 1st and the 99th percentile, and of financial and utilities firms. Variables definition: IA is the information asymmetry for the firm; DOC is a dummy variable that equals 1 if the firms belongs to an industry (in a 3-digit SIC code level) experiencing an import tariff rate reduction for a specific year, and 0 otherwise; SIZE is the logarithm of total assets at the end of the fiscal year; LEV is the sum of long-term debt and notes payable deflated by total assets at the end of the fiscal year; NAF is the number of the analysts following the firm; and ROA is the return on assets for the firm.

	Coefficient		t-stat
Intercept	-2.05		(-36.48)
	(0.00)	***	
DOC	-0.05		(-1.41)
	(0.15)		
SIZE	-0.08		(-9.79)
	(0.00)	***	
LEV	-0.05		(-0.27)
	(0.34)		
ROA	-2.59		(-30.70)
	(0.00)	***	
NAF	-0.02		(-13.35)
	(0.00)	***	

Number of Obs	:	19,223
R-squared	:	12.00%
F-Statistic	:	(0.000)***
Year FE	:	Yes

*** Significant at the 0.01 level; ** at the 0.05 level; * at the 0.10 level. Significance levels are based on two-tailed test.

Table 8: *Regression results for Eq. 9*

To estimate the effect of the information asymmetry on the cost of capital, when information asymmetry is determined by an increase in competition, I use the following equation:

$$WACC_{i,t} = \beta_0 + \beta_1 DOC_{k,t} + \beta_2 IA_{i,t} + \beta_3 (DOC_{k,t} * IA_{i,t}) + \beta_4 SIZE_{i,t} + \beta_5 LEV_{i,t} + \beta_6 ROA_{i,t} + \beta_7 NAF_{i,t} + \varepsilon_{i,t} \quad (9)$$

The table reports the results of the regression for the aforementioned model. Data concerns US listed firms for the years 2005-2015, for firms with available data for at least 9 firm years, after the elimination of the 1st and the 99th percentile, and of financial and utilities firms. Variables definition: WACC is the weighted average cost of capital of the firm; DOC is a dummy variable that equals 1 if the firms belongs to an industry (in a 3-digit SIC code level) experiencing an import tariff rate reduction for a specific year, and 0 otherwise; IA is the information asymmetry for the firm; DOC#IA is an interaction term between the DOC and the IA; SIZE is the logarithm of total assets at the end of the fiscal year; LEV is the sum of long-term debt and notes payable deflated by total assets at the end of the fiscal year; NAF is the number of the analysts following the firm; and ROA is the return on assets for the firm.

	Coefficient		t-stat
Intercept	9.42		(46.97)
	(0.00)	***	
DOC	-0.31		(-1.25)
	(0.09)	*	
IA	0.24		(9.45)
	(0.00)	***	
DOC#IA	-0.15		(-1.86)
	(0.06)	*	
SIZE	0.15		(5.58)
	(0.00)	***	
LEV	-13.70		(-79.15)
	(0.00)	***	
ROA	-1.16		(-3.93)
	(0.00)	***	
NAF	0.03		(5.48)
	(0.00)	***	

Number of Obs	:	19,223
R-squared	:	67.46%
F-Statistic	:	(0.000)***
Year FE	:	Yes

*** Significant at the 0.01 level; ** at the 0.05 level; * at the 0.10 level. Significance levels are based on two-tailed test.

Appendix 2

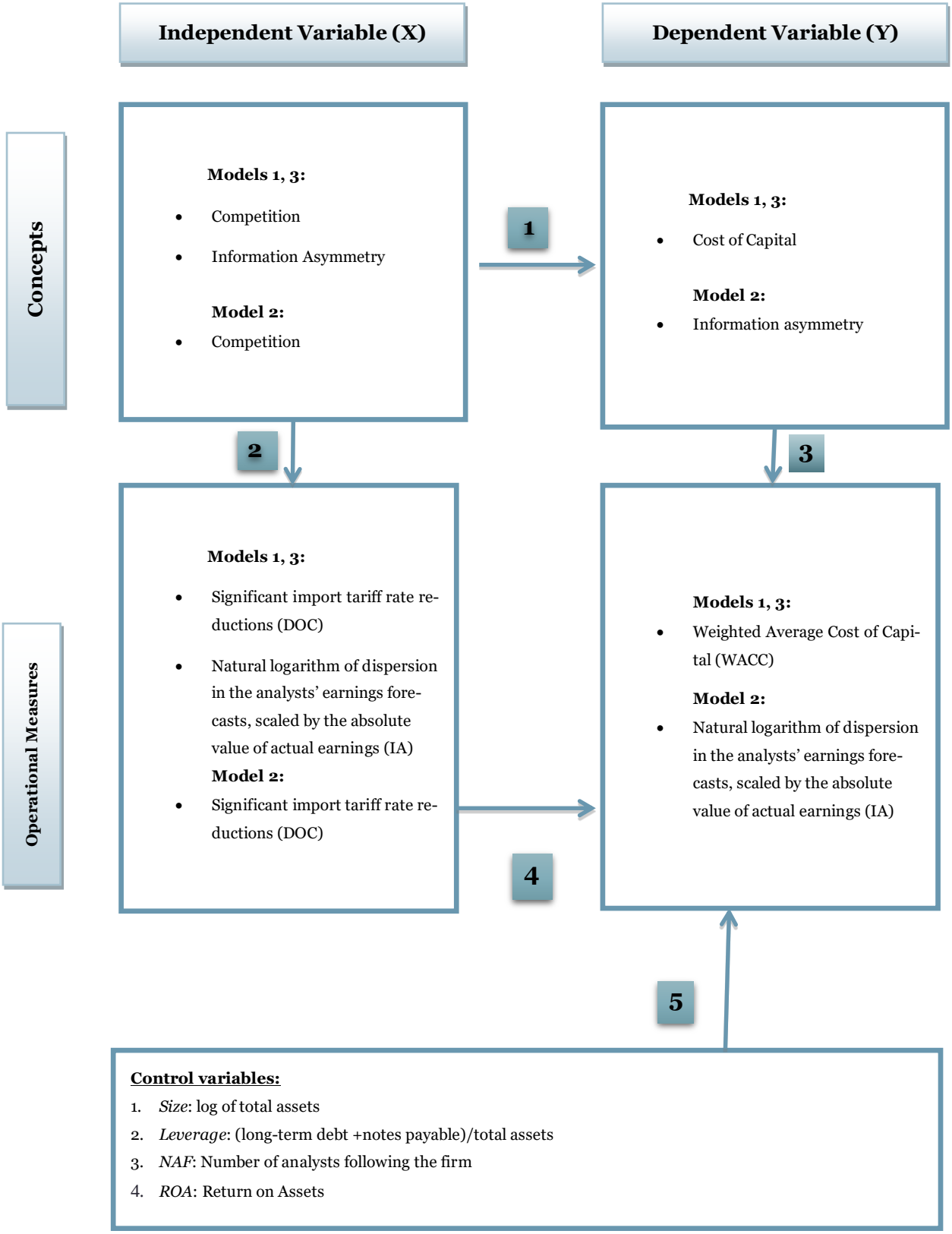

Figure 1: *Libby boxes for the research*

Figure 2: *Distribution of import tariff rate reductions per industry through time.*

The figure depicts the number of industries, at the SIC-3 level classification, which experienced an import tariff rate reduction for the sample period, 2005-2015. Tariff rates are calculated using compiled data by the U.S. Customs. A tariff rate reduction per year per industry is counted when, it is as large as, or larger than, three times the median of the respective industry (considering possible transitory changes).