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"Change in the tax rate on corporate profits in Austria 2005 - is there any effect on the capital structure of the companies?"

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ABSTRACT - ENGLISH

This paper investigates whether the capital structure of the firms reacts to the changes of the corporate income tax. For the purpose of recognition, the influence and effect of the taxes, I examine the Austrian reform which reduced the corporate income tax from the level of 34% to 25% and entered into force in 2005. The aim of this introduction was to reduce the tax incentives of using debt as the source of financing and decrease the distortion in the capital structure of the Austrian companies. In order to check if the reform impacted on the leverage in the expected direction, namely that the debt-to-equity ratio decreased after the year of introduction, I observe the movement of the debt-to-equity ratio across Austrian companies over the period, from 2002 to 2008.

In order to understand the financing policy better, I compare the difference in the development of the leverage ratio between Austria and Germany due to the fact that these economics are comparable. Using the neighboring country as a control group allows me to separate other effect that might influence the capital structure too.

The empirical outcomes show that the reform led to a significant decrease in the share of debt in the capital structure among Austrian units. Nevertheless, the strongest response to the reform was remarked among a large firms, and across the smaller ones it was hardly, or even at all, noticeable. Summing up, the Austrian tax change affected the capital structure of the enterprises a lot and encouraged the use of equity financing.

ABSTRACT – GERMAN

Dieser Beitrag beschäftigt sich mit der Untersuchung , ob die Kapitalstruktur der Unternehmen auf die Änderung der Körperschaftsteuer reagiert. Um den Einfluss und die Wirkung von Steuern zu erkennen, untersuche ich die österreichische Reform. Damals ist die Körperschaftsteuer von 34% auf 25% gesunken und die Reform ist in 2005 in Kraft getreten. Das Ziel der Einführung war es, die Steueranreize zu senken, die Fremdfinanzierung weniger zu nutzen und die Verzerrung der Kapitalstruktur der österreichischen Unternehmen zu verringern. Um zu überprüfen, ob sich die Reform auf das Leverage in die erwartete Richtung ausgewirkt hat, nämlich dass die Verschuldungsquote nach dem Jahr der Einführung gesunken ist, beobachte ich die Entwicklung der Verschuldungsquote unter den österreichischen Unternehmen im Berichtszeitraum von 2002 bis 2008.

Um die Finanzierungspolitik besser zu verstehen, vergleiche ich den Unterschied in der Entwicklung des Leverages zwischen Österreich und Deutschland, da diese Wirtschaftsdaten vergleichbar sind. Die Verwendung des Nachbarlandes als Kontrollgruppe ermöglicht mir, andere Effekte zu trennen, die auch die Kapitalstruktur beeinflussen könnten.

Die empirischen Ergebnisse zeigen, dass die Reform zu einem deutlichen Rückgang des Schuldenanteils an der Kapitalstruktur der österreichischen Einheiten geführt hat. Die stärkste Reaktion auf die Reform war jedoch bei großen Unternehmen zu bemerken, und bei kleineren Unternehmen war sie kaum, oder überhaupt nicht, zu erkennen. Zusammenfassend hat die österreichische Steueränderung die Kapitalstruktur der Unternehmen stark beeinflusst und den Einsatz von Eigenkapital gefördert.

1. Introduction

Which effects are caused by the corporate income tax reduction? Are there any? If the answer is affirmative what are these responses? Does the financing policy depend on the tax rate?

According to the Modigliani and Miller theory, the optimal financing decisions maximize the after-tax value of the firms' total cash-flows. What does the mentioned financing policy depend on? Corporate theory has found some core factors that determine the corporate capital structure as bankruptcy costs, agency costs, information asymmetry, and taxes.[1]

The last element plays an important role in the trade-off theory which claims that companies choose the ratio of debt and equity in order to optimize the financing decision and related costs with profits.[2] It is one of the essential aspects in financial economics since it was developed for the first time by Modigliani and Miller (1958, 1963).

The influence of the tax rate on the capital structure is not new and has been broadly discussed, especially in the context of the resent financial crisis. Nevertheless, empirically there are no many evidence which confirm the relationship between the corporate income tax rate and capital structure. As claimed by Graham in his research on taxation from 2008, "there is no known study that documents tax-related time series effects in debt usage".[3]

A source of inspiration for me to focus on this topic was a paper written by Panier, Pérez-González and Villanueva. Authors debate on the capital structure of firm in Belgium after the tax reform, which happened in the similar period of time, 2006, as this one in Austria. Therefore, I got interested in the relation between taxes and sources of capital in the context of the capital structure.

[1] F. Longstaff, I. Strebulaev (2014), p.1-12

[2] L. Popescu, S. Visinescu, p. 315-320

[3] F. Longstaff, I. Strebulaev (2014), p.1-12

Considering borrowed money there are several advantages and disadvantages. One of the pros might be not giving up the ownership of the company, neither now nor later on, on the future profit. The second advantage is the tax benefit, namely that interest paid on debt can be deducted from the profit, lowering the taxable amount. Contrarily, paying back a larger amount than the initial one is associated with bankruptcy costs. This is a result of the fact that borrowing money increases the probability of bankruptcy, and therefore the costs of using debt are higher too. Another disadvantage is that being financed by too much debt can be seen very risky and discourage potential investors.[4]

In this paper I focus on the relationship between the taxes, borrowed money and the debt-to-equity ratio, as well as the relations between them.

2. Hypothesis stated on the example of the Austrian corporate income tax (CIT)

2.1. Overview regarding the CIT system in Austria

The current tax legal system for corporations in Austria, the Körperschaftsteuergesetz (KStG), was introduced in 1988. Previously, the tax laws were the KStG 1934 and KStG 1966. In Austria firms and their shareholders are taxed separately, but partnerships are not considered as taxable subjects. Nevertheless, the partners have to pay tax proportionally on their share in the partnership. The corporations, due to the fact that they are taxable subjects themselves, can make a deal with the shareholders, whereas deals between the partnership and its partners are forbidden.[5]

Within the KStG 1988 there were several changes regarding the level of the corporate income tax. In Austria there are only two personal taxes: the individual

[4] C. Dubay (2015), "Taxation of Debt and Equity: Setting the Record Straight", The Heritage Foundation, retrieved from: https://www.heritage.org/taxes/report/taxation-debt-and-equity-setting-the-record-straight

[5] F. Breuss, S. Kaniovski, M. Schratzenstaller (2004), p. 627-643

income one and the corporate income, which cannot be substituted by any other. In this paper, as already mentioned, I focus on the two last levels of the CIT, namely 34% and 25%.

	Year	CIT
KStG 1988	1989 – 1994	30%
	1994 – 2004	34%
	since 2005	25%

2.2. Hypothesis statement

As mentioned, there are as well disadvantages as advantages of the debt financing, and they play a huge role in the term of an optimal capital structure. What happens to the capital structure after the corporate tax is decrease by a relative big amount? A lower tax rate means that every euro of interest paid (on debt) reduces the tax liability by the corporate tax rate. This implies that the incentive of using debt, after the reform, is going to decrease and that the companies are going to use equity instead. Following this approach, the null hypothesis is stated, namely that the consequences of **a lower tax should be followed by a higher level of equity ratio** in the period after 2005.[6] This work tries to investigate whether there is a significant effect on the capital structure and if the null is confirmed or should be rejected.

In order to test whether the theoretical concept is true in the praxis and investigate the impact of taxation on capital structure, I use the example of a reform from Austria in 2005. It is assumed to be an exogenous variation to the debt financing cost.

In the case of the tax reform from 2005, firms have a smaller incentives to use debt as the source of financing. Prior to 2005, when the tax was at the level of 34%, the

[6] J. Shoven, J. Waldfogel (1990), p.190

tax liabilities of the company were reduced by a higher percentage than after the tax reduction to 25%. Due to the fact that the advantage of using debt was reduced, the equity financing is supposed to take place on a bigger scale.[7] The awaited effect is a decrease in the distortion of the capital structure driven by taxes that benefit the debt usage. As a final result, the financing decisions are supposed to be more neutral in terms of taxes and the tax less dependent on the tax deduction.

3. Empirical Evidence

Empirical strategy, which is explained and discussed in this section, allows to check whether the Austrian reform and the expected consequences were true and have been confirmed in the real world.

The significant reduction of the corporate income tax rate from 34% to 25% placed, at that time, Austria second among EU-15 countries with the lowest taxation. The Austrian economic experts admit that in order to be an attractive business location and to compete with European countries there was a need to introduce the reform of decreasing the tax.[8]

3.1. Data Selection

For the purpose of this thesis to check if the tax meaningfully affects the capital structure, I use the reform in Austria as an hypothetically exogenous source of variation to the incentive of debt financing. The reform , as mentioned, aimed to cut down the distortion which benefited the debt usage.[9]

The firm- level data for companies from both countries I obtain from the accessible for the student of the University of Vienna, Worldscope, and the historical

[7] F. Breuss, S. Kaniovski, M. Schratzenstaller (2004), p. 627-643
[8] M. Mahovsky (2004)
[9] F. Breuss, S. Kaniovski, M. Schratzenstaller (2004), p. 627-643

international corporate tax rates from the OECD. Using data for all Austrian and German companies included in the Worldscope lists I have chosen companies from Austria and Germany in the period of three years before and after the reform, which was entered into force in 2005.

3.1.1. Selection of comparable

To further investigate the effect of the reform on capital structure of the companies, I compare data from Austria with German ones. It is supposed to be a valid counterfactual since both countries are similar in several contexts. They are geographically close, share the same language and currency. Furthermore, due to the fact that they are economically integrated and Austrian law is comparable in many aspects to German, they are possibly exposed to common aggregate shocks and trends. [10]

Additionally, as a result of the reporting regulations and requirements and due to the fact that firms follow similar reporting standards, I can assume that the quality of German and Austrian data is high and comparable.[11]

Based on the data from Worldscope, I have chosen several positions from the balance sheet for companies from each of these two countries. At the very beginning, for Germany there was data for 215 companies, whereas for Austria only for 168 units. However, some of the data was not reliable and therefore I could not consider all of them (see the *Data choice* section)

3.1.2. Selection of the sample period

I focus on financial data reported with a yearly frequency from 2002 to 2008, in order to have data few years before and after the reform introduction. The data

[10] H. Daske, G. Gebhardt (2006), p.461-498

[11] H. Daske, G. Gebhardt (2006), p.461-498

between 2002 and 2005 is necessary and allows me to identify and observe the trends that had been existing in the two countries before the reform entered into force in Austria. Since there could be a tendency in the terms of the debt-equity-ratio, which could, and was likely to, affect the movement in the future, I had to consider and control for it. Having the similarities between both economies enables me to check the development of the debt-to-equity ratio after the year of 2005 (see the *Matching (Difference-in-Differences) & Dependent variable* sections). For this purpose, I use panel data for measuring the development of the data over the sample period. Panel data enables to control for unobservable variables which change across time but not across units (for instance, international agreements).

4. The regression model

The standard tradeoff theory claims that the corporate tax rates are supposed to be a dominant determinant in terms of corporate financing and leverage decisions. In this section I show the basic case of the regression in my master thesis and approaching the capital structure the companies.[12]
As already mentioned, the core point of the paper is to investigate whether the capital structure is affected by the corporate income tax rate.

Are there any tax incentives which influenced the decisions regarding financing made by the firms? Did the reform impact on the capital structure of the companies in Austria or were there other reasons? If the hypothesis statement is confirmed, was the change in leverage homogenous across all companies? Did maybe the response differentiate among some of them? If so, what might it depend on? Does the size matter of a firm matter in the terms of financing decisions?

[12] L. Popescu, S. Visinescu, p. 315-320

4.1. Dependent variable

In this subsection I exploit the possibly exogenous time-series variation in the corporate tax rate, which as a consequent is likely to affect the tax deduction and incentive to use the debt financing, and examine whether the financing decisions of the companies have changed.

To check if the tax reform meaningfully impact on the capital structure I use the leverage ratio. In case the hypothesis statement is correct, I expect that after the corporate tax reform entered into force in 2005 the companies started to use less debt than prior to 2005. In other words, the share of debt in the capital structure is expected to decrease after 2005 across Austrian companies.

As the dependent variable, to evaluate the company's leverage I focus on the debt-to-equity ratio, which explains and gives the information, for each euro of equity, how much debt there is. The number is an important measurement in the context of corporate finance and tells to what extent the firm's operations are financed through debt compared to equity.

In order to figure out how big the ratio is, there is a need to use two positions from the balance sheet of each firm that I considered from the Worldscope lists. The total liabilities (what the company owes others), namely the sum of the long and short term debt, is to be divided by the amount of common equity which represents common shareholders' investment in a company (the book value of the firm).

4.2. The regression strategy

To investigate the core problem of this master thesis I regress the dependent variable, the mentioned leverage ratio, on some independent ones. Formally, the "basic" regress model is as follows:

$$y_{it} = \alpha + \gamma REF_{it} + \varepsilon_{it} \qquad \textit{(model 1)}$$

where

- $\boldsymbol{Y_{it}}$ - captures the debt-to-equity ratio of a firm *i* at time *t*

- $\boldsymbol{REF_{it}}$ - is a dummy variable and stays for the tax reform which occurred in Austria. It is considered only for Austrian companies and for them is equal to 1 due to the fact that this group has been treated, namely that was a subject to the tax reform. For the German firms, on the other hand, the ***REF*** variable takes the value of 0 (see the *Matching (Difference-in-Differences)* section).

Having all the variables and taking into account the described tax incentives, I expect, as mentioned in the *Hypothesis statement* section, $\boldsymbol{\gamma}$ to be negative and statistically significant.

Important issues, that have to be considered, are aggregate trends and shocks that happen parallelly to the tax reform around 2005. Even though the corporate income tax change is possibly an exogenous variable, the other coextending events, due to the fact that might be hard to control, can probably confound the inference and conclusion. [13]
If there are some concurrent movements around the time of the introduction the new tax level, it is likely to bias ***Y*** in the regression model (1).

In order to omit this concern I investigate the capital structure of Austrian corporations in comparison with those located in Germany. As already mentioned, using the data at the firm-level from both countries that are similar in terms of economy and geography allows me to claim that they would be likely to be exposed to the same aggregate shocks and follow common trends.[14] Nevertheless, Germany did not introduce any corporate income tax change around 2005, the period that I focus on in this paper.

[13] G. Imbens, D. Rubin (2015)

[14] According to http://www.economywatch.com/world_economy/austria/export-import.html, in 2008 Austria's biggest export partner was Germany (almost 29.5% of the total trade)

To address the concern that treated units, Austrian ones which were the subjects to the reform from 2005, and non-treated units, located in Germany that were not affected by the corporate income tax change, may not be identical, or even comparable, in the sense of observable factors, and that the debt-to-equity ratio changes could be explained and driven by different trends happening at the same time, I implement the matching Difference-in-Differences (DiD) methodology (explained in the *Matching (Difference-in-Differences)* section).

5. Matching (Difference-in-Differences)

5.1. Similarities between these two economies

For the purpose of estimating the treatment effect of the corporate income tax reform, there is a need to consider, as already mentioned, two groups of units – the treated and untreated companies. Austrian and control firms have to be identical with regard to the observable characteristics for the DiD strategy to be valid.

I consider the pre-reform characteristics and assume that they were comparable prior to 2005. If these clusters are comparable before, it is assumed that if there was no treatment (the reform was absent), the original difference between the treated and untreated units should be continued over time and the development and the shift in the group of Austrian firms will be parallel. [15]

Formally, the treatment effect of the reform is the difference in the outcomes, in this paper the debt-to-equity ratio, between the companies from the treated group, the Austrian one, and the non-treated one from Germany. The treatment effect is assumed to be constant and does not depend on each units.[16]

[15] J. Angrist, J. Pischke (2009)

[16] J. Angrist, J. Pischke (2009)

Moreover, in order for DiD strategy to be valid, it is necessary for the treated and control companies to be exposed to common movements around the time of the entrance into force of the tax reform.[17] For the purpose of proving it, I checked the rate of growth in gross domestic product (GDP) in both sample countries. It has been confirmed that these two groups of economies are subjects to the same trends and move in the same direction over time (see the ***Figure 1***, where the GDP growth is investigated for the period from 2002 to 2008). The correlation between GDP growth in Austria and GDP growth in Germany, which is equal to 0.93, confirms that these countries are closely linked. Based on this convincing fact, the assumption of using Germany as a credible control group for time varying trends influencing Austrian corporations is likely to be valid.

5.2. Matching based on total assets

To ensure that the non-treated units are comparable with Austrian firms the matching difference-in-differences is implemented.[18] It allows to match units in the opposite treatment group according to the similarity between firms in terms of observable characteristics prior to the reform (in this master thesis work based on total assets). The opposite groups are the companies from both countries – Austria and Germany. The Austrian firms are considered to be the treated group due to the fact that they were the subjects to the corporate income tax change in 2005. For German ones, which were not affected by the reform, they are taken into consideration as the control group.

In order to implement the matching difference-in-differences procedure, I firstly need to identify valid matching companies in the non-treated group that are comparable with these from the treated one and are likely to be exposed to similar shocks and trends. To determine similar firms according to the observable characteristics, I take into account total assets as a variable and based on this

[17] J. Angrist, J. Pischke (2009)

[18] J. Heckman, James, H. Ichimura, and P. Todd (1997), p. 605-654

feature I proceed the matching. From all of the data that was provided by the Worldscope lists, which contained information with regard to total assets for 170 units of Austrian firms and 215 of German companies, I have selected only those which data was valid and reliable (see the *Data choice* section). After implementing the selection, I focus on 98 companies from Austria and 134 companies from Germany.

In order to identify comparable units from the non-treated and treated group I consider, as already mention, the total assets which present the size of the firm.

Why might the size sometime matter? The refinancing costs, which are related to the changes in the capital structure of a company, are most likely to be noticeable. Replacing the existing debt by a firm or a renegotiation of the terms of the debt obligations may require a financial background and negotiating power. The existing debt may have some exit fees, that are charged by the lenders when the debts are refinanced earlier than their maturity, which can outweigh the described incentives to use more equity.[19] Additionally, there might be some deferred establishment fees which have not been paid when the loan was taken but have to be paid on exit. Case of changing the lender or renegotiate new condition is associated with some additional fees such as for the application and documentation. All of these costs, which compose the total refinancing costs, effect more smaller firms due to the fact that the cost are relatively huge for them and that they might not change their capital structure if they deviate a lot from their long-term target.[20] Therefore, I expect that larger firms response more to the tax reform and tax incentives. This is what I explore in the empirical test of the paper.

To avoid the scaling problem and make the numbers of total assets comparable I normalize each variable before the matching by taking the natural logarithms.

[19] I. Strebulaev (2007), p. 1747-1787

[20] I. Strebulaev (2007), p. 1747-1787

For each pair I match the units from both groups only for the first year of the sample period, 2002, and I proceed the DiD test on a subsample of these matched firms.

5.3. The one-to-one matching

In order to implement the matching procedure, I calculate the difference between the natural logarithm of total assets for each Austrian company and each German one. By using the "nearest-neighbor matching" methodology, which estimates the ATT[21], I match each treated firm from the sample with only one control unit and discard controls that are not selected as matches[22]. Matching 1:1, as in this paper, allows to select the pairs such that the difference between total assets is minimized (the smallest distance between the value of the natural logarithm of total assets for the firm from Austria and Germany determines the pairs), considering the fact that there are less treated units that control ones, I end up with the amount of pairs that is equal to the amount of Austrian companies.

Focusing on the matching 1:1, there is one main shortcoming regarding this methodology. The fact that discarding control units, which were not selected as matches, eliminates a big number of observations what, as a consequence, reduces the explanatory power.[23] Nevertheless, the decrease in the power is relatively small due to two reasons. Firstly, the precision of the estimator is mostly driven by the group with a smaller amount of the observations.[24] Thus, if the treated group (the Austrian one with fewer units) stays contents, the reduction in the size of only the control group should not decrease the explanatory power significantly.[25]

[21] ATT- Average Treatment Effect on the Treated calculated as the average of within pair differences. From: M. Fraser and S. Guo, (2010), p. 49

[22] E. Stuart (2010), p. 1-21

[23] E. Stuart (2010), p. 1-21

[24] K. Imai, G. King, E.Stuart (2007), p. 199-236

[25] K. Imai, G. King, E.Stuart (2007), p. 199-236

The other cause is that having two, even smaller, groups that are more similar increases the power and the precision.[26] In this case, the standard deviation of this matching, compared to the estimators from a linear regression, is lower even if many of the observations have been discarded.[27]

After the matching is done in the first year, 2002, the pairs matched are kept for the whole sample period. Therefore, after the pairs are determined, I add for each pair their data, regarding the dependent variables that I try to explain in this work, the debt-to-equity ratio, from the following years. Each firm from Austria is compared with its control firm from Germany for each year (the same pairs of two firms are compared across time).

6. Data choice

In this section I aim to briefly explain the selection process of the data that I did while working with all of the companies included in the Worldscope lists, because as already mentioned in the above chapter (see the *Matching based on total assets* section), I made a selection procedure while choosing valid and reliable companies from the whole list.

Considering the firm-level information with regard to total assets, I obtained data for 168 Austrian and 215 German firms. I extracted the financial statements for the treated and control countries for the sample period, from 2002 to 2008.
Nevertheless, as it was explained in the previous chapters, for the purpose of investigating the effect of the change in the corporate income rate introduced in 2005, I removed companies that had evidence only for either one or two years (I deleted 51 from Austrian and 55 from German companies).
Moreover, due to the fact that I need to take into account firms which have data prior to the reform and after it, I further eliminated other units (19 firms from

[26] G. Snedecor, W Cochran (1980)
[27] H. Smith (1997), p. 325–353

treated and 24 from the control group). Information available only before or after the tax change do not have any explanatory power, because the movement of the debt-to-equity ratio cannot be compared before and after the reform, and any response in the leverage ratio cannot be investigated.

The same pattern applies to the data regarding the leverage ratio. Firstly, I got rid out of these companies which had observation from only one or two years. Followed this structure, 7 companies from Austria and 76 firms from Germany were deleted from the dataset. Regarding the firms with the data either before or after the introduction of the reform, there were 6 from the treated and 23 from the non-treated group. After the selection, I end up with 95 Austrian firms and 116 Austrian companies.

	AUSTRIA	GERMAN
	TOTAL ASSETS	
originally	168	215
selected	**98**	**134**
removed	70	81

	AUSTRIA	GERMAN
	DEBT- TO- EQUITY	
originally	108	214
selected	**95**	**116**
removed	13	98

graph 1

6.1. Summary statistic

6.1.1. Summary statistics before matching

Having selected the reliable observations, I provide the summary statistics which give me a brief overview regarding the set of observations. With the help of the summary statistics I obtain the most important information regarding the data. It summarizes and describes the basic features as number of the observations, the arithmetic mean, median, the standard deviations and shows the minimum and maximum number among the whole dataset.

All of the commands, in this and previous and further chapters are done with the help of Software for Statistics and Data Science provided by *STATA*.

At the beginning, before the matching was implemented, I considered all the chosen observations, and perform the summary statistics for the "raw" dataset–for the Austrian and German units. The results are presented and descried as below.

In the *Table I* are displayed summary statistics for all the firms from both groups – treated (column I) and non-treated (column II). Panel A is dedicated for the data regarding total assets, and panel B shows the summary statistics with respect to debt-to-equity ratio.

Taking into account the panel A, the first row gives the information regarding the number of observations – for Austria there are 669 and for Germany 875 taken into consideration. Nevertheless, the number contains all of the years, namely from 2002 to 2008, such that, in order to know the real number of companies included in this section, I need to divide the number by 7. For the treated group, it would mean that there are 95 companies, but, as written in the previous section, there were 98 units included. It indicates that there are 17 Austrian observations missing. For the control group, there would be 125 firms, but, from the section above, there were 134 companies considered. Thus, there are 63 absent information regarding the considered firms.

The second row displays the average value of assets which is €6,1 million for Austria and is €18,5 million for Germany. Such a big, because a triple, difference might come from a different sample size between these countries, due to the fact that I obtained 98 and 134 observations from Austria and Germany, respectively. The other possible explanation is likely to be the fact that the economy of Germany is almost ten times greater in comparison with Austrian ones, so.[28]

In the third row it is presented the median of total assets for both economies. For the Austrian firms it is equal to €277079 and for Germany €123950.

[28] Comparison based on the data of gross domestic product in both countries in the middle of the sample period, 2005.Information from OECD (https://stats.oecd.org/index.aspx?queryid=60702#)

Moreover, in order to have a better big picture, I observe the trend of the median and mean for both economies. The results are presented in the *Figure 2* and in the *Figure 3*, respectively. Even though none of these trends, neither the movements of the median nor the mean, are identical, they do not differ much from each other, especially prior to the entrance into force in 2005.

In panel B it is shown the debt-to-equity ratio for the whole sample of companies. The first column, as above, presents information for Austria and the second one for Germany, and the first row presents the number of observations. For Austria it could be interpreted that, due to the fact that there were 95 companies considered (see the *Data choice* section), 39 observations are missing. For the control group there were 116 companies taken into consideration, such that 48 observations are absent. The mean of the ratio for the treated group is €297 what can be interpreted that for each €100 of equity there is, on average, this level of debt. For Germany the number is equal to €240. These amounts, as well as the median (for Austrian firms €71, and for German ones €44) shown in the second row, are relatively narrow.

6.1.2. Summary statistics after matching

In this subsection I want to focus on the summary statistics with the information regarding the data after the pairs from both groups were matched. Moreover, I aim to compare these elementary features with those explained in the subchapter above.

After implementing the matching procedure (see the *Matching (Difference-in-Differences)* section), where the pairs were matched based on the shortest distance in the total assets, I provide the summary statistics considered the matches only.

Analogically as for the "raw" data, the *Table I* shows summary statistics for all the units from both groups – treated (column I) and non-treated (column II). Panel C displays the data regarding total assets, and panel D summarizes the information and gives the overview for debt-to-equity ratio.

Taking into consideration panel C, the first row regarding the number of observations shows, as expected, the number of Austrian observations that were before the matching (see *panel A*). At the beginning there were 669 that came from 98 companies (see the *graph 1*). Due to the fact that all Austrian firms were matched with exactly one company from Germany, the number of the observations in the treated group should stay the same. Analogically, the number of the observations in the control group should be reduced, compared to the version before the matching, because some controls which were not selected as matches were discarded (see *The one-to-one matching* section). Indeed, in this case the amount decreased.

The second row displays the average mean of the data and shows a really nice result. The difference between the average value of the total assets narrowed a lot which confirms that the implemented matching procedure seems to be correct. For the treated group it is equal to €6,1 million, which is not surprising due to the fact, as already mentioned, that the observations of Austrian companies remain the same. For the non-treated group the value is relatively small, in comparison to the version before the matching, and equals €5.6 million. The reason for such a big difference in German companies is that, due to the matching and that not all of the selected companies are included in this summary statistics, some of the biggest control companies were removed and not selected as matches for the firms from Austria. It can be seen in the fifth row of the table were the maximum value among all companies is presented – in the version before, the maximum size of the control company included was equal to € 1041 million, in the current statistic the maximum size is more than six time smaller and equals €152 million.

The difference regarding the median, which is shown in the third row, decreased as well a lot. For the Austrian firms it stays constant, and for German ones increases to €192359.
Considering the standard deviation for Austria it remains, as expected, constant and for Germany it decreased approximately five times to €21million. Such a big drop comes as well from the fact that the biggest companies were not selected, thus there is no such a big dispersion.

Panel D refers to the debt-to-equity ratio for the matched pairs. The information for the treated group is the same as in the version before the matching. Regarding the control group, the number of the observations decreased (the same reason as explained for the total assets).
The average of the ratio for the German companies increased to the level of €313 and the median changed by a comparatively small amount of €2 and is equal to €42. The relatively small difference between these two versions (before and after the implemented matching) is not really surprising because these variables are only ratios, in this sense that it does not depend directly from the size of the company.

6.2. Statistical significance of total assets

At the end of this section I aim to check and confirm the expected results with regard to significance of the total assets. More precisely, I test for the units after the matching whether the difference between the total assets of the treated and the non-treated groups is statistically significant.

Due to the fact that, after the matching which matched the pair of the companies from the two opposite groups based on the shortest distance regarding the total assets, the difference in the matching variable should be insignificant. The companies from the treated and control group are supposed to be similar, in case of the correct matching procedure, such that the difference in the average total assets should be not significant.

For the purpose of testing the significance, I provide a one sample t-test in *STATA*, where I focus on the companies chosen to be the pairs (the amount of 90) for the year for which the matching was implemented, namely 2002. The null hypothesis (H_0) in this test states that the difference is equal to zero for the confidence interval (CI) at the level of 95%. The difference in the value of the total assets between the Austrian and German firms should be, as explained above, **statistically insignificant**.

The *Table II* shows the results of the one sample test. After meeting some required assumptions as a continuous test variable, independence of the observations, and thus test variable, and that the sample and population on the test variable is normally distributed, the t-test does not reject the null hypothesis. Due to the fact that 0.2112 is larger than the significance level of 0,05, the null hypothesis confirms that the difference in the value of the total assets is statistically insignificant.

7. Regression analysis

7.1. The basic model

In the following chapter I focus on the presenting and the analysis of the results obtained from the panel data regression for the dependent variable, namely the debt-to-equity ratio. I aim to answer several questions. Firstly, did the Austrian firms change their capital structure resulted from the tax reform in 2005? Did any of them - taxes or other effects explain the response in the context of the leverage around 2006? In case there were some responses, did it differ across companies or was it homogenous?

For the purpose of investigating the impact of the corporate income tax change from the reform on the capital structure of the Austrian companies, I regress the dependent variable on the intersection of the treated units and these which were existing after the reform (after 2005). As already briefly explained in *The regression*

strategy section, for the model 1, if the tax change meaningfully affect the leverage decisions, I expect **γ** to be statistically significant and negative such that the share of debt in the capital structure after the reform decreases.

$$y_{it} = \alpha + \gamma REF_{it} + \varepsilon_{it}$$

(model 1)

Regressing on the intersection of these two dummies, allows me to examine the effect on the firms that were exposed to the reform. I regress two models: the basic one (1) and one considering the fixed effect as well (explained in the *Fixed-effect specifications* session – regression model (2)). Having these variables the hypothesis states: if the company was treated – was affected by a decrease in the corporate tax change, the debt ratio is expected to be smaller due to the fact that the incentive to use debt, and in consequence for a firm to have a lower taxable income, is reduced.

Table III, panel A, presents the results for all pairs considered. This what is taken into account in the regression is the movement of the leverage ratio among the matched pairs over the sample period, from the year 2002 to 2008. I look at the development of the dependent variable and observe how it behaves for the treated companies, the Austrian ones, in the comparison with the control ones. In the *Table III,* panel A, the F-test statistic has a F-distribution and the null hypothesis states that all coefficients are actually zero, what in other words, means that the model has no predictive power.[29] In this case, as it is shown in the panel A by the p-value, the probability shows that the null hypothesis can be rejected with the confidence which is more than 99% (precisely, 1- 0,0045). A low R-squared value, which occur not only in this regression but will appear in the following sections, does not necessarily indicates a problem. Those regression models can be good and the small R-squared value might result from the nature of the investigated issue, namely that there are many unexplainable variations. The statistically

[29] C. Brooks (2002), p. 102

significance of an individual variable enables to draw a conclusion regarding the relationship between the independent and dependent variables.[30]

The t- test investigates the significance of the specific coefficient. The null hypothesis stated in this test is that the coefficient is 0. In order to reject the hypothesis, the absolute value of t-value, for the 95% confidence level, has to greater than 1.96. In this particular case, due to the t-test value, the null hypothesis can be rejected and the coefficient is significant at the level of 0.05%. Regarding the interpretation of the coefficient, the value is a negative one, such that the independent variable has an impact on the debt-to-equity ratio. Therefore, it could be interpreted that the companies from the treated group, which were affected by the corporate tax change, after the reform in 2005 have a smaller leverage ratio. The coefficient on a dummy variable measures the average difference between these two groups. In this case the difference in the debt-to-equity ratio between an Austrian firm, which existed after the tax change, and a German one is supposed to be, on average, lower by 490. The results confirm the expected outcome stated in the *Hypothesis statement* section.

7.2. Fixed-effects specifications

This subsection is dedicated to looking at the regression model which is more specified and includes the fixed-effects. This effect does not vary over the time, the sample period considered in this paper, and is different for each company.
The advantage of the fixed- effects is ruling out the confounding effect in time-invariant firm characteristics.[31] There might be some factors that are relevant only at the firm- or industry level and which affect strongly the financing decision. Nevertheless, these important determinants might not be crucial for all firms and

[30] J. Frost, "*How To Interpret R-squared in Regression Analysis*", retrieved from: https://statisticsbyjim.com/regression/interpret-r-squared-regression/
[31] P. Allison (2005)

not related to the reform itself. Therefore, not controlling for them in the regression model can bias the estimators.

Using the fixed – effects I can estimate the treatment effect more precisely due to the fact that it analyzes only, as mentioned, the impact of the variable that varies over the sample period and treats each company separated (as a dummy variable). It is assumed that some individual characteristics might influence the financing decisions and there is a need to control for them, and that those time-invariant features are unique for each individual firm.[32] In the regression, I cluster the standard errors over the pairs due to the fact that the observations for one pair (which contains two units from two groups) in different years are correlated.[33]

The regression model (2) with the comparison to the basic one (see the regression model (1) differs in $\boldsymbol{X_{it}}$ which explains a series of firm or industry variables that shape financing decisions.

$$y_{it} = \alpha + \gamma REF_{it} + \psi_{\chi} X_{it} + \varepsilon_{it} \qquad \textit{(model 2)}$$

Taking into account the tax incentives, I expect **γ**, as for the basic model, to be negative and economically and statistically significant.

The results for this regression are shown in the *Table III*, panel B. The number of observations is, the same as in the basic model, equal to 574. The number of groups that are considers, equals 89, means that there is this amount of pairs of the units from both groups – the treated and control ones, for which the fixed-effects specifications are being controlled.

Regarding the significance tests: F-test indicates whether all the coefficients in the model have predictive power. As shown in the *Table III,* panel B, the p-value of 0.9825 means that the null hypothesis can be rejected with the confidence which is more than 98%, at any significance level below 1.75%. The t-test for a specific coefficient tells that the independent variable in this case has a significant impact

[32] Presentation made by O. Torres-Reyna, "*Panel Data Analysis Fixed and Random Effects using Stata*", Princeton University

[33] Presentation made by A. Nichols, M. Schaffer , "*Clustered Errors in Stata*", United Kingdom Stata Users' Group Meetings, 2007

on the dependent variable. Namely, the treatment effect among companies existing after 2005 does matter and those treated units have a lower leverage by 392. Nevertheless, comparing this results with the one from the basic model without the fixed-effects specifications (see the *Table III*, panel A) I can draw a conclusion that there were some factors that lower the debt-to-equity ratio. However, when I control for these determinants, the result is proportionally smaller.

8. Size restrictions

8.1. Three groups regarding the size

As already mentioned (see the *Matching based on total assets* section), there are many relevant factors in the context of the financing decisions and the leverage, and the size of a company is one of them. Capital structure with regard to the size is discussed in the literature broadly, nevertheless there are some contradictory opinions. Some of the papers claim that there is a positive relation between the size and the leverage of a company[34] while, on the other side, there are authors who find the relationship to be negative.[35]

Due to these inconsistent views, I implement in this work some size restrictions, and I focus on each group of companies separated. In the following subsections I split the traded firms from Austria according to the total assets in order to investigate whether the financing decisions and the leverage ratio differ across small, medium, and large companies. I tried to classify the enterprises with relation to the legislation of the European commissions with several categories: large companies, with the turnover above € 50million, medium (the turnover below € 50million), and small ones (below € 10 million). However, by diving the firms in this way, I would obtain groups with a very differential amounts of companies. Therefore, I split all of the considered companies from the Worldscope lists in

[34] H. Milton, A. Raviv (1991), p. 297- 355

[35] S. Titman, R. Wessels (1988), p. 1-19

three groups: small firms with the total assets below € 75000, the medium–size with the considered variable between both thresholds, and the large ones with the volume over the level of € 1000000. I take into account these restrictions while performing the matching procedure across all of the companies for the beginning of the sample period, 2002.

The volume of the enterprise affect the ability to take a long term debt. Taking into consideration a loan, it should be easier for a large company, that has a negotiating and financing power, to obtain a long-term debt rather than for a small enterprise. As it is claimed in one of the paper focusing on the capital structure[36], bigger companies have normally a more diversified portfolio what results in the fact that they tend to fail more rarely. In other words, the bigger the firm, the lower the probability of bankruptcy, and, as a consequence, the supply of debt, with better conditions, should be larger.

Nevertheless, once the small firms enter into the loan contract, it tends to be more difficult to rebalance their capital structure due to some refinancing costs (see again the *Matching based on total assets* chapter). I find these arguments more convincing, and therefore I expect smaller companies to change their leverage less willingly. They should find the corporate income tax change less attractive and it should affect less their financing decisions.

In order to investigate this issue, I will perform some regression focusing only on one of these above mentioned group separated. It *Table IV* I place the results for all these three groups. Panel A presents the small companies, panel B the medium-size and panel C the large enterprises.

In the group of the smallest companies, there were 31 units of the treated group included. There are 33 companies whose total assets in 2002 were at the higher than the lowest threshold, and lower than the highest threshold considered here. Regarding the information obtain from the regression, several aspects need to be taken into consideration – the F-test and t-test for each of the coefficients.

[36] R. Rajan, L. Zingales (1994), p. 1-23

For the smallest group the p-value is relatively high (0.2798), which indicates, that the model does not really have the predictive power. This conclusion is not surprising and confirms the explained above logic that small enterprises do not really response to the tax change and tax incentives. The coefficient of determination, R^2, which is almost zero, confirms that the model does not explain the dependent variable well. The t-test for an individual coefficient acknowledges the fact that the debt-to-equity ratio is not explained by the explanatory variable among the small companies.

Considering panel B, in the *Table IV*, which focus on the medium-size enterprises, the results are a bit better and predict the dependent variable in a more convincing way. In spite of a better regression, the p-value of neither the F-test nor of the t-test allows me to reject the null hypothesis at any of the significance level as 99%, 95%, or even 90%.

The regression performed among the large companies included in the Worldscope list gives the best outcomes. According to the F-test, I can reject the null hypothesis which states that the whole model has a predictive power at the level of 90% (precisely, 0.9145), and the coefficient is also statistically significant at the same level. The debt-to-equity ratio of each of the treated unit is, on the average, a lower by 718 (compared to the control unit). Therefore, the expected outcomes are obtained because across the largest companies the response was the strongest. The small firms, on the other hand, did not lower the use of debt in their capital structure.

8.2. Median as the threshold

This chapter is dedicated to look at the regression and its results in regard to the median, which is the “middle” point in the dataset. I use the median, as in the previous section, of all treated companies in the year of the matching procedure, in 2002 from the list of all observations listed in numerical order. After calculating the

number, I split the companies into two groups – below an d above the threshold - and conduct the regression for each of them.

At the beginning I was about to use the average value, the mean as the "critical value". Nevertheless, in the list of the Austrian companies there were some outliers (shown in the *Figure 4*))which impact on the value of the mean hugely and, as a consequence, the regression analysis. On the other side, I could not find any rationale reasons why these companies should be rejected and not taken into account while proceeding the regression.

However, the outliers do not affect the median a lot, and including one number which is far away from the median, does not change the final version of the middle number drastically. Thus, I used the median for finding the threshold, which for Austrian companies in the year when the tax change entered into force, was equal to €159327.

The *Table V* shows the regression for both groups of companies. Panel A and B present the "normal" version, while panel A.a and B.b are dedicated for the expanded version of the regression – I control for the fixed-effect specification- among the group below and above the value of the median, respectively, and cluster the standard errors over the pairs, as in the *Fixed-effects specifications* chapter.

For the group with smaller companies, displayed in panel A, the positive coefficient (at the level of 36.2) indicates that the Austrian companies which existed after 2005 did not lower their debt-to-equity ratio, which contradict the hypothesis of the master thesis. Nevertheless, the p-value of the F-test and t-test for the specific coefficient (equals to 0,38) tell that the predictive power of the model is relatively poor. The conclusion acknowledges, the already mentioned findings in the above section, that the Austrian small companies did not change their capital structure and financial decisions after the tax reform.

The results of the regression across the bigger group of the treated units, displayed in panel B, present other findings. The p-values of the F-test for the whole model and of the t-test confirm, that at the significance level of 99% the null hypothesis

can be rejected. In other words, among the bigger companies, the whole model and the coefficient have the explanatory power. Moreover, the average difference between the treated and nontreated group is equal to approx. 956. These results corroborate the expected and already found outcomes (see the *Hypothesis statement* and the above subsection).

The results when I control for the fixed-effects seem interesting to me and are worth to be mentioned. As it is shown in the panel B.b, with the fixed-effect restrictions the coefficient. Both regressions, according to their p-value, are statistically significant at the similar level (approx. 99%), but the value of the coefficients differs a lot. While controlling for the fixed-effects the average difference among these two groups – Austrian and German ones- is expected to be lower by 729. Considering the smaller companies, the null hypothesis is rejected due to the high p-value for both test (at the level of 0.386). Nevertheless, even at this significance level, the value coefficient differs very slightly (compared the value of 36.2, taken from the panel A, with the value of 34.9 from the panel A.a). Thus, among bigger companies there are more intern factors that influence the financial decisions and controlling for them gives a better estimators.

8.2.1. Median and the interval of +-5%

Due to the fact that the median seems to be a proper threshold in the sense that it separates the companies into two groups that response to the corporate tax reform differently, this subsection is dedicated for some variations around the middle point of the total assets.

I divide the Austrian units into two groups. I focus on the cluster being apart 5% from the median, such that I investigate all the treated units, and their pairs, whose total assets are at the level of 105% of the median. Thus, I test all the companies bigger or equal to € 167293. In order to better understand the relation between the size of the enterprise and its response to the tax change, I compare these results with the second group. The other cluster contains the units with the

total assets at the minimum level of 95% of the median, namely I observe the change in the leverage among firms bigger than € 151630. The hypothesis, which would correspond to the already found outcomes, is that the response across the first group should be stronger than across the second one. In other words, larger firms would lower their debt-to-equity ratio more than the smaller firms.

Results shown in two panels in the *table VI* confirm the hypothesis. Panel A and panel B present the regression for the companies that are bigger and smaller than the threshold in the year of matching procedure, respectively. This first group contains of 58 treated units in 2002, and the second one, due to the fact that the threshold is lower and thus smaller firms are also included, 62. Outcomes displayed in both panels are statistically significant at the level of 99% (for the overall test of the model and the individual significance of each coefficient). The estimators indicate that, among the smaller group, the debt-to-equity ratio is lowered by 844 in comparison with the German units (panel B), and among the bigger group, the response was stronger and was equal to -903. In conclusion, as it was expected, the larger companies the stronger was the change in the capital structure.

8.2.2. Median and the interval of +-15%

This subsection, similarly as the previous one, focus on some intervals around the median as a threshold regarding the size of the Austrian units. Nevertheless, as a variation of the above subsection, I look at the enterprises with the distance from the middle point at the level of 15%. The logic behind this method is to investigate two aspects. Firstly, I aim to compare, as previously, the results considering the interval of 15%. Secondly, I want to discuss the outcome in comparison to the above subchapter. Again, as it was already mentioned and explained, I would expect bigger companies, namely those with the size at the minimum level of 115% (equals to € 183226), to react stronger to the corporate income tax reform from

2005. Smaller companies with the total assets at the level of € 135428 which is 85% of the median of the treated units are supposed to response weaker.

As it can be concluded from the *Table VII* with the display of the regression output for these two clusters, the stated hypothesis can be confirmed. Again, both tests, the F-test and the t-test, in each panel are statistically significant at the level of 99%. The coefficient estimated for the bigger group of the enterprises with the total assets higher or equal to 115% of the median tells that the response was stronger in comparison to the group with smaller companies. For the first one the difference in the debt-to-equity ratio between Austrian and German units is supposed to be at the level of -1010, compared to the difference among smaller firms (equals -850). Furthermore, taking into consideration the outcomes from the 8.1. chapter, all of the output from the dataset considered acknowledges the stated hypothesis. The larger the companies regarding to their size, and thus smaller the amount of the units included, the stronger the response in terms of the capital structure (*Table VI* and *Table VII*).

9. Announcement effect

In this chapter I want to investigate whether the announce of the corporate income tax change affected the financing decisions. The difference between this section and previously discussed is that I focus not only on the period when the reform entered into force, namely in 2005, but in the year when the information regarding the future tax change became public, at the beginning of 2004.[37] Companies, after receiving the information regarding the tax reform which is planned to occur in 2005, could react immediately without waiting until the reform enters into force. They could adjust their financing decisions and adapt the leverage ratio in such way the after-tax value of the firms' total cash-flows is maximized.

[37] M. Mahovsky (2004)

In order to check if this concern is addressed properly, I regress the dependent variable on the intersection of the units from the treated group and these which were existing after the year when the information was announced, 2004. In other words, the idea and procedure of the matching difference-in-differences stays constant (compared to the explanations in the previous chapters), but the year of the entrance into force, 2005, is replaced by the year of the announcement of the reform, 2004.

Table VIII shows the results of the regression and includes three panels: A, B and C. The first one displays the outcomes for all of the considered companies. The relatively high p-value, for both significance tests: the F-test and the t-test, equals to 0,156, indicates that the null hypothesis cannot be rejected at any of the significance level. Thus, the model and the coefficient do not explain much. However, taking into account the obtained significance level, the response of the Austrian companies compared to the German ones among the matched pairs is lower than the response received in the regression for, when the reform was introduced, 2005 (see *The basic* model).

The panel B and C present results for two groups where the critical point, as in the *Median as the threshold* chapter, the middle point divides the observations into two groups. The response among smaller companies, shown in the panel B, differ very slightly from the "basic" version discussed in the 8.2 chapter. The estimator (36.8) tells that the leverage ratio was not lowered across the treated companies after the tax reform was announced. However, the p-value (at the level of 0.41) indicates that the model for this group of enterprises does not have a predictive power.

Panel C is dedicated for the bigger companies and differs in the outcomes from the "basic" version. The explanatory power of the model and the coefficient itself, according to the p-value (equals to 0.93), is statistically significant at the level of 90%. The estimators of the coefficient allows me to draw a conclusion that the large treated companies, at least those which are bigger than the medium of the total assets, differ in their leverage ratio from the German companies by 525. Due

to the fact that this distinction is lower than the "basic" version (*Table V*, panel B), which was at the level of -963, I can argue that the treated units responded more strongly after the reform entered into force and not only when it was announced. The findings seem convincing to me, due to the fact that until 2005 the firms could still exploit the tax advantage of the debt.

10. Conclusion

Optimal financing policy that maximizes the after-tax value of cash flows is a broadly discussed topic in the corporate finance literature, and there are many factors that impact on the decisions. One of the determinants is the tax, more precisely the corporate income tax which was the point of this paper. This master's thesis tries to answer the question whether the firms and their capital structure depend on the tax changes.

Focusing on the exogenous variation in the tax and the tax benefits with respect to the debt financing I show that there were responses in the financing decisions among the tested companies. For the purpose of the investigation, I use the tax reform that happened in Austria in 2005 which reduced the corporate income tax from 34% to 25% and observe the changes in the capital structure across Austrian enterprises for the sample period from 2002 to 2008. To better estimate the effects and isolate some simultaneous influences, I compare the movements with the ones that occurred among the German control group of firms. I match each unit from Austria with one from Germany on the base of the smallest difference between their size in terms of total assets on 2002.

The results show that there was a huge decrease in the debt-to-equity ratio of Austrian companies compared to the German ones. However, the response among small firms is not remarkable. These outcomes confirm the hypothesis that states that the fiscal policy plays a big role regarding the leverage ratio and financial decisions. By encouraging companies to use equity as a source of financing, government increases the likelihood that bondholder will be paid back in case of the bad economy state.[38]

My paper contributes to the topic regarding the financing policy by demonstrating that changes in corporate income tax can meaningfully impact on the companies' capital

[38] F. Panier, F. Pérez-González, and P. Villanueva (2015)

structure. Nevertheless, there are many other factors which potentially affect the structure and which need to be examined in the empirical researches.

REFERENCES

P. Allison, "*Fixed Effects Regression Methods for Longitudinal Data Using SAS*", chapter 5, 2005.

J. Angrist, J. Pischke, "*Mostly Harmless Econometrics: An Empiricst's Companion*", chapter 5, 2009.

F. Breuss, S. Kaniovski, M. Schratzenstaller, „*Steuerreform 2004/05 – Maßnahmen und makroökonomische Effekte*", Monatsberichte 8/2004, p. 627-643, 2004.

C. Brooks, "*Introductory Econometrics for Finance*", 0th Edition, publisher: Cambridge University Press p. 102, 2002.

H. Daske, G. Gebhardt, „*International Financial Reporting Standards and Experts' Perceptions of Disclosure Quality*", ABACUS, Vol. 42, Nos 3/4, p. 461-498, 2006.

M. Fraser and S. Guo, "*Propensity Score Analysis: Statistical Methods and Applications*", 2nd ed., p. 49, 2010.

J. Graham, "*Taxes and Corporate Finance*", Handbook of Corporate Finance, Empirical Corporate Finance, Elsevier Science, Amsterdam, 2008.

J. Heckman, H. Ichimura, and P. Todd, "*Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme.*" The Review of Economic Studies, Vol. 64, pp. 605-654, 1997.

K. Imai, G. King, E. Stuart, "*Matching as nonparametric preprocessing for reducing model dependence in parametric causal inference. Political Analysis.*", p. 199–236, 2007.

G. Imbens, D. Rubin, "*Causal Inference for Statistics, Social, and Biomedical Sciences: An Introduction*", chapters 12-18, 2015

F. Longstaff, I. Strebulaev, "*Corporate taxes and capital structure: a long-term historical perspective*", NATIONAL BUREAU OF ECONOMIC RESEARCH, p.1-12,2018.

J. Mackie-Mason, "*Do Taxes Affect Corporate Financing Decisions?*" The Journal of Finance, Vol. 45, pp. 1471-1493, 1990.

M. Mahovsky, "*Tax cuts in Austria – Placebo or genuine reform?"*, ECFIN COUNTRY FOCUS, Volume I, Issue 6, 2004.

H. Milton; A. Raviv, "*The Theory of Capital Structure.*", Journal of Finance, 46 (1), p. 297-355, 1991.
F. Panier, F. Pérez-González, and P. Villanueva, "*Capital structure and taxes: What happens when you (also) subsidize equity?*", 2015.

L. Popescu, S. Visinescu, "*A review of the capital structure theories*", p. 315-320.

R. Rajan, L. Zingales, „*What do we know about capital structure? Some evidence from international data*", Cambridge, p. 1-23, 1994.

J. Shoven, J. Waldfogel, "*Debt, Taxes and Corporate Restructuring*", Brookings Institution Press, p. 190 & 767-792, 1990.

H. Smith, "*Matching with multiple controls to estimate treatment effects in observational studies*", Volume 27, Issue 1, p. 325–353, 1997.

G. Snedecor, W. Cochran. "*Statistical Methods*." Iowa State University Press, 1980.

l. Strebulaev, "*Do Tests of Capital Structure Theory Mean What They Say?*" The Journal of Finance, Vol. 62, pp. 1747–1787, 2007.

E. Stuart, "*Matching methods for causal inference: A review and a look forward*", p.1-21, 2010.

S. Titman, R. Wessels, „*The Determinants of Capital Structure Choice.*", Journal of Finance, 43(1), p. 1–19, 1988.

APPENDIX

FIGURES

FIGURE 1.
COMMON TRENDS IN AUSTRIA AND GERMANY
GDP GROWTH

This graph puts emphasis on the tight correlation and links between Austria and Germany. It presents the gross domestic product (GDP) growth rate at the country level for both economies. The years of the sample period, from 2002 to 2008, are placed on the X-axis. The correlation coefficient between the GDP growth in Austria and in Germany is 0.93.

Source: author's calculations based on data obtained from *countryeconomy.com/gdp*

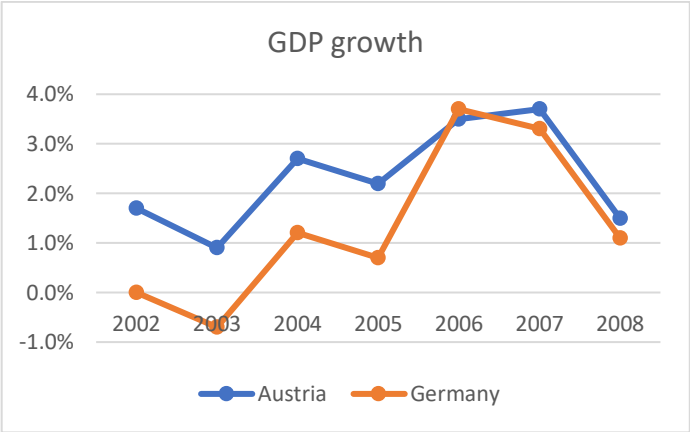


FIGURE 2.
MOVEMENT OF THE TOTAL ASSETS IN AUSTRIA AND GERMANY
MEDIAN

This chart presents the movement among total assets over the sample period in Austria and Germany. The number of observations varies slightly over time – for Austria it is from 90 (in 2002) to 98 and for Germany from 115 (in 2002 and 2008) and 133. The most crucial period that allows me to observe the trends prior to the reform is the time before 2005. Up to this point there is a similar trend in these observables across both economies.

Source: author's calculations based on data obtained from Worldscope lists.

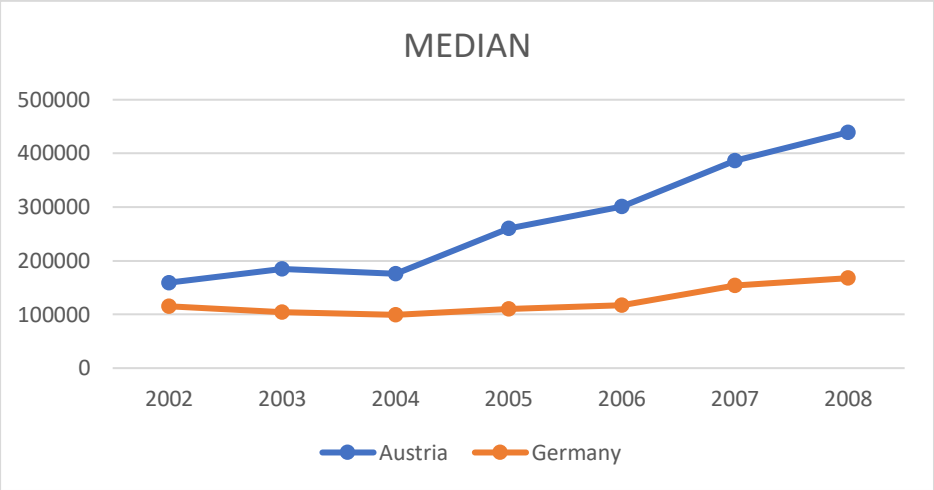


FIGURE 3.
MOVEMENT OF THE TOTAL ASSETS IN AUSTRIA AND GERMANY
MEAN

This diagram indicates the development among the debt-to-equity ratio from 2002 to 2008 in both economies. The numbers of observations is exactly the same as in the figure 2. The movement also are not necessarily the same but do follow a similar pattern over the whole sample period.

Source: author's calculations based on data obtained from Worldscope lists.

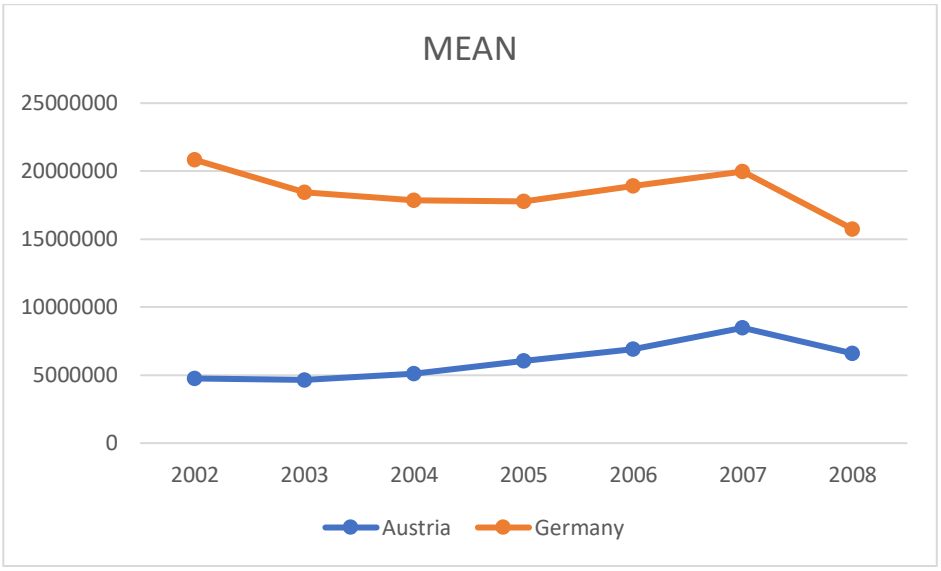
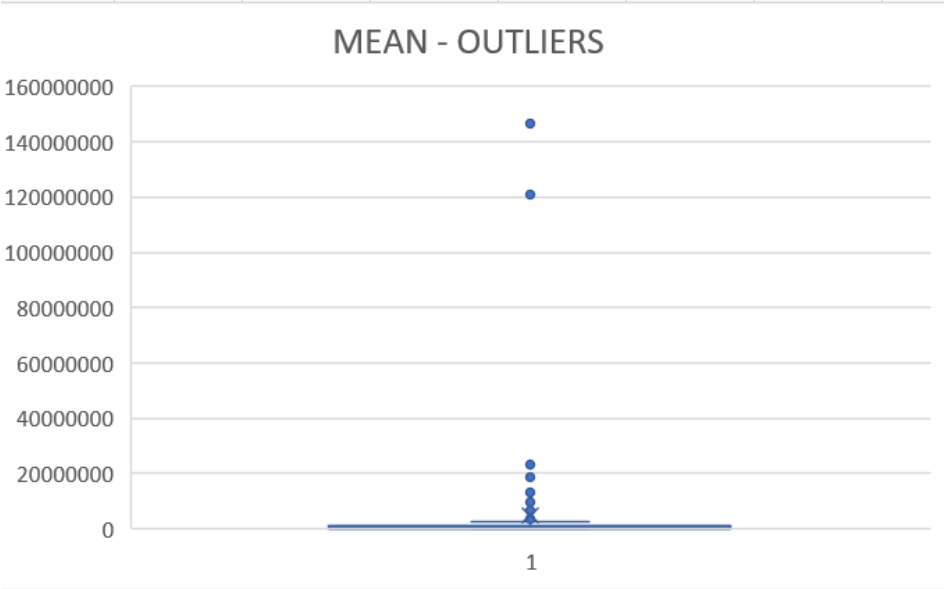


FIGURE 4.
MEAN OF THE TOTAL ASSETS OF THE AUSTRIAN COMPANIES. OUTLIERS

This graph shows the outliers across the value of the total assets of all treated companies from the Worldscope lists used for the purpose of the matching procedure in 2002.



TABLES

TABLE I.
SUMMARY STATISTICS

This table shows information with respect to total assets (panel A as well as panel C) and to the debt-to-equity ratio (panel B and panel D) for all firms taken into account from Austria and Germany from 2002 to 2008. The first two panels (panel A and panel B) show the information regarding the "raw" data before the matching. The two last panels (panel C and panel D) consider the pair that were matched.

Total assets are presented in EUR as the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. In panel A all available companies, that were selected as the reliable data, are considered.

Panel B shows the debt-to-equity ratio for the whole sample. The ratio is calculated as the sum of debt (long term and short term debt and current portion of long term debt), which is divided by the common equity. For an easier interpretation, the number is multiplied by 100, that means that the number of debt in the table presents the debt for €100 of equity.

Source: author's calculations in STATA based on data obtained from the datastream Worldscope.

*Panel A. TOTAL ASSETS FOR THE GROUPS **BEFORE** THE MATCHING*

stats	totala~A	totala~D
N	669	875
mean	6,091,026	18,502,228
p50	277,079	123,950
min	28	24
max	208,314,000	1041066000
sd	23,539,935	100,062,283

*Panel B. THE DEBT-TO-EQUITY RATIO FOR THE GROUPS **BEFORE** THE MATCHING*

stats	debteq~A	debteq~D
N	626	764
mean	297	240
p50	71	44
min	-2,326	-19,293
max	8,718	17,212

*Panel C. TOTAL ASSETS FOR THE GROUPS **AFTER** THE MATCHING*

stats	totala~A	totala~D
N	669	698
mean	6,091,026	5,559,903
p50	277,079	192,359
min	28	24
max	208,314,000	152,965,178
sd	23,539,935	21,838,012

*Panel D. THE DEBT-TO-EQUITY RATIO FOR THE GROUPS **AFTER** THE MATCHING*

stats	debteq~A	debteq~D
N	626	640
mean	297	313
p50	71	42
min	-2,326	-19,293
max	8,718	17,212

TABLE II.
ONE SAMPLE T – TEST

This table displays the one sample t- test with regard to the difference in the total assets. The variable tested is called difTA and stays for the difference in the value of the total assets for the treated and untreated groups. The test is done for the confidence interval (CI) at the level of 95% and contains the 90 pairs of the companies. The stated hypothesis, namely that the difference a significance level of 0.05 is not significant, is confirmed.

Source: author's calculations in STATA based on data obtained from Worldscope lists.

One-sample t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
difTA	90	453927.7	360464.8	3419670	-262308.2	1170164

mean = mean(**difTA**) t = **1.2593**
Ho: mean = **0** degrees of freedom = **89**

Ha: mean < **0** Ha: mean != **0** Ha: mean > **0**
Pr(T < t) = **0.8944** Pr(|T| > |t|) = **0.2112** Pr(T > t) = **0.1056**

TABLE III.
REGRESSION THE DEBT-TO-EQUITY RATIO ON THE INTERSECTION OF THE TREATED UNITS AND THESE EXISTING AFTER 2005

This table shows the regression the dependent variable, the debt-to-equity ratio, on the intersection of the treated companies which were existing after the reform enter into force in 2005. Without the fixed – effects specifications (panel A) and with the fixed – effect specifications, which is supposed to control for determining factors that are relevant for an individual company (panel B). In panel B I cluster the standard errors over the pairs. From these table can be interpreted the impact of the coefficient, as well as the significance of each coefficient and the whole model with regard to the predictive power.

Source: author's calculations in STATA based on data obtained from Worldscope lists.

Panel A. REGRESSION FOR THE BASIC MODEL, WITHOUT THE FIXED-EFFECTS

Source	SS	df	MS		
				Number of obs	= **574**
				F(1, 572)	= **8.13**
Model	**34025697.4**	**1**	**34025697.4**	Prob > F	= **0.0045**
Residual	**2.3935e+09**	**572**	**4184452.13**	R-squared	= **0.0140**
				Adj R-squared	= **0.0123**
Total	**2.4275e+09**	**573**	**4236531.09**	Root MSE	= **2045.6**

difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
1.post2005	**-489.8081**	**171.7678**	**-2.85**	**0.005**	**-827.1806**	**-152.4355**
_cons	**149.0093**	**127.8496**	**1.17**	**0.244**	**-102.1026**	**400.1213**

Panel B. REGRESSION FOR MODEL, WITH THE FIXED-EFFECTS

Fixed-effects (within) regression — Number of obs = 580
Group variable: **pair** — Number of groups = 91

R-sq:
within = 0.0151
between = 0.0867
overall = 0.0171

Obs per group:
min = 3
avg = 6.4
max = 7

F(1,90) = 5.86
corr(u_i, Xb) = 0.0541 — Prob > F = 0.0175

(Std. Err. adjusted for 91 clusters in pair)

difference	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
1.post2005	-391.9094	161.8946	-2.42	0.017	-713.5413	-70.2776
_cons	147.7303	89.04202	1.66	0.101	-29.1672	324.6278

TABLE IV.

REGRESSION THE DEBT-TO-EQUITY RATIO ACCORDING TO THE SIZE OF THE TREATED COMPANY

This table presents the regression the debt-to-equity ratio, on the intersection of the treated companies which were existing after the reform enter into force in 2005. The main focus here is focusing on one of the three groups of the treated units with regard to their size. The enterprises were divided into small ones (the total assets below the level of € 75000 – presented in panel A), the medium one (between € 75000 € 1000000 – shown in panel B), and the large ones (over €1000000, in panel C).

All of these regressions are made without the fixed – effects specifications. These panels show the impact of the coefficient, their significance and the explanatory power of the whole model.

Source: author's calculations in STATA based on data obtained from Worldscope lists.

*Panel A. REGRESSION FOR THE **SMALLEST** GROUP*

Source	SS	df	MS	Number of obs	=	138
				F(1, 136)	=	1.18
Model	82297.0114	1	82297.0114	Prob > F	=	0.2798
Residual	9507336.92	136	69906.8891	R-squared	=	0.0086
				Adj R-squared	=	0.0013
Total	9589633.94	137	69997.328	Root MSE	=	264.4

difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
1.post2005	49.26162	45.40217	1.09	0.280	-40.52393	139.0472
_cons	-24.342	34.13378	-0.71	0.477	-91.84362	43.15962

*Panel B. REGRESSION FOR THE **MEDIUM** GROUP*

```
.
. reg difference i.post2005
```

Source	SS	df	MS	Number of obs	=	224
				F(1, 222)	=	2.33
Model	7990331.95	1	7990331.95	Prob > F	=	0.1283
Residual	761401224	222	3429735.24	R-squared	=	0.0104
				Adj R-squared	=	0.0059
Total	769391556	223	3450186.35	Root MSE	=	1852

difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
1.post2005	-380.3066	249.1619	-1.53	0.128	-871.3318	110.7187
_cons	132.3046	186.1284	0.71	0.478	-234.5	499.1093

*Panel C. REGRESSION FOR THE **LARGEST** GROUP*

Source	SS	df	MS	Number of obs	=	199
				F(1, 197)	=	2.99
Model	25553721.1	1	25553721.1	Prob > F	=	0.0855
Residual	1.6850e+09	197	8553072.64	R-squared	=	0.0149
				Adj R-squared	=	0.0099
Total	1.7105e+09	198	8638934.5	Root MSE	=	2924.6

difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
1.post2005	-718.2228	415.5212	-1.73	0.085	-1537.664	101.2179
_cons	101.1083	303.2631	0.33	0.739	-496.9506	699.1671

TABLE V.

REGRESSION THE DEBT-TO-EQUITY RATIO WITH REGARD TO THE MEDIAN OF THE TOTAL ASSETS IN THE GROUP OF THE TREATED UNITS

In this table are shown the results of the regression for two groups. The critical point which indicates the threshold is the median of the total assets among the treated units used for the matching in 2002. The middle point, equal to €159327, split the enterprises into two groups – below, presented in panel A, and above, displayed in panel B. These table is expanded by two additional panel, A.a and B.b which shows those two groups with the fixed-effect specifications, for the group low and above the median, respectively.

Source: author's calculations in STATA based on data obtained from Worldscope lists.

*Panel A. REGRESSION FOR THE GROUP **BELOW** THE MEDIAN*

Source	SS	df	MS	Number of obs	=	230
				F(1, 228)	=	0.76
Model	74388.8112	1	74388.8112	Prob > F	=	0.3831
Residual	22212628.1	228	97423.8075	R-squared	=	0.0033
				Adj R-squared	=	-0.0010
Total	22287016.9	229	97323.218	Root MSE	=	312.13

difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
1.post2005	36.20034	41.42775	0.87	0.383	-45.42987	117.8305
_cons	13.40255	30.90526	0.43	0.665	-47.4939	74.299

*Panel A.a. REGRESSION FOR THE GROUP **BELOW** THE MEDIAN WITH FIXED-EFFECTS*

Fixed-effects (within) regression — Number of obs = 230
Group variable: **pair** — Number of groups = 34

R-sq:
within = 0.0039
between = 0.0054
overall = 0.0033

Obs per group:
min = 5
avg = 6.8
max = 7

F(1,33) = 0.77
corr(u_i, Xb) = 0.0044 — Prob > F = 0.3856

(Std. Err. adjusted for 34 clusters in pair)

difference	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
1.post2005	34.93797	39.736	0.88	0.386	-45.90553	115.7815
_cons	14.10509	22.11395	0.64	0.528	-30.88608	59.09625

*Panel B. REGRESSION FOR THE GROUP **ABOVE** THE MEDIAN*

Source	SS	df	MS	Number of obs	=	333
				F(1, 331)	=	10.74
Model	75487199.2	1	75487199.2	Prob > F	=	0.0012
Residual	2.3256e+09	331	7026026.65	R-squared	=	0.0314
				Adj R-squared	=	0.0285
Total	2.4011e+09	332	7232235	Root MSE	=	2650.7

difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
1.post2005	-956.9464	291.9482	-3.28	0.001	-1531.254	-382.6384
_cons	403.4904	216.4259	1.86	0.063	-22.25331	829.2341

*Panel B.b. REGRESSION FOR THE GROUP **ABOVE** THE MEDIAN WITH FIXED-EFFECTS*

Fixed-effects (within) regression — Number of obs = 333
Group variable: **pair** — Number of groups = 54

R-sq:
within = 0.0300
between = 0.0942
overall = 0.0314

Obs per group:
min = 1
avg = 6.2
max = 7

F(1,53) = 7.01
corr(u_i, Xb) = 0.0651 — Prob > F = 0.0107

(Std. Err. adjusted for 54 clusters in pair)

difference	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
1.post2005	-728.8996	275.3681	-2.65	0.011	-1281.218	-176.5811
_cons	278.1674	151.3284	1.84	0.072	-25.35896	581.6938

TABLE VI.

REGRESSION THE DEBT-TO-EQUITY RATIO WITH REGARD TO THE MEDIAN OF THE TOTAL ASSETS IN THE GROUP OF THE TREATED UNITS AND THE INTRVAL OF +-5%

This table is dedicated to investigate two groups of the treated units with respect to their size. There are two groups which contain companies bigger than the median and the interval of 5% being apart from the threshold. One of the cluster, displayed in panel A, includes 58 treated companies bigger than 105% of the median in 2002 (at the level of € 167293), and 62 treated units whose total assets were bigger than 95% of the middle point (equals to € 151630) are presented in panel B.

Source: author's calculations in STATA based on data obtained from Worldscope lists.

Panel A. REGRESSION FOR THE GROUP OF AUSTRIAN FIRMS BIGGER THAN 105% OF THE MEDIAN

Source	SS	df	MS	Number of obs	=	314
				F(1, 312)	=	8.64
Model	63177804.6	1	63177804.6	Prob > F	=	0.0035
Residual	2.2809e+09	312	7310565.83	R-squared	=	0.0270
				Adj R-squared	=	0.0238
Total	2.3441e+09	313	7489055.41	Root MSE	=	2703.8

difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
1.post2005	-903.756	307.4287	-2.94	0.004	-1508.652	-298.8604
_cons	330.9853	230.1632	1.44	0.151	-121.8831	783.8537

Panel B. REGRESSION FOR THE GROUP OF AUSTRIAN FIRMS BIGGER THAN 95% OF THE MEDIAN

Source	SS	df	MS	Number of obs	=	364
				F(1, 362)	=	9.92
Model	64238909.1	1	64238909.1	Prob > F	=	0.0018
Residual	2.3432e+09	362	6472791.76	R-squared	=	0.0267
				Adj R-squared	=	0.0240
Total	2.4074e+09	363	6631927.07	Root MSE	=	2544.2

difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
1.post2005	-844.8078	268.1666	-3.15	0.002	-1372.168	-317.4478
_cons	344.608	199.2746	1.73	0.085	-47.27326	736.4893

TABLE VII.

REGRESSION THE DEBT-TO-EQUITY RATIO WITH REGARD TO THE MEDIAN OF THE TOTAL ASSETS IN THE GROUP OF THE TREATED UNITS AND THE INTRVAL OF +-15%

This table is dedicated to investigate two groups of the treated units with respect to their size. There are two groups which contain companies bigger than the median and the interval of 15% being apart from the threshold. One of the cluster, displayed in panel A, includes treated companies bigger than 115% of the median in 2002 (at the level of € 183226), and treated units whose total assets were bigger than 85% of the middle point (equals to € 135428) are presented in panel B.

Source: author's calculations in STATA based on data obtained from Worldscope lists.

Panel A. REGRESSION FOR THE GROUP OF AUSTRIAN FIRMS BIGGER THAN 115% OF THE MEDIAN

Source	SS	df	MS	Number of obs	=	313
				F(1, 311)	=	10.73
Model	79374090.9	1	79374090.9	Prob > F	=	0.0012
Residual	2.3010e+09	311	7398777.01	R-squared	=	0.0333
				Adj R-squared	=	0.0302
Total	2.3804e+09	312	7629467.12	Root MSE	=	2720.1

difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
1.post2005	-1010.385	308.4804	-3.28	0.001	-1617.358	-403.4126
_cons	406.4191	226.6724	1.79	0.074	-39.58638	852.4246

Panel B. REGRESSION FOR THE GROUP OF AUSTRIAN FIRMS BIGGER THAN 85% OF THE MEDIAN

Source	SS	df	MS	Number of obs	=	365
				F(1, 363)	=	10.20
Model	65269159.9	1	65269159.9	Prob > F	=	0.0015
Residual	2.3234e+09	363	6400655.32	R-squared	=	0.0273
				Adj R-squared	=	0.0246
Total	2.3887e+09	364	6562381.98	Root MSE	=	2530

difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
1.post2005	-850.1205	266.2188	-3.19	0.002	-1373.645	-326.5958
_cons	350.4576	197.556	1.77	0.077	-38.04045	738.9556

TABLE VIII.

REGRESSION THE DEBT-TO-EQUITY RATIO ON THE INTERSECTION OF THE TREATED UNITS AND THESE EXISTING AFTER THE ANNOUNCEMENT OF THE REFORM IN 2004

This table shows the regression the dependent variable, the debt-to-equity ratio, on the intersection of the treated companies which were existing after the reform was planned and publicly announced in 2004. The firms could start taking actions regarding their financing decisions already in 2004. Panel A is dedicated for all of the companies which were taken into account. Panel B and panel C are restricted, as it was in the table V, and present the results for the firms whose total assets are below the median (€159327) across Austrian companies and above it, respectively.

Source: author's calculations in STATA based on data obtained from Worldscope lists.

Panel A. REGRESSION FOR THE MODEL CONSIDERING ALL OF THE TREATED UNITS

Source	SS	df	MS	Number of obs	=	572
				F(1, 570)	=	2.01
Model	8564478.9	1	8564478.9	Prob > F	=	0.1564
Residual	2.4244e+09	570	4253293.8	R-squared	=	0.0035
				Adj R-squared	=	0.0018
Total	2.4329e+09	571	4260844.04	Root MSE	=	2062.4

difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
1.post2004	-268.6601	189.3282	-1.42	0.156	-640.5262	103.206
_cons	69.26566	159.1139	0.44	0.663	-243.2554	381.7867

*Panel B. REGRESSION FOR THE GROUP **BELOW** THE MEDIAN*

Source	SS	df	MS	Number of obs	=	230
				F(1, 228)	=	0.66
Model	64693.7832	1	64693.7832	Prob > F	=	0.4161
Residual	22222323.1	228	97466.3295	R-squared	=	0.0029
				Adj R-squared	=	-0.0015
Total	22287016.9	229	97323.218	Root MSE	=	312.2

difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
1.post2004	36.75219	45.11067	0.81	0.416	-52.13492	125.6393
_cons	7.662501	37.85932	0.20	0.840	-66.93639	82.26139

*Panel C. REGRESSION FOR THE GROUP **ABOVE** THE MEDIAN*

Source	SS	df	MS	Number of obs	=	343
				F(1, 341)	=	2.84
Model	19825265.3	1	19825265.3	Prob > F	=	0.0926
Residual	2.3773e+09	341	6971572.34	R-squared	=	0.0083
				Adj R-squared	=	0.0054
Total	2.3971e+09	342	7009156.24	Root MSE	=	2640.4

difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
1.post2004	-525.9542	311.8917	-1.69	0.093	-1139.428	87.51963
_cons	252.1548	261.4359	0.96	0.335	-262.0753	766.385

CODE USED IN STATA

```
set more off, perm
    /*                    Preparing data                    */
global dir = "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA project"
import excel "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA
project\DATA_Datastream_selected_relevant_2002_2008.xlsx",
sheet("TotalDebtCommonEquity_A") firstrow clear
/*importing data - leverage ratio (debt to equity) for firms from Austria*/

//make names distinguishable based on first 6 letters
capture rename CAIMMOINT CAIMMINT
capture rename VORARLBERGERBANK VORABA
capture rename WIENERPRIVAT WIENPRIVAT
capture rename AUSTRIAEMAIL AUSTEMAIL

foreach x of var ATEC-ZUMT {
    local sub = substr("`x'",1,6)
    display "`sub'"
    rename `x' debtequity_A`sub'
}
/*changing name for all columns as debtequity*/

rename Name year_A
/*changing name for the first column*/

destring *, replace
reshape long debtequity_A, i(year_A) j(name_A) string
/*converting data  from wide to long - to marger later on */

save "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA project\debtequity_A.dta", replace
/*saving data as debtequity ratio for Austria*/

import excel "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA
project\DATA_Datastream_selected_relevant_2002_2008.xlsx", sheet("TotalAssets_A") firstrow
clear
/*importing data - TOTAL ASSETS for firms from Austria*/
```

```
//make names distinguishable based on first 6 letters
capture rename CAIMMOINT CAIMMINT
capture rename VORARLBERGERBANK VORABA
capture rename WIENERPRIVAT WIENPRIVAT
capture rename AUSTRIAEMAIL AUSTEMAIL

foreach x of var ATEC-ZUMT {
    local sub = substr("`x'",1,6)
    display "`sub'"
    rename `x' totalassets_A`sub'
}
/*changing name for all columns as totalassets*/

rename Name year_A
/* the name of the first column changed */

destring *, replace
reshape long totalassets_A, i(year_A) j(name_A) string
/*converting data  from wide to long - to marger later on */

save "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA project\totalassets_A.dta", replace
/*saving data as totala assets ratio for Austria*/

merge 1:1 name year_A using "$dir/debtequity_A.dta"
/*merging one-to-one two files - total assets and debt equity ratio - both for firm from Austria*/
drop _merge
/*deleting one column which appears in both files*/

gen post2005 = (year_A >= 2005)
/* generating a variable for Austrian firms which exist after 2005 (year of the tax change in
Austria)*/
gen treated = 1
/*generating a dummy variable which = 1 if the company exists after 2005 and was affected by the
tax reform */

egen firm =group(name)
/*Austrian firms' name shown numerical*/
```

```
xtset firm year
/*data as paneldata and time-dimension*/

save "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA project\output_A.dta", replace
/*saving the whole data*/

    /*                    for German firms                    */

import excel "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA
project\DATA_Datastream_selected_relevant_2002_2008.xlsx", sheet("TotalAssets_D") firstrow
clear
/*importing data - Total Assets for firms from Germany*/

//make names distinguishable based on first 6 letters
capture rename CAIMMOINT CAIMMINT
capture rename VORARLBERGERBANK VORABA
capture rename WIENERPRIVAT WIENPRIVAT
capture rename AUSTRIAEMAIL AUSTEMAIL

rename ABWICKLUNGSGE AAWICKLUNG
rename ADVANCEDPHOTONICS ADVANPHOTONICS
rename BREMERLAGERHAUS BBREMERLAGERHAUS
rename ALLIANCEHEALTHCARE ALLOANCEHEALTHCARE
/*changing names for companies so the first 6 letters of each differ*/

foreach x of var AMOK-BROA {
    local sub = substr("`x'",1,6)
    display "`sub'"
    rename `x' totalassets_D`sub'
}
/*changing name for all columns as debtequity*/

rename Name year_D
/*changing name for the first column*/

destring *, replace
reshape long totalassets_D, i(year_D) j(name_D) string
```

```
/*converting data  from wide to long - to marger later on */

save "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA project\totalassets_D.dta", replace
/*saving data as totala assets ratio for Germany*/

import excel "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA
project\DATA_Datastream_selected_relevant_2002_2008.xlsx",
sheet("TotalDebtCommonEquity_D") firstrow clear
/*importing data - leverage ratio (debt to equity) for firms from Germany */

//make names distinguishable based on first 6 letters
capture rename CAIMMOINT CAIMMINT
capture rename VORARLBERGERBANK VORABA
capture rename WIENERPRIVAT WIENPRIVAT
capture rename AUSTRIAEMAIL AUSTEMAIL

rename ABWICKLUNGSGE AAWICKLUNG
rename ADVANCEDPHOTONICS ADVANPHOTONICS
rename BREMERLAGERHAUS BBREMERLAGERHAUS

foreach x of var AMOK-BRIL {
    local sub = substr("`x'",1,6)
    display "`sub'"
    rename `x' debtequity_D`sub'
}
/*changing name for all columns as debtequity*/

rename Name year_D
/* the name of the first column changed */

destring *, replace
reshape long debtequity_D, i(year_D) j(name_D) string
/*converting data  from wide to long - to marger later on */

save "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA project\debtequity_D.dta", replace
/*saving data as totala ssets ratio for Germany*/
```

```
merge 1:1 name year using "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA
project\totalassets_D.dta"
/* mergering one-to-one data from the file debtequity into the assets*/

gen post2005 = (year_D >= 2005)
/* generating a variable for Austrian firms which exist after 2005 (year of the tax change in
Austria)*/
gen treated = 0
/*generating a dummy variable which = 1 if the company exists after 2005 and was affected by the
tax reform */

egen firm =group(name)
/*Austrian firms' name shown numerical*/
xtset firm year
/*data as paneldata and time-dimension*/
drop _merge
/*deleting one column which appears in both files*/
save "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA project\outcomes_D.dta", replace

    /*                          REGRESSION                          */

merge 1:1 _n using "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA
project\output_A.dta"
/*adding Austrian data*/
save "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA project\output_A&D.dta", replace
/*saving data from both groups from the whole sample period*/

    /*                          SUMMARY STATISTICS                  */

tabstat totalassets_A totalassets_D, s(n mean median min max sd) format(%12.0fc)
tabstat debtequity_A debtequity_D, s(n mean median min max sd) format(%12.0fc)

/*                          DiD                                     */

/*                          MATCHING                            */
use "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA project\outcomes_D.dta", clear
/*preparing firms from Germany*/
```

```
keep if year ==2002
/*keeping year 2002 as a basic one - for this year pairs are being matched (from both groups) */

save "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA
project\prepared_for_matching_D.dta", replace
/*saving German firms, from the beginning of the sample period, based on them the matching will
be proceed*/

use "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA project\output_A.dta", clear
/*preparing firms from Austria*/
keep if year ==2002
/*keeping year 2002 as a basic one - for this year pairs are being matched (from both groups)*/
/*

        /////*          CASES - optionally one to be chosen      *////

        /*      TESTING ACCORDING TO THE SIZE OF A COMPANY    */
keep if totalassets_A < 75000
/*focusing only on the group of small enterprises with the total assets below 75000EUR*/

keep if totalassets_A > 75000
keep if totalassets_A < 1000000
/*restrictions allowing me to take into account only the medium-size companies*/

keep if totalassets_A > 1000000
/*focusing only on the group of large enterprises with the total assets above 1000000EUR */

        /*          TESTING ACCORDING TO THE MEDIAN                    */

/* taking into consideration the median of Total Assets for Austrian companies and looking only at
these companies whose Total Assets are greater than median from the year 2002 equal to 159327
*/
keep if totalassets_A <= 159327
/*companies with the total assets below the median*/
keep if totalassets_A > 159327
/*companies with the total assets above the median*/
```

```
/*taking into consideration the median (+-5% and +-15%) of Total Assets for Austrian companies
and looking only at these companies whose Total Assets are greater than median from the year
2002 equal to 159327 */

keep if totalassets_A >= 167293.35
/*companies with the total assets above the level of 105% of the median*/

keep if totalassets_A >= 151360.65
/*companies with the total assets above the level of 95% of the median*/

keep if totalassets_A >= 183226
/*companies with the total assets above the level of 115% of the median*/

keep if totalassets_A >= 135427.95
/*companies with the total assets above the level of 85% of the median*/
*/

save "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA
project\prepared_for_matching_A.dta", replace

/*saving the chosen data for the treated group*/


cross using "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA
project\prepared_for_matching_D.dta"
/*adding German data- pairwise combination of two datasets - German and Austrian groups*/

save "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA project\matching.dta", replace
/*saving data from both groups*/

                /*      MATCHING BASED ON THE DIFFERENCE IN THE TOTAL ASSETS      */
gen dist = abs(log(totalassets_A)-log(totalassets_D))
/*nearest-neighbor matching" matching each Austrian firm with the control firm that minimizes the
distance (the difference in the value of total assets*/
sort name_A dist
/*sorting the firms from the smallest distance to the largest one based one the NN matching*/
by name_A: keep if _n==1
/*taking the smallest distance for the matching*/
```

```
save "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA project\matches.dta", replace
/*saving the matched pairs*/

use "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA project\output_A.dta", clear
/*adding data for Austrian companies for the rest of the sample period, for the following years - namely from 2003 to 2008 included*/

cross using "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA project\outcomes_D.dta"
/*adding data for German companies for the rest of the sample period, for the following years - namely from 2003 to 2008 included*/

joinby name_A name_D  using "C:\Users\skurpaska\Desktop\Uni Master\Inference\STATA project\matches.dta"
/*form the pairwise combinations within groups*/
keep if year_A ==year_D
/*keeping pairs from both groups only for the sample period*/
drop dist
/*deleting one column which appears in both files*/

        /*          SUMMARY STATISTICS AFTER MATCHING          */

tabstat totalassets_A totalassets_D, s(n mean median min max sd) format(%12.0fc)

tabstat debtequity_A debtequity_D, s(n mean median min max sd) format(%12.0fc)


        /*          CREATING THE DEPENDENT VARIABLE          */
gen difference = debtequity_A - debtequity_D
/*generating a DiD  between the debtequity ratio of Austrian and German firm*/

egen pair =group(name_A name_D)
/*names of the firms shown numerical*/

/*optional: TESTING THE SIGNIFICANCE OF THE DIFFERENCE IN TOTAL ASSETS - chapter 6.2
gen difTA = totalassets_A - totalassets_D
/*generating a new variable that is a difference between the total assets of Austrian and German companies*/
```

```
ttest difTA = 0
/*one sample t test testing if the difference is insignificant*/
*/
xtset pair year_A
/*data as paneldata*/

reg difference i.post2005,
/*regressing the dependent variable on the intersection of the treated firms (from Austria) which exist after 2005, without considering the fixed effect*/

xtreg difference i.post2005, fe cluster(pair)
/*fixed effect - using fixed effect estimators for firms which are trated and were existing after 2005 - an intersection of these two*/
```