Is innovativeness an additional determinant for dividend payout?

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This paper investigates the determinants of dividend payout for U.S. and German firms, with special attention to innovativeness. Therefore a regression analysis is made including R&D-revenue ratio, firm size, profitability, growth opportunities and debt-to-equity ratio. Furthermore, a comparison of the regression coefficients for innovativeness was made to investigate, if there is a difference between both countries. After running the regression analysis based on the gathered data, the results show a partially significant negative impact of innovativeness on dividend payout for U.S. firms in the years 2008 and 2010, whereby no significant relationship for the total time span was found, using pooled data. The difference between the regression coefficients for both countries for the total time span is not significant, whereby for the years 2008 and 2010 a significant difference was found. In general all variables only show significant results for one part of the sample and therefore only partially confirm previous studies.

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1. INTRODUCTION

"Today´s business environment, perhaps more than at any other time in modern history, demands a continuous search for new sources of competitive advantage" (Trent & Monczka, 2003). Based on the increased competitive pressure and the need to perform better than the competitors, the exploration of advantages became more important in recent years. One source of competitive advantage can be the innovativeness of a company, which is based on the extent of R&D-expenditure. Due to the perpetual need to launch new products based on the shortened time-to-market span (Fisher, 1997), the expertise and value status of the R&D-department can be essential for success. Managers have to accurately assess the current situation of the company and decide to what extent organizational and financial resources should be allocated to this department.

According to Lahiri and Chakraborty (2014) there is a trade-off between dividend payments and R&D expenditure based on short-termism. Short-termism describes the concentration on short-term projects to make immediate profit rather than focusing on long-term success. A manager has to decide whether it is more beneficial to invest the financial resources of the company in different business sections in order to increase the company value and as a consequence thereof the share price. The other option is to pay dividends annually and share the profit of the company with its shareholders resting upon the provision of financial resources.

Although many researchers discussed the term innovation and innovativeness, no clear definition and classification has been made. (Garcia et al., 2002). Thus, an innovation can be divided into radical, incremental, discontinuous or imitative innovations, but also as modular, improving and evolutionary innovations. Therefore, it is challenging to declare one innovation clearly. Furthermore, academics made a distinction between product innovativeness and firm innovativeness. Since this paper focuses on the firm´s dividend policy and innovativeness, the firm innovativeness should be explained in more detail. A firm's innovativeness can be defined as "the propensity for a firm to innovate or develop new products" (Garcia et al., 2002).

Before reviewing current literature a short introduction to dividend policy will be made, to facilitate a better insight into the topic. Dividend policy has been discussed for many years by various researchers (Rafique (2012); Gill et al (2010)), but so far, no universal theory or solution has been found (Rehman & Takumi, 2012). However, several different determinants have been identified to influence the dividend policy. Fama & French (2001) and Denis & Osobov (2008) revealed, that profitability, size and growth opportunities affect the propensity to pay dividends. Furthermore, Rafique (2012) confirms the correlation between firm size and dividend payout and add the corporate tax as another determinant of dividend payout. This paper aims to investigate another potential determinant of dividend payout, which will be the innovativeness of a firm, as the R&D expenditure, which was identified to be sufficient as a measurement by Rubera & Kirca (2012).

However, according to the other mentioned papers (Fama & French (2001), Rafique (2012), Lahiri & Chakraborty (2014), which uses ratios to measure their variables, the R&D expenditure will be measured as the ratio between R&D expenses and total revenue. Other papers like the one of Fama & French (2001) or Gugler (2003) investigated growth opportunities, which included R&D, but did not focus on it exclusively. Lahiri & Chakraborty (2014) investigated determinants of dividend payout and compared R&D firms with non R&D firms, with the results that there is a positive association between dividend payout and non-R&D firms. Furthermore, Jensen and Johnson (1995) indicate that R&D expenses increase significantly prior to decreases or complete cuts in dividend payout.

The main question to be answered in the following paper will be:

Is innovativeness an additional determinant for dividend payout?

Furthermore, differences between German and U.S. firm will be discussed. These differences form the basis for the second hypothesis, which investigates, if there is a difference of the influence of innovativeness on dividend payout for German and U.S. firms.

The paper will be structured as follows: In section 2 the theoretical framework will be elaborated based on reviewing relevant literature. This section aims to provide background information about general dividend policy relevance theories, determinants for dividend payout and following the differences between firms originated in Germany and the U.S. Moreover, two hypotheses will be presented. In section 3 the methodology will be discussed including the formulation of a model, the description of variables and the data selection. Afterwards the results will be presented, starting with the descriptive statistics and following the multivariate regression analysis and the z-test. Consequently, the conclusion will be made with additional limitations and further research suggestions.

2. THEORETICAL FRAMEWORK

In the following section the theoretical background will be provided, which leads to the constitution of hypotheses. The structure will be as follows: First, the general relevance of dividend policy will be discussed. Afterwards, current literature regarding determinants of dividend payout will be analyzed. Following the differences between German and U.S. firms will be exhibited. Lastly, the hypotheses will be presented.

2.1 Relevance of dividend policy

Before starting with the determinants of dividend policy, a short insight to dividend policy will be provided. As this paper, the researchers first focused on the relevance of dividend policy and afterwards investigated the different determinants of dividend payout based on the provided theory. The explicit reason why some firms pay dividends, while others don´t is an essential subject in today´s dividend literature. One of the first teams to investigate this topic are Miller and Modigliani (1961), who found the irrelevance of dividend policy under a certain set of underlying assumptions. These assumptions require a perfect market, with (1) perfect capital markets, (2) rational behavior and (3) perfect certainty. Miller and Modigliani (1961) conclude that the dividend payout policy does not influence the current share price, since the share price decreased with the same amount of the dividend payout per share. Therefore, there is no difference for shareholders, whether to get paid dividends or not.

However, there were other studies conducted, which argues the irrelevance theorem of Miller and Modigliani (1961). Basically, these studies weaken the assumptions, which were made by MM in order to make it more feasible for the real world. For instance, Walter (1963) investigated the effect of dividend payout on share price as well, but state that in the real world there are imperfections, which should lead to differences in the share prices. Furthermore, DeAngelo and DeAngelo (2006)

state, that if not 100% of free cash flow is distributed to shareholders and retention is a possibility, dividend payout policy does matter. Additionally, Brennan (1971) argue, that actual markets suffer from imperfections, like transaction costs and different tax rates for income and capital gains.

Comprising the current literature on the relevance of dividend payout policy, if there is a perfect market the dividend policy does not affect the share price and is in this respect, irrelevant. However, due to market imperfections, dividend policy does matter, as confirmed by other researchers. Based on this, the results of the paper can contribute to the investigation of dividend policy, which still is a puzzle nowadays .

2.2 Dividend payout and its determinants

While some researchers investigated the relevance of dividend payout policy, others try to identify potential determinants for dividend payouts. The following section will provide the background information and results of other studies. However, the following papers did not only focus on R&D-expenses and dividend payout exclusively, whereby some also include growth opportunities. The first paper to be mentioned is the study of Black (1976) who starts with the already discussed irrelevance theorem. He identified several different factors, which affect the dividend policy significantly like capital structure, taxes, transaction costs, information for shareholders and the demand of investors. However, he failed to find a definite answer to the question why firms pay dividends.

Denis and Osobov (2008) investigate the propensity to pay dividends in the US, Canada, Germany, France and Japan. In their study they identified several different determinants, namely firm size, growth opportunities, profitability and the ratio of retained earnings to total equity (earned/contributed capital mix). Furthermore, they found evidence supporting signaling and clientele theory, which was also confirmed by Black (1976). However, Denis and Osobov (2008) do not include R&D-expenses in their variable growth opportunities. Their variable is measured as the ratio of the market value to the book value of total assets.

Gill et al. (2010) investigate determinants for dividend policy for U.S. firms in the manufacturing and service industry and found two different functions for both industries. For their complete sample they identified profit margin, sales growth, debt-to equity ratio and taxes as drivers for dividend payout. Therefore, they confirm Denis and Osobov (2008) and Black (1976) findings partially and extended them. Whereby Rafique (2012) examined the Pakistani market, she confirms the significance of firm size and corporate tax, but other possible determinants like growth, profitability, earnings and financial leverage don´t have a significant influence on dividend payout. Therefore, the significance of determinants can vary across countries and don´t have to be universal worldwide.

Fama and French (2001), who investigate the development of dividend payouts, claim that non-dividend paying firms generally invest at a higher rate and do more R&D. Therefore they indicate a negative relation between R&D-expenses and dividend payout, without an explicit statistical test. Their main conclusion is that there is a generally lower propensity to pay dividends regardless of their characteristics.

Moreover, Lahiri & Chakraborty (2014) also found that R&D-intensive firms pay fewer dividends than firms which are not strongly involved with R&D. R&D-intensive firms exhibit a lower leverage level, based on the agency theory. Therefore the R&D-expenditure is based on the free cash flow of a firm, which leads to a decrease in dividends. Furthermore, they also suggest the information asymmetry theory, because managers tend to pay fewer dividends and distribute the earnings to the R&D-department. Therefore no information about their R&D-intensity is revealed or at least only lagged information will be provided They base their findings on agency theory and information asymmetry.

Gugler (2003) investigated the interrelation between ownership structure and dividends with regards to firms with or without growth opportunities. He claims that firms with low growth opportunities “disgorge cash irrespective of who controls the firm”, which also suggest a negative relationship between both variables. Gugler (2003) measures the growth opportunities as the expected marginal returns of R&D and added the expected marginal return of capital investment as well.

2.3 Differences between German and U.S. firms

In this section some of the differences between German and U.S. firms will be presented, whereby this part only show a few examples. Of course there are more differences, which can affect the following hypothesis in part 2.4. Firms from Germany and the U.S. differ in various financial characteristics. Folkinshteyn et al. (2014) claim that U.S. manufacturing firms have lower total assets turnover and debt ratios compared to German manufacturing firms, but a higher profitability ratio. One of the reasons for these differences is the legal system (Common vs civil law system), which differs in both countries in several laws. For instance, the German law system offers a higher protection of employee rights, which has a negative impact on profitability, due to the rising labor costs. German firms tend to have a greater debt level, which could be a result of historical or cultural factors. Another potential explanation for the lower debt in the U.S. could be the lower cost of equity.

Furthermore these countries differ in their ownership structure. According to the current literature, the majority of firms from countries all over the world follow a concentrated ownership structure, whereby the Anglo-Saxon countries prefer the dispersed ownership (Gugler & Yurtogul, 2003). Following the ownership structure of German firms should be concentrated, which is confirmed by provided data of Franks & Mayer (2001). Franks & Mayer (2001) claims that the majority of large corporations (85%) have shareholders with shares of at least 25% and more than the half (57%) of the shareholders own more than 50% of shares. Boehmer (2000) confirms these data and claims them to be representative for all listed firms in Germany (not only the sample of Franks & Mayer) for the time span 1985 – 1997. Furthermore, these findings were approved by Köke (1999) for the manufacturing industry in Germany, where the average size of the largest shareholders is higher than 81% in 1998. Based on these figures one can assert that the German ownership structure can be generalized as concentrated compared to the ownership structure in the U.S., which is more dispersed.

Additionally, these countries differ in their board structure, where in Germany the two-tier system and in the U.S. the one-tier system is present. In a study conducted by Jungmann (2006) both systems were analyzed with the results, that no system is significantly superior to the other one. However, both systems have the potential for improvements.

Moreover, both countries differ in terms of the extent of influence of banks. While the German financial system is characterized with close bank-firm relationships and consequently a high degree of involvement of banks, the degree of bank involvement in the U.S. is relatively low. This is

because commercial banks are prohibited to take a large position in non-financial companies.

Besides the presented different characteristics of both countries, there are other differences, which are not presented in this paper. This means, that there may be other factors, which will influence the second hypothesis.

2.4 Hypotheses

Based on the information gathered from existing literature in the theoretical framework, this paper will investigate the following hypotheses, which will be tested with the outcomes of the analysis. The first hypothesis will be as follows:

H1: Innovativeness affects dividend payout ratio negatively

Current literature suggests that non-R&D firms pay more Dividends compared to R&D-intensive firms, which was based on descriptive statistics.(Fama & French, 2001)

Moreover, Lahiri & Chakraborty (2014) also had the same approach and investigated this relation with a regression analysis. They confirm this claim by Fama & French (2001) and therefore approved the information asymmetry theory. The impact of R&D on dividend policy was found to be negatively related. They suggest that there is a trade-off between R&D-expenditure and dividend payout, due to the preference to use internal finance resources, rather than issuing debt. Taking this into account the relation between R&D-expenditure and the dividend payout ratio is expected to be negative.

The second hypothesis investigates the difference between the impact of R&D-expenditure on the dividend payout ratio between German firms and U.S. firms.

H2: Impact of R&D-expenditure on the dividend payout ratio is equal for German and U.S. firms

Current literature did not investigate this explicit difference so far, which exacerbates to formulate an expectation in any direction. Therefore, the null hypothesis does not expect any difference. Although both countries differ in several ways, which is presented above for a few characteristics, we do not know if there is a difference in the coefficient. However, this test should investigate if there is a significant difference, which may be caused by these differences. In order to test if these characteristics are really significant for this difference, another regression analysis can be made in other future researches.

3. Methodology and Data

In the section Methodology the model to test hypothesis one will be elaborated on the basis of the article of Denis and Osobov (2008). Following, the test for the second hypothesis will be presented. Afterwards, the dependent variable, independent variable as well as the control variables will be explained shortly.

3.1 Model

The first hypothesis will be investigated by conducting a multivariate regression analysis. Therefore, a model needs to be elaborated, which is done by using Denis & Osobov (2008) as a template. The model will be used to test the impact of R&D-expenditure on the dividend payout ratio and additionally several control variables are added to secure the validity of the test. The control variables are: firm size, profitability, growth opportunities and the debt-to-equity ratio. Furthermore, this model will use lagged variables, which is based on the findings of Lintner (1956). He claims that lagged earnings are a key determinant of dividends and therefore the financial figures of the previous year are important for the dividends paid in the year afterwards.

The regression equation, which will be used in this study is the following:

$$\textit{Dividend Payout ratio } (DPR)_t = \alpha + \beta_1 (RD)_{t-1} + \beta_2 (P)_{t-1} + \beta_3 (GO)_{t-1} + \beta_4 (DER)_{t-1} + \beta_5 (FS)_{t-1} + \varepsilon_t$$

With:
DPR = Dividend Payout ratio

FS = Firm size

P = Profitability

GO = Growth opportunities

DER = Debt equity ratio

RD = R&D-revenue-ratio

α, β_1, β_2, β_3, β_4, β_5 = regression coefficients

The expectation for the regression coefficient of (RD) will be that β_1 is negative and therefore has a negative impact on the dividend payout ratio. For this test, the complete sample (both countries) will be used, whereby both samples will be evaluated separately. This means that the regression analysis will be made for both countries.

The second hypothesis will be tested in a different way. First the regression coefficients will be gathered from the previous analysis. Then the regression coefficient β_1 will be compared by using a z-test as suggested by Paternoster et al. (1998). The formula for the z-test is the following:

$$\mathrm{z} = \frac{\beta(Ger) - \beta(U.S.)}{\sqrt{SE(Ger)^2 + SE(U.S.)^2}}$$

With:

Z= z-score

β (Ger); β (U.S.) = regression coefficients

SE (Ger); SE (U.S.) = estimated standard error

The hypothesis will be rejected if the z-score is higher or equals 1.96 with a significance level of α=5%, because then the p-value is under 0.05.

Following the variables of the above shown model will be elaborated in terms of a definition and the measurement method. Therefore, the dependent variable will be explained first and afterwards the independent variables.

3.2 Variables

This section starts with explaining the dependent variable and following the control variables and the independent variable including the definition and equations.

3.2.1 Dependent variable

The dependent variable, as presented in the model used above is the dividend payout ratio (DPR), since the goal of the study is to show the impact on the dividend payout. To secure a valid conclusion, the variable will be measured as a ratio. The equation formula for the dividend payout ratio is:

$$\text{Dividend Payout Ratio (DPR)} = \frac{Total\ Cash\ Dividends}{Total\ Net\ Earnings}$$

3.2.2 Independent variable

The independent variable to be included in the model of Denis & Osobov (2008) is the R&D-revenue-ratio, since the purpose of this paper is to study this relationship. The ratio will be calculated as follows:

$$\text{R\&D-revenue ratio} = \frac{R\&D\ Expenses}{Total\ Revenue}$$

As already mentioned in part 2.2 various researchers found a negative relation between R&D-intensive firms and dividend payout like Fama and French (2001) as well as Lahiri & Chakraborty (2008). This is based on the information asymmetry theory, which claims that managers tend to use internal sources of finance to invest in the R&D to not reveal any information to competitors by borrowing money from external sources. Therefore, we expect this relationship to be negative.

3.2.3 Control variables

The model also include four control variables as mention previously, based on the findings of Denis and Osobov (2008), namely Firm size, Profitability, Growth opportunities and Earned/Contributed capital mix. Therefore, the definition and measurement of these variables will be similar to those of Denis and Osobov (2008).

3.2.3.1 Firm size

The variable firm size can be measured by various different methods, for example the total assets or number of employees. Since this study uses the model of Denis and Osobov (2008) the firm size will be measured with the natural log of total assets. Therefore:

Firm size = natural logarithm of Total Assets

Based on the findings of Denis and Osobov (2008) the relation between dividend payout ratio and firm size is expected to be positive.

3.2.3.2 Profitability

The profitability of a company is the ability to generate a profit, which is the residual amount of money after all expenses were deducted from the incoming money. The equation formula for Profitability will be:

$$\text{Profitability} = \frac{Earnings\ before\ interest\ after\ tax\ (EBIAT)}{Book\ value\ of\ total\ assets}$$

3.2.3.3 Growth opportunities

The growth opportunities are investments or projects of a company, which has the potential to grow and generate profit in the future. The equation for growth opportunities is:

$$\text{Growth opportunities} = \frac{Market\ Value\ of\ the\ firm}{Book\ value\ of\ total\ Assets}$$

3.2.3.4 Debt-Equity ratio

The debt-to-equity ratio indicate the proportion of shareholders equity to debt, which is used to finance company´s actions and assets. The equation formula for this ratio, gathered from the article of Lahiri & Chakraborty (2014), is:

$$\text{Debt-to-equity ratio:}\ \frac{Total\ borrowings}{Total\ assets}$$

3.2.3.5 Years

The above mentioned model does not contain the variable "years", but a differentiation will be made during the analysis, by analyzing the years solely. This is made to compare the impact of the R&D-revenue ratio on dividend payout ratio between the provided years. The reason for that is the existence of the global financial crisis and its possible impact on this relation.

3.3 Data

Before an analysis can be made the data has to be collected. The necessary data will be gathered from the database Orbis, which provides financial figures from firms all over the world. The sample will include U.S. and German firms. Furthermore, data from the years 2006 to 2014 will be collected, because Orbis provides data for these years and the validity is increased due to the greater amount of data. The sample excludes utilities (SIC-codes 4900-4949) and financial firms (SIC-codes: 6000-6999), based on the method of Denis & Osobov (2008), who also excluded these SIC-codes. Additionally, all firms will be included, which have at least one valid value for the variables. This means that firms, which only have one complete set of data for the variables will also be used, even if they do not provide data for all possible years. This is done to increase the available amount of data.

Furthermore, outlying values for any financial figure will be excluded from the analysis to secure that the outcome of the analysis is not influenced by extreme values. Additionally the minimum ratio of R&D-revenue ratio will be set to 1%, because the focus is on companies, who have a reasonable amount of R&D-expenses. Therefore, firms with minimal amounts of R&D-expenses will be excluded.

Based on these criteria, the sample for the U.S. firms will include 686 firms over the years 2006-2014. The exact number of observations for each year will be included in the tables in the analysis. The sample for the German firms will contain 423 firms over the years 2006-2014.

4. Results

4.1 Descriptive statistics

In this section the key data for the U.S. firms and German firms will be described and explained with the help of the Tables 1 and 2, which can be found in the appendix. First the data will be described separately and following a short comparison will be made.

Starting with the German firms, the dividend payout ratio does not vary much around its mean of 0,23, because of its relatively low standard deviation. The same holds for the R&D-revenue ratio, profitability and debt-to-equity ratio. Furthermore, the R&D-revenue ratio ranges within 0,01 (1%) and 9,46 (946%). The high maximum can be explained by firms, which uses debt to finance these expenses. The firm size varies relatively more than the other variables, which means that most of the firms are not relatively equal in size. The profitability varies between -2,62 and 1,18 with a mean of 0,00, which means that some firms made negative profit in the observed time-span, while others made a positive profit. The standard deviation shows, that most of the firms are close to the mean. The growth opportunities also have a high standard deviation, which can be explained by the different availability of growth opportunities for German firms. While some firms do have strong growth opportunities, others have approximately zero. The mean for growth opportunities is 1,12. The debt-to-equity ratio ranges

between 0,00 and 5,13 with a mean of 0,56. Therefore, some firms don´t use any debt to finance their business, while others heavily rely on using debt. The difference can be explained by the different industries of the included firms.

The dividend-payout ratio for U.S. firms varies between -3,55 and 6,5 with a mean of 0,07. Furthermore, the ratio has a low standard deviation, which indicates that most firms are relatively close to the mean. The R&D-revenue ratio ranges within 0,01 (1%) and 55,07 (5507%),. As for German firms, the high maximum can be explained by firms, which heavily invest by using debt. The firm size varies between 0,08 and 18,79. Therefore, the U.S sample includes firms with a relatively small firm size. The standard deviation shows, that the firms vary in terms of their size. The profitability shows a great minimum and maximum. Therefore, some firms made huge negative profit in the observed time span. The mean of -4,75 is negative, which shows that firms in general didn´t make a good profit. However, this can be influenced by firms, which made a huge loss. Furthermore, the standard deviation shows that the firms differ a lot in terms of their profitability. The growth opportunities vary between 0,00 and 3930,86, which shows that some firms don´t have any growth opportunities, while others have tremendous opportunities. This can also be explained by a low value for total assets, but simultaneously high market capitalization, which can be the case for some industries. The debt-to equity ratio also has a high standard deviation (like the growth opportunities), which indicate a high difference in the sample in terms of their debt-to-equity ratio. As for German firms, some do not use debt to finance their actions, while others heavily rely on debt, which can be explained by different industries included in the sample.

If one compares the data for both countries, it is noticeable , that U.S. firms tend to be more extreme in terms of their financial data. Especially, the negative profit is worth to mention. While German firms don´t make much negative profit, there are lots of U.S. firms, which have a high negative profit. Additionally, the growth opportunities maxima are much higher and also for the R&D-revenue ratio. Addiotionally, the standard deviations for all variables except the dividend-payout ratio are much higher for U.S. firms than for German firms. However, the firm size seems to be quuite similar, except for the minimum size. The debt-to-equity ratio differs a lot because of U.S. firms with a high debt-to-equity ratio.

4.2 Regression analysis

In the following section the results of the regression analysis will be provided with the help of Table 3 and 4, which can be found in the Appendix. Following the first hypothesis will be confirmed or rejected.

The first hypothesis was constructed to test whether innovativeness has an impact on the dividend-payout ratio, whereby the innovativeness is measured with the R&D-revenue ratio. For this purpose, pooled data for each country were used for the variables. By taking Table 3 and 4 into account, it seems that there is approximately no effect at all on the dividend-payout ratio. For German firms the standardized coefficient is 0,003 with no significance and for U.S. firms the standardized coefficient is -0,003 with no significance. Therefore, the impact of the R&D-revenue ratio is in both directions, but very low and with no significance. Based on this, the hypothesis will be rejected, due to the near-zero impact in both directions and the lack of significance of the variable. The coefficients for the variables in this regression analysis were standardized, because the variables were measured in different units. For instance, the variable firm size was calculated by using the natural logarithm for the total assets, while other variables were calculated as a ratio of two financial figures. Because of that, it is more beneficial to use the standardized coefficients, thus that the data are not distorted by different variable measures.

The variable firm size has a positive impact with no significance for German firms, while it has a significant positive impact for U.S. firms with a standardized coefficient of 0,207. Profitability has a significant positive impact for German firms with a standardized coefficient of 0,183. For U.S. firms there seems to be a negative impact (-0,026) with no significance. Growth opportunities seem to have significant a positive impact on the dividend-payout ratio with 0,095 for German firms, while the positive impact for U.S. firms (0,006) is not significant. The debt-to-equity ratio has no significant impact for both countries, whereby the direction of the relation is negative for German firms and positive for U.S. firms.

Furthermore, the r-square for both countries seems to be quite low (Germany: 0,039, US: 0,037), which means that only 3,9% of values for German firms and 3,7% of values for U.S. firms are explained by this model

However, if one has a closer look on Table 5 and 6, it seems that the regression coefficients vary between the years for both countries. The regression coefficient for the R&D-revenue ratio for German firms has positive values as well as negative values, but with no significance in all years. The regression coefficient for R&D-revenue ratio for U.S. firms shows positive values for the years 2007 (0,132), 2011 (0,149) and 2012 (0,028) with no significance, but also shows negative values, which indicate a negative impact for several years. These negative values are significant for the years 2008 and 2010 with the values -0,363, -0,412. Therefore, it seems that there are differences in the years, which may need to be studied in more detail to find the reasons for that.

4.3 Z-Test

In order to test the second hypothesis, which was constructed to test whether the regression coefficients are significantly different, the z-test has to be executed. Therefore, the unstandardized β will be used as well as the standard error. These data are provided by SPSS and presented in Table 5.. As can be seen in Table 7, the z-score for the total time span is 0,08. Following the p-value is 0,00001, which means that the we fail to reject the hypothesis. Therefore, there is no significant difference for the complete time span for the regression coefficients for R&D-revenue ratio and we conclude that there is no difference for both countries in terms of their impact of R&D-revenue ratio (Innovativeness) to the dividend-payout ratio.

The z-test for all years separately shows values between -1,07 to 3,31, where values under -1,96 and over 1,96 would mean a rejection for the second hypothesis. The only years where the z-score is high enough are the years 2008 and 2010. As can be seen, not only do the regression coefficients for U.S. firms differ in their significance, but also the difference between U.S. firms and German firms is significant in those years. The z-score for the year 2014 is only barely not significant. Therefore, the z-test shows, that the second hypothesis generally failed to be rejected, but there is also a difference for some years, which results in the change of the regression coefficients of the U.S. firms.

5. Conclusion

The aim of this paper was to analyze the impact of innovativeness on the dividend payout ratio and additionally to

investigate if there is a difference impact for German and U.S. firms. Based on the results presented in 4.2, we reject the first hypothesis, because there is no significant impact of R&D-revenue ratio on the dividend-payout ratio. Therefore, it seems that Innovativeness is not an additional determinant for dividend payout for U.S. and German firms, based on the regression analysis for the complete time span. Furthermore, the second hypothesis failed to be rejected, which means that for the complete time span there is no significant difference between both countries in terms of the impact of R&D-revenue ratio on the dividend-payout ratio. Therefore, innovativeness does not influence the dividend payout in both countries differently.

However, it seems that for some years for U.S. firms a significant impact of R&D-revenue ratio on the dividend-payout ratio was found. Following the difference between both countries in the years 2008 and 2010 was significantly different.

In general the other variables only partially confirm the results of previous studies. Thus, the profitability has a significant positive impact for German firms, but a negative and insignificant impact for U.S. firms. Different from the expectation the growth opportunities have a positive impact on the dividend-payout ratio for German firms, while the U.S. firms do not show any significant relationship. The firm size has no significant inpact on the dividend-payout ratio for German firms, while it is significant for U.S. firms. Furthermore, the debt-to-equity ratio shows no significant impact for U.S. and German firms for the complete time span.

Therefore, although some determinants have the same relationship direction as expected for one sample, no relationship can be confirmed with certainty for the whole sample consisting of U.S. and German firms and the whole time span.

6. Limitations and further research

This study is only able to confirm previous results partially and therefore no certain confirmation for any variable can be made. Therefore, some factors which were not included in the study may have caused the insignificant results, which were found for many variables. Furthermore, the variables can be defined in a different way. For instance, the firm size was calculated as the natural logarithm of total assets, while there are other options to calculate the firm size. Therefore, the results could be different, if the variables would be calculated in a different way.

A recommendation for further research would be to change the calculation of the variables and compare the results with this paper. Then, the potential difference can be identified, if there is a difference. Furthermore, more countries could be included to increase the validity of the comparison between the regression coefficients. Additionally, if the variable for innovativeness is changed, the comparison results of the regression coefficients can also be different.

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8. Appendix

Table 1: Descriptive statistics for German firms

	N	Min	Max	Mean	Std. Deviation
Dividend-payout ratio	3265	-5,81	8,46	,23	,58
R&D-revenue ratio	1101	,01	9,46	,17	,68
Firm size	3336	5,18	19,92	12,13	2,42
Profitability	3311	-2,62	1,18	,00	,21
Growth opportunities	3066	,00	52,58	1,12	2,24
Debt-to-equity ratio	3332	,00	5,13	,56	,31

The dividend-payout ratio is measured by dividing total cash dividends by total net earnings. The R&D-revenue ratio is calculated by dividing R&D-expenses by total revenue. The firm size is the naturla logarithm of the total assets. The profitability is calculated by dividing EBIAT by the book value of total assets. Growth opportunities are measured by dividing the market value of the firm by the book value of total assets. The debt-to-equity ratio is measured by dividing total borrowings by total assets.

Table 2: Descriptive statisics for U.S. firms

	N	Min	Max	Mean	Std. Deviation
Dividend-payout ratio	4678	-3,55	6,50	,07	,38
R&D-revenue ratio	2742	,01	55,07	,92	3,77
Firm size	4996	,08	18,79	9,89	3,81
Profitability	4978	-752,86	130,31	-4,75	28,36
Growth opportunities	4106	,00	3930,86	30,65	189,58
Debt-to-equity ratio	5054	,00	5214,17	19,31	183,01

The dividend-payout ratio is measured by dividing total cash dividends by total net earnings. The R&D-revenue ratio is calculated by dividing R&D-expenses by total revenue. The firm size is the naturla logarithm of the total assets. The profitability is calculated by dividing EBIAT by the book value of total assets. Growth opportunities are measured by dividing the market value of the firm by the book value of total assets. The debt-to-equity ratio is measured by dividing total borrowings by total assets.

Table 3: Regression analysis for German firms

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,113	,109		1,042	,298
	R&D-revenue ratio	,003	,037	,003	,086	,932
	Firm size	,009	,008	,038	1,107	,269
	Profitability	,555*	,118	,183*	4,721	,000
	Growth opportunities	,045*	,015	,095*	2,990	,003
	Debt-to-equity ratio	-,029	,068	-,014	-,424	,672

This table shows the standardized as well as the unstandardized coefficients for the regression analysis for German firms. The t-value and significance are also included.. The dependent variable is the dividend-payout ratio. The adjusted R-square is 0,039.Standardized coefficients are used for the regression analysis, unstandardized coefficients are necessary for the later used z-test. * indicate statistical significance at the 5% level.

Table 4: Regression analysis for U.S. firms

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,318	,047		-6,714	,000
	R&D-revenue ratio	,000	,003	-,003	-,143	,886
	Firm size	,035*	,004	,207*	9,170	,000
	Profitability	-,004	,006	-,026	-,764	,445
	Growth opportunities	8,439E-5	,000	,006	,204	,838
	Debt-to-equity ratio	,000	,001	,012	,496	,620

This table shows the standardized as well as the unstandardized coefficients for the regression analysis for U.S. firms. The t-value and significance are also included.. The dependent variable is the dividend-payout ratio. The adjusted R-square is 0,037.Standardized coefficients are used for the regression analysis, unstandardized coefficients are necessary for the later used z-test. * indicate statistical significance at the 5% level.

Table 5: Regression analysis for German firms for separate years

Variable	Expected relationship	2007	2008	2009	2010	2011	2012	2013	2014
		Beta	Beta	Beta	Beta	Beta	Beta	Beta	Beta
R&D-revenue ratio	-	0,162 (0,198)	0,001 (0,991)	-0,018 (0,882)	0,014 (0,893)	-0,026 (0,766)	0,021 (0,839)	-0,016 (0,851)	0,026 (0,766)
Firm size	+	-0,259* (0,026)	-0,159 (0,167)	-0,066 (0,568)	0,088 (0,374)	0,211* (0,020)	0,124 (0,162)	0,161 (0,055)	0,007 (0,928)
Profitability	+	0,556* (0,000)	0,307* (0,017)	0,102 (0,399)	0,212 (0,052)	0,204* (0,028)	0,252* (0,023)	0,302* (0,001)	0,409* (0,000)
Growth opportunities	-	0,099 (0,376)	-0,195 (0,108)	0,001 (0,990)	-0,076 (0,474)	0,182* (0,042)	0,205* (0,027)	0,125 (0,109)	0,229* (0,004)
Debt-to-equity ratio	+	0,364* (0,004)	-0,029 (0,813)	0,023 (0,852)	-0,267 (0,012)	-0,116 (0,208)	-0,039 (0,660)	0,002 (0,979)	-0,029 (0,696)
Number of observations		79	100	113	125	131	148	154	150
Adjusted R-square		0,235	0,039	0,032	0,054	0,104	0,060	0,124	0,206

This table shows the standardized regression coefficient of the regression analysis for German firms, where dividend-payout ratio is the dependent variable. The expected relationship is gathered by current literature and shown in 3.2 Variables. The adjusted R-square and number of observations is included as well. Significance values are included in brackets. * indicate statistical significance at the 5% level.

Table 6: Regression analysis for U.S. firms for separate years

Variable	Expected relationship	2007	2008	2009	2010	2011	2012	2013	2014
		Beta	Beta	Beta	Beta	Beta	Beta	Beta	Beta
R&D-revenue ratio	-	0,132 (0,441)	-0,363* (0,030)	-0,085 (0,592)	-0,412* (0,002)	0,149 (0,297)	0,028 (0,821)	-0,153 (0,220)	-0,218 (0,071)
Firm size	+	-0,203 (0,244)	0,146 (0,345)	0,128 (0,438)	0,150 (0,298)	-0,178 (0,289)	-0,106 (0,457)	-0,016 (0,907)	-0,090 (0,505)
Profitability	+	-0,138 (0,519)	-0,27 (0,224)	0,093 (0,553)	0,214 (0,166)	0,049 (0,790)	-0,421* (0,007)	0,129 (0,391)	0,333* (0,025)
Growth opportunities	-	0,001 (0,997)	0,45 (0,065)	0,167 (0,285)	0,093 (0,538)	-0,148 (0,415)	0,246 (0,119)	-0,008 (0,961)	-0,171 (0,238)
Debt-to-equity ratio	+	0,082 (0,657)	-0,139 (0,423)	-0,058 (0,736)	-0,188 (0,221)	0,106 (0,508)	0,091 (0,546)	0,065 (0,660)	0,002 (0,988)
Number of observations		60	63	60	63	62	79	81	81
Adjusted R-square		0,034	0,01	0,029	0,179	0,049	0,051	0,011	0,067

This table shows the standardized regression coefficient of the regression analysis for German firms, where dividend-payout ratio is the dependent variable. The expected relationship is gathered by current literature and shown in 3.2 Variables. The adjusted R-square and number of observations is included as well. Significance values are included in brackets. * indicate statistical significance at the 5% level.

Table 7: Z-test for regression coefficients

Year	German firms		U.S. firms		z-score	p-value
	Beta	SE	Beta	SE		
2007	0,55	0,423	1,929	2,488	-0,55	0,582
2008	0,002	0,217	-6,46	2,906	2,22	0,026
2009	-0,032	0,217	-1,251	2,319	0,52	0,603
2010	0,019	0,14	-6,011	1,819	3,31	0,0009*
2011	-0,058	0,194	2,771	2,629	-1,07	0,285
2012	0,04	0,198	0,204	0,898	-0,18	0,857
2013	-0,012	0,064	-2,066	1,67	1,23	0,219
2014	0,027	0,09	-1,816	0,991	1,85	0.064
Total	0,003	0,037	0,000	0,003	0,08	0,00001*

This table shows the unstandardized regression coefficients for R&D-revenue ratio for German and U.S. firms, gathered from the previous tables for each year and for the total. The z-score and p-value are calculated using the equation of part 3.1. * indicate statistical significance at the 5% level.