5-2015

Corporate Leverage and Taxes around the World

Saralyn Loney
Utah State University

Corporate Leverage and Taxes around the World

Saralyn Loney

Utah State University

Abstract:

This paper analyzes the relationship between global corporate tax rates and leverage ratios. Theory suggests that firms facing a higher tax rate will have more debt, in order to maximize the effect of the tax savings provided by interest payments. This paper analyzes corporations around the world, including companies based in the United States. I show through this data that tax rates and leverage ratios do, in fact, have a positively correlated relationship. The high-leverage, high-tax firms should also have lower interest coverage ratios, due to the fact that they will pay more in interest because they hold more debt. These results indicate that the use of leverage as a tax benefit is upheld by firms in general.

I. Introduction

The combination of debt and equity a firm holds is known as capital structure. Corporations must weigh the benefits of issuing debt against the costs associated with such an issuance. Debt can be costly, and too much debt can be detrimental to a company. However, a company with little to no debt will benefit largely from issuing bonds. The benefits appear at tax time, due to what is known as the debt tax shield. A corporation calculates their income tax bill after all of their business expenses. By subtracting interest paid on debt from income, they save quite a bit of money. This is considered to shift wealth to equity holders, which is the primary goal of a corporation.

The savings in taxes is worthwhile provided it outweighs the cost of issuing the debt, or the amount of interest paid to the debt holders. A firm must also consider the cost of bankruptcy, as holding too much debt will increase their chances of going bankrupt. In countries such as the United States, which has one of the highest corporate tax rates in the world, this use of leverage to avoid taxation is often quite beneficial. Unless a company is over-levered, they will find savings in issuing debt and will likely do so. As found in Faulkender and Smith (2014), companies in the United States are even finding savings by extending operations to other countries with lower tax rates rather than pay the high U.S. tax rates. Unless the income earned abroad is repatriated, companies will avoid paying taxes at the high U.S. rate. This lowers the corporation's effective tax rate significantly. Desai, Foley and Hines (2004) examined similar data with more of a focus on the source of debt, and found that the same trend of increased leverage related to tax rates holds.

Corporations may fund their activities and investments through the issuance of debt or equity, or cash on hand. Understanding the choices a company makes is vital to empirical

researchers and the market. A low-risk, low-debt firm could be a good investment for a lender wishing to diversify their holdings, and could be charged a lower interest rate on a new debt issuance. Knowing the relationship between risk and return and realizing that the use of leverage in the United States can be used for the purpose of shielding income from taxation may help investors and researchers understand and forecast firm behavior.

In this paper, I am looking at whether or not the same use of leverage to protect income from governmental taxation is practiced globally. I am examining leverage with the same controls as Faulkender and Smith (2014) using a global data set. The difference is that Faulkender and Smith (2014) focuses on companies incorporated in the U.S. and their foreign holdings, while I examine companies incorporated around the world. They examined whether or not these companies used their foreign affiliates in the same way, shielding income from lower local tax rates through debt as well as avoiding U.S. high tax rates through their foreign affiliates. Their findings indicate that companies are, in fact, using both and show that taxes are of a first order concern.

Understanding the use of leverage is a cornerstone of corporate finance. Researchers need this information to analyze economic policy, banks may use it to help determine interest rates and to find new clients and key management in a corporation should be able to determine the optimal leverage ratio for the firm. Comprehending the exploitation of the debt tax shield can be beneficial to the entire market. For example, say a good financial economist went to work for a government entity. If she has a good understanding of this legal form of tax minimization, she may be able to help create policies that would beneficial to the United States as a whole. She may realize that a lower corporate tax rate in the U.S. would incentivize companies to abandon foreign affiliates and repatriate all funds. In so doing, they will

effectively create more jobs and increase the GDP of the United States. This would be highly beneficial to the country (or market) as a whole, and it all starts with an understanding of what the debt tax shield is and who is using it.

The benefits of using leverage to avoid taxation are high, but it has been repeatedly shown that firms do not fully utilize leverage. Companies in lower tax countries have debt, which may or may not be associated with taxes. However, we see that as tax rates increase, debt levels of companies subjected to those tax rates increases simultaneously. Mean and median leverage figures increase steadily with tax rate hikes. The data reflects that this relationship is positive and significant indicating that firms do have higher leverage when operating in countries with higher tax rates.

II. Data

The data used in this paper comes from COMPUSTAT. It is a compilation of financial reporting data and effective tax rates from 84 different countries. There are over 280,000 country-firm-year observations, which span over 1993 to 2013. The primary objects of concern are effective tax rates and leverage. Leverage is a simple calculation of debt over firm value. The dependent variable interest coverage is a ratio that indicates the ability of a firm to make interest payments on their debt. With simultaneous increases in debt and taxes, the interest coverage ratio should decrease because of the higher payments required on the additional debt.

The other dependent variables that this paper examines are two leverage measures, and are expected to have a positive relationship with effective tax rate. The first, book value leverage, is calculated as the sum of short- and long-term debt divided by the sum of total debt

and the book value of shareholders equity. The net book leverage ratio is the same as above, with total debt minus cash in the numerator. The final measure is related to interest coverage. This ratio is expected to have a negative relationship with the effective tax rate, since firms will have more debt and therefore be less able to pay their interest payments. The interest coverage ratio is defined as EBITDA divided by interest expense. The regression in the paper is run on the natural log of interest coverage, which is the natural log of 1 plus the interest coverage ratio. This was done in Faulkender and Smith (2014) which scales the annual cash flow obligations relative to the size of the firm.

III. Results

Table 1 shows summary statistics for all of the variables in the data set. It reflects the minimum, maximum, mean, median, standard deviation and sample size for each of the dependent and independent variables. This table gives a brief overview of what is contained in the sample. It is interesting to note that the net book leverage minimum and maximum are almost symmetrical around zero, but the mean and median are quite far from those values. Also, the range in values of the natural log of interest coverage is quite wide, indicating less consistency in that ratio.

The first column in table 2 contains summary statistics of leverage related to the effective tax rate for the entire data set. All ratios have been winsorized at the 95^{th} and 5^{th} percentiles, respectively. I have also removed negative and zero leverage. The data is separated into quartiles by effective tax rate. The first quartile, with the lowest mean and median tax rates, also contains firms with the lowest mean and median leverage to firm value ratio. The fourth quartile

has the highest mean and median tax rates, as well as the highest leverage ratios. Leverage and tax rates for the two middle firms also increase by quartile. Thus, these summary statistics show that with higher tax rates many corporations do, in fact, have more debt. As expected, with tax rate increases leverage ratios also tend to increase. This indicates that corporations do use debt as a tax shield, especially when they face high tax rates.

The second column of table 2 shows the interactive summary statistics for the interest coverage ratio related to the effective tax rate. The first quartiles show a low tax rate and a high interest coverage ratio. As we move down along each quartile, the tax rates increase and the interest coverage ratios decrease as expected. The fourth quartile, however, shows a spike in the interest coverage ratio. This is not intuitive, as these firms are shown to have more debt, and should therefore be less able to cover their interest payments. This is, however, only a summary statistic, and the results may hold as expected when controlling for access to the external market. The regression run below shows a positive relationship, so this anomaly in the last quartile may be strong enough to skew the results.

Table 3 shows the leverage book value, net book leverage and natural log of interest coverage regressions run with between effects. It is done this way because the between regressions average out the time component, which shows the results essentially as cross-sectional without a time variable. The time variable may cause relational errors, and where we don't expect companies to change their country of operation often, it makes sense to view the results as cross-sectional.

The first column of table 3 shows the results from the book value leverage regression. These results indicate a positive relationship between effective tax rates and leverage, consistent with corporate finance theory, Faulkender and Smith (2015), and my hypothesis in this study.

The regression gave a high t-statistic, so it is highly significant. This regression is also indicative of a positive relationship between book value leverage and sales, which makes sense. It would seem that firms with higher sales would be able to take on more debt. The coefficient on PP&E is also significantly positive.

The second column in table 3 shows the results from the regression on net book leverage. These results also indicate a positive relationship between leverage and tax rates. This is consistent with the results of the other regression and the expectations of this and other papers. The relationship between leverage and sales is again positive, along with PP&E. These results are consistent with the book value leverage regression, and further validate the inferences made about these relationships.

The final column in table 3 lists the results from the between effect regression on interest coverage. These results are just the opposite of the summary statistics relating interest coverage to tax rates. We see a positive coefficient on effective tax rate in this regression. This indicates that as tax rates increase, raising leverage ratios with it, the ability of the firms to pay back all of their interest payments on this debt also increase. Theory suggests that the relationship should be just the opposite, and this regression contradicts that and the summary statistics. Possible reasons for this discrepancy are errors across the time variable and the anomaly in the fourth quartile. Sales and interest coverage have a positive relationship in this regression. This makes sense because as sales increase, a firm will have more of an ability to pay back the interest on their debts. However, the coefficient on sales is not very high in this regression. Also, the coefficient on property, plant and equipment is negative.

Table 4 shows the regression results on book value leverage using OLS. This results in a positive, yet insignificant, coefficient on effective tax rates. The OLS regressions on the other

dependent variables brought about coefficients of opposite signage from the between effect regressions. This is inconsistent with the interactive results and the between effect regressions. These mixed results for the interest coverage regressions may be due to the fourth quartile, where the interest coverage ratio breaks pattern and increases in the highest tax bracket. The discrepancies in the net book leverage and insignificance in the book value leverage results may be related to an error in the data. I ran multiple regressions to account for various different factors. I included year dummies, removed year dummies, clustered the results by gvkey or country and tried different combinations of these things. My hypothesis is that the unbalanced nature of the time series within the cross-sectional data is causing the problem. That would explain why the between effect regressions hold the trend as expected, but OLS does not. The between effect regressions average out the time factor, and therefore yield proper results.

IV. Conclusion

The results shown in the between effect regressions on leverage substantiate the hypothesis in this paper and those of Faulkender and Smith (2015). It is quite clear that there is a positive relationship between the tax rates that companies face and their debt to firm value ratio. The best theoretical explanation for this, validated by the data, is that firms are using debt to shield a portion of their income from being taxed by the government. Debt is a great instrument to use for this purpose because interest payments are subtracted before income taxes are calculated. The more debt a company has, the less they will pay in taxes because less income will be subject to taxation. Firms will want to prevent over-levering their operation, which will have detrimental effects on the firm overall, as it will dramatically increase their likelihood of

bankruptcy and therefore increase their cost of leverage. Optimal capital structure balances the tax benefit of leverage with the cost of bankruptcy.

The interest coverage results, however, do not support these beliefs. As taxes rise, leverage rises. This should increase interest expense and therefore decrease the interest coverage ratio. Interest expense is the denominator of the interest expense ratio, so as it increases, the ratio overall should decrease. The regression, however, shows just the opposite. This may be due to errors in the time variable or the fourth quartile anomaly. These discrepancies are interesting, and should be explored further in a paper that researches this at a deeper level.

The contribution of this paper is that it shows that this positive relationship between leverage and tax rates across multiple countries of incorporation. Faulkender and Smith (2014) show that this trend holds within multinational corporations based in the United States, but has not looked beyond those borders at the rest of the world. In their working paper, Faulkender and Smith (2015) will look at the global trend, based on the same data used in this study. This paper will give them a starting place for evidence of a basic trend that they will then expand on.

The evidence in this paper is reliant on between effect regressions. This is sensible because these regressions average out the time component and shows the results as a time-averaged OLS. If the time component can be fixed or controlled, like it is in the between effect regressions, the trend holds significantly between leverage and taxes. The p-values from these regressions are quite low. The results may be stronger with more data, more time, or a better time measure. This paper does have enough evidence, though, to support a likely trend worldwide. The theory that corporate tax rates do play a role in capital structure is supported by this paper, among many others, and is therefore probable, not only for corporations based in the United States, but those all over the world as well.

References:

Desai, Mihir A, C. Fritz Foley, and James R. Hines Jr., 2004, A Multinational Perspective on Capital Structure Choice and Internal Capital Markets., *Journal of Finance* 59, 2451-2487.

Faulkender, Michael W. and Jason M. Smith, 2015, Taxes and Leverage at Multinational Corporations. Working Paper.

Table 1

Summary Statistics

Table 1 shows the minimum, maximum, mean, median and standard deviation of each variable. The variables have all been winsorized at the 95th and 5th percentiles.

	Min	Max	Mean	Median	St Dev	Observations
Book Value Leverage	0.000	0.8008	0.3216	0.3023	0.2471	288,344
Net Book Leverage	-0.6679	0.6975	0.0959	0.1435	0.3689	288,321
ln Interest Coverage	-0.0040	5.7886	2.4405	2.1428	1.4710	236,280
Effective Tax Rate	0.1700	0.5160	0.3256	0.3140	0.0836	289,423
ln Sales	-0.8074	12.7734	6.7029	6.6444	3.5619	289,407
PP&E	0.0227	0.7369	0.3051	0.2907	0.2082	289,413
Return on Assets	-0.1646	0.1926	0.0423	0.0481	0.0824	288,607
Depreciation	0.0049	0.0902	0.0347	0.0312	0.0229	268,392
Dividends (Dummy)	0.000	1.000	0.8873	1.000	0.3162	289,423

Table 2

Interactive Variables Summary

Table 2 presents the interactive summary statistics by quartile. The first section shows the positive relationship between leverage and tax rates. This shows the trend of increasing tax leverage as tax rates increase. The leverage is calculated as total debt of the firm divided by the firm value. This ratio is winsorized at the 95^{th} and 5^{th} percentiles.

The second section shows the negative relationship between the interest coverage ratio and tax rates, until the fourth quartile. This shows that as taxes and leverage increase, the interest coverage ratio decreases, with the anomaly of the last quartile. The interest coverage ratio was calculated as EBITDA divided by interest expense. The results presented here are actually related to the natural log of interest coverage, which is calculated as ln(1 + interest coverage ratio). These ratios are also winsorized at the 95^{th} and 5^{th} percentiles.

	Leverage			ln Interest Coverage		
Quartile	Tax Rates	Mean Leverage	Median Leverage	Tax Rates	Mean ln Int Cov	Median ln Int Cov
1	0.2227	0.2266	0.25	0.2227	2.3411	2.1206
2	0.2955	0.2954	0.30	0.2955	2.1792	1.9716
3	0.3435	0.3435	0.34	0.3435	2.0422	1.8936
4	0.4419	0.4408	0.43	0.4419	2.5287	2.3238

Table 3

Between Effect Regressions

Table 3 presents the results of the between effects regressions on book value leverage, net book leverage and the natural log of interest coverage. The first section displays the results from the regression on book value leverage. It shows the positive, significant coefficient of the effective tax rate. The second section shows the results from the regression on net book leverage. It, too, shows the positive, significant coefficient of the effective tax rate. The final column shows the results from the ln interest coverage regression.

Book value leverage is calculated as total debt divided by total debt plus shareholder's equity. Net book leverage is calculated the same as book leverage, except with total debt minus cash and marketable securities in the numerator. The ln interest coverage is calculated as the natural log of one plus the interest coverage ratio, which is calculated as EBITDA divided by interest expense. The independent variables are as follows: lnsales is just the natural log of sales, ppeb is property, plant and equipment, calculated as PP&E divided by total assets, roa is the return on assets, calculated as EBIT divided total assets, depr is the depreciation variable, calculated as depreciation divided by total assets and divs is a dummy variable that indicates whether or not a firm paid dividends that year. All of these dependent and independent variables have been winsorized at the 95th and 5th percentiles.

The regression models are as follows:

$$BV\ Lev_{i,t} = \beta_0 + \beta_1 tax + \beta_2 sales_{i,t-1} + \beta_3 ppeb_{i,t} + \beta_4 roa_{i,t} + \beta_5 divs_{i,t} + \beta_6 depr_{i,t} + \epsilon_{i,t}$$

$$Net\ BV\ Lev_{i,t} = \beta_0 + \beta_1 tax + \beta_2 sales_{i,t-1} + \beta_3 ppeb_{i,t} + \beta_4 roa_{i,t} + \beta_5 divs_{i,t} + \beta_6 depr_{i,t} + \epsilon_{i,t}$$

$$\ln IntCov_{i,t} = \beta_0 + \beta_1 tax + \beta_2 sales_{i,t-1} + \beta_3 ppeb_{i,t} + \beta_4 roa_{i,t} + \beta_5 divs_{i,t} + \beta_6 depr_{i,t} + \epsilon_{i,t}$$

	Book Value Leverage	Net Book Leverage	ln Interest Coverage
efftaxrate	0.2165***	0.2317***	0.2217**
	(0.0164)	(0.0241)	(0.0922)
lnsales	0.0179***	0.0215***	0.0229***
	(0.0004)	(0.0006)	(0.0023)
ppeb	0.2495***	0.6266***	-1.3655***
	(0.0064)	(0.0095)	(0.0373)
roa	-0.3980***	-0.3625***	13.8041***
	(0.0177)	(0.0261)	(0.1290)
depr	0.5612***	0.6721***	6.5863***
	(0.0621)	(0.0915)	(0.3556)
divs	-0.0081*	0.0678***	0.2032***
	(0.0043)	(0.0064)	(0.0241)
N	266,664	266,655	222,441
R^2	0.1208	0.1728	0.2912

Table 4

OLS Regression Results

Table 4 shows the results from the OLS regression on book value leverage. It shows the positive, yet insignificant coefficient of the effective tax rate. Book value leverage is calculated as total debt divided by total debt plus shareholder's equity. The independent variables are as follows: lnsales is just the natural log of sales, ppeb is property, plant and equipment, calculated as PP&E divided by total assets, roa is the return on assets, calculated as EBIT divided total assets, depr is the depreciation variable, calculated as depreciation divided by total assets and divs is a dummy variable that indicates whether or not a firm paid dividends that year. The dependent and independent variables have been winsorized at the 95^{th} and 5^{th} percentiles.

The model:

$$BV\ Lev_{i,t} = \beta_0 + \beta_1 tax + \beta_2 sales_{i,t-1} + \beta_3 ppeb_{i,t} + \beta_4 roa_{i,t} + \beta_5 divs_{i,t} + \beta_6 depr_{i,t} + \beta_7 year1_{i,t} + \beta_8 year2_{i,t} + \beta_9 year3_{i,t} + \beta_{10} year4_{i,t} + \beta_{11} year5_{i,t} + \beta_{12} year6_{i,t} + \beta_{13} year7_{i,t} + \beta_{14} year8_{i,t} + \beta_{15} year9_{i,t} + \beta_{16} year10_{i,t} + \beta_{17} year11_{i,t} + \beta_{18} year12_{i,t} + \beta_{19} year13_{i,t} + \beta_{20} year14_{i,t} + \beta_{21} year15_{i,t} + \beta_{22} year16_{i,t} + \beta_{23} year17_{i,t} + \beta_{24} year18_{i,t} + \beta_{25} year19_{i,t} + \beta_{26} year20_{i,t} + \epsilon_{i,t}$$

	Book Value Leverage
efftaxrate	0.0103
	(0.0066)
lnsales	0.0187***
	(0.0001)
ppeb	0.2188***
	(0.0023)
roa	-0.4537***
	(0.0058)
depr	0.4985***
	(0.0209)
divs	-0.0267***
	(0.0014)
y1	Omitted
y2	-0.0109
	(0.0074)
y3	-0.0093
	(0.0072)
y4	-0.0008
	(0.0064)
y5	0.0054
	(0.0060)
y6	0.0040
	(0.0059)
y7	0.0033
	(0.0058)
y8	-0.0102
	(0.0058)
y9	-0.0128**
	(0.0058)
y10	-0.0141**
	(0.0057)
y11	-0.0136**
	(0.0057)
y12	-0.0165***
	(0.0057)
y13	-0.0183***
	(0.0057)
y14	-0.0351***
	(0.0057)
y15	-0.0406***
	(0.0057)
y16	-0.0346***
	(0.0057)
y17	-0.0445***
	(0.0057)
y18	-0.0536***
	(0.0057)
y19	-0.0567***
	(0.0057)
y20	-0.0474***
	(0.0057)