Provincial taxation and bankruptcies in Canada

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Abstract

I estimate the elasticity of bankruptcies with respect to the provincial corporate income tax rate using variation across provinces and industries in Canada. My results show no significance effect between the number of bankruptcies by industry, province and year and provincial small business tax and general tax.

1 Introduction

Previous literature has attempted to investigate into the effect of behaviour of firm under different tax systems. The overall study of the literature has reveal that with higher corporate income taxation, there are more chance that a firm can take on an tax aggressive behaviours including taking more debt to finance investment. Because of interest payment deduction policy from tax policy, firm can use their interest payment as the source of tax shelter. "Tax Avoidance, Tax Aggressiveness, Tax Risk and Firm Risk" Paper of David A. Guenther, Steven R. Matsunaga, Brian M. Williams, 2013 have taken into consideration of this behaviour of tax and characterize the situation of a firm that takes on actions to avoid tax but the position is not likely to be sustained in the future as tax aggressiveness. The empirical evidence from the paper, however, has shown no significant link between the level of firm risk and the level of the tax aggressiveness of a firm. The firm risk in the paper is defined as the volatility in the monthly stock return.

As an extending study of the paper, first, i argue that stock earning volatility of the

stock does not depend solely on the earning and the firm performance and internal structure of capital. Stock earning volatility also has to do with a lot of speculation, the policy of the firm as well as the policy change of the regulation system that the firm is operating under, the management system and decision made by majority of voting panel. Second, to explain why earning volatility should not be considered the same as the level of firm risk i will use an example as such: A firm can operate with high level of volatility in their stock earning but if the general trend of the earning is moving upward then the firm should be consider to be safer or less risky than a firm with lower level of volatility in their stock earning while having the general trend of earning going downward .Volatility in this case is not accurate indicator of the level of risk of the firm.

This sparkles the motivation for this paper. The approach is to replace firm risk measure as stock volatility to level of bankruptcies. In this paper, we measure the elasticity of bankruptcies on the different level of tax across province and industry. The advantage of having the bankruptcies as the level of firm risk is that the higher firm risk should lead to higher probability of the firm going bankrupted, there is no ambiguity in using bankruptcies as the measurement for the level of firm risk. This is an improvement in certain aspect over using stock earning volatility to measure firm risk. However, its limitation is that firm risk needed to be able to convert into actual bankruptcy. The mechanism of the liabilities convert into actual bankruptcies has not been studied in very well-detailed manner, so there is some ambiguity.

The main hypothesis that i investigate in the paper is that tax rate increases will lead to an increase in bankruptcies rates. Because of tax shield and deduction for interest payment, firms are willing to put themselves in a more aggressive debt position, this leads to the higher probability of firm going bankruptcies. If this mechanism is true then on aggregate level, on the average, there will be more bankruptcies firms filing on the province and industry with higher tax rate.

The period of study in the paper is from year 2011 to year 2017 during this period, no significant reform in the tax system under on the federal level. i have the data and variation in the tax rates and bankruptcies categories by industry and economic

sector of all the provinces of Canada (excluding all the territories). This allows me to study the bankruptcies elasticity of provincial corporate tax on the macro level.This, however, creates multiple challenge that i need to overcome which i will state in later section. There are two primary advantages of using provincial data in Canada. First, The data is constructed using different sources from Statistics Canada so the quality of the data is at higher standard. Because the data is available for both industry and province on different years. This allows me capture rigorously both the common trend of the province such as the characteristic of the province as well as the common trend of the industry such as policies change in certain industry.

As note before, i exclude the data of the data from the territories of the Canada and only consider the data from the provinces of the Canada. There are two main reasons: The first reason comes from the lack of variation of tax data in all territories. Since the territories of Canada does not have its own government body, its tax policy is decided wholly at federation level so there is no variation according to the period of study. Secondly, the territories are regulated differently in than the rest of the province in Canada since my data is on aggregate level, this difference in characteristics can potentially be a source of endogenous effect that i cannot capture. An important limitation of our approach is that the data is at macro level. To study the effect of tax rate onto bankruptcies, a more intensive micro approach should be used. Because there might be endogeneity that exists at micro level and a macro approach might not be able to capture. Ideally, an individual companies that went bankrupted and their internal data (such as the level of capitalization) going back to a certain period would be most suitable to our study since we can control for other factors. However, because of the limitation on data availability, I can only find data at aggregate level. Under this restriction of data, I set the goal to measure the bankruptcies elasticity of corporate tax rate. There is another problem that is most prominent in this study is the incapability of indicating the exact marginal tax rate on each bankrupted firm in the data. Instead, what I have is only the small business tax rate and the general tax rate that is imposed on a certain province and industry in certain year.

Comparing across province with the general OLS and 2SLS result, industry and time, i found that the effect is insignificant for both small business tax rate and general tax rate. Firms who are qualified for the small business tax are those with capitalization level (asset) of less than 15,000,000 and the cap on the small business tax is 500,000 of earning before tax. Both small business tax rate and general tax rate are separated into two case: non manufacturing and manufacturing sectors. The manufacturing tax will be applied only to the manufacture sector for both small and general business.

I will use two instrument variables to estimate the effect of both small business tax rate and general tax rate onto the level of bankruptcies: the legislative power of the provincial government and the unemployment rate. Both of these data are available in the province and year level but not at the industry level. I used robust check on the relevance of both instruments. Both of them has significant relationship with the small business tax and general tax. There is, however, an underling problem with the approach. Since both of the instrument are highly related to small business and general tax and i estimate the effect of the small business and general tax separately, the estimation using 2SLS model might entangle both of the effect of the small business tax and general business tax. Since the data is at aggregate level and there is no available way to exactly indicate the average marginal tax for each industry by province in each year.

I begin with an overview of relevant introduction into Provincial Corporate Income Tax Rate. After which is followed by an introduction of empirical strategy. Then a discussion of the result is presented. The paper ends with conclusion and in an appendix section, another mode will be proposed to improve on the accurate of the result.

2   Literature Review

Roger H.Gordon and Young Lee (1999) working paper investigating the effect of taxes on the corporate debt policy. The paper estimation is built upon the difference in corporate tax rate that is faced by the largest and the smallest firms(35 percent vs 15

percent). The paper exploit this variation and able to the estimate that larger firms will finance additional 8 percent of their asset with debt compared to the smaller firm.

The paper noted that there is tax deductible of interest payment but not for dividend payment. In another word, if a firm is looking for capital to invest for a new project, the firm can either selling more stock to finance their investment or taking more debt. Interest payment deductibles creates an incentives for firm to finance by debt.

The paper uses the relative tax rate variation for small and large corporations and investigate the effect of tax on the debt/assets for small and large firms.

The identification that the paper used is the "difference-in-difference" estimation. Using this estimation, authors are able to find that there is large effect on corporate use of debt for the smallest and largest firms while have little effect on intermediate firms. However, the weak effect on the intermediate firms is the result of measurement error.

Another paper that will look at is the Césaire A. Meh and Yaz Terajima,(2008). In this paper, the authors has noticed that small business bankruptcies and personal bankruptcies can be interchangeable. That is on the scale of small business, if the owner of the firm want to file for bankruptcy, he can file for either small business bankruptcy or personal bankruptcy depending on which is more beneficial to him. It notes that the entrepreneur has also 3.5 times as much unsecured debt and from the literature review of the paper, non-entrepreneur and a large proportion of debtors that file for bankruptcies are those who are entrepreneurs from Sullivan, Warren, and Westbrook (1989). One key feature is that entrepreneur that is bankrupted typically have extremely high level of debt. The study is using overlapping generation model. A calibration is used and the result shows that entrepreneur accounts for most debt in bankruptcies about 60 percent in default and account for 30 percent of loan in the whole economy. In summary, first, their finding shows that entrepreneur are more likely to file for personal bankruptcy than non-entrepreneur. Second, although entrepreneur represent only 20 percent of all household bankrupts, entrepreneur does, however, accounts for 60 percent level of debt. Lastly, entrepreneurs hold 30 percent

5

of all consumer debt. The paper has revealed the relationship of unsecured debt and bankruptcies. That is the entrepreneur are more likely to take on higher of debt and also more like to file for personal bankruptcy.

Both of the paper motivate me to study the relationship of tax rate on bankruptcy. If firms does take on more debt/asset because of the incentive coming from interest payment deduction and more debt leads to higher probability of a firm going bankruptcies. Then on average, at aggregate level, the number of firms that went bankrupted should be higher in the industry and province with higher tax rate.

3 Provincial Corporate Income Tax Rate

In the Canadian federation, the constitutions allows both federal and provincial government to directly impose the level of corporate tax. There is no variation of federal tax rates across province but variation exists at provincial level. Each province chooses two tax brackets for the corporation that located within its province. The first tax bracket, the lower bracket is applied to the all the business with the level of capitalization that is less than 15,000,000. This is known as the small business tax. The maximum earning that is qualified for small business tax is 500,000. Any corporation that does not have capitalization level below 15,000,000 is under general tax system unless they are manufacturing firm then there is special lower general manufacturing tax rate. The income tax in Canada constitute the majority of the annual revenue of the Government of Canada as well as the provincial government of Canada. Generally speaking, on level of federation, corporate income tax revenue is one third of the personal income tax. So on provincial level, the corporate income tax should be similarly significant.

Bankruptcies in Canada is govern by the Bankruptcy and Insolvency Act ("BIA"). a federal agency, Office of the Superintendent of Bankruptcies, are responsible for that bankruptcies are administer in a fair and orderly manner. Bankruptcies is important aspect of the economic that has not been popularly studied in the literature. It surges unemployment rate and is an important economic indicator for economic stability. The level of asset that is liquidated in in Canada in all province in year 2017

is 619506000. That is about 620 millions level of assets that exist the economy in 2017 alone. This can create one of the primary source for unemployment. Therefore, bankruptcies rate should be considered one of the main indicator for the Canadian economic.

I choose the year of 2011 as the beginning of the data set and 2017 as the ending because on the Statistic Canada data on Bankruptcies website, the data is annually and most completely in this period of study. The screening of data is leniently required because the model that is built in this study is capable of capturing the policy effects and the external effects that affect each industry in one province every year. For example, if there is a change in provincial or specific industry then either the province or industry effect will be able to capture that effect.

The corporate income tax rate data is collected from the same period as of the bankruptcies rate. The main source of variation does not come from the industries and years but from different provinces. On the industry dimension, there is only one source of variation coming from whether the sector is manufacturing or non-manufacturing since Canadian government is providing incentives to encourage more investment in the manufacturing industry through lower tax rate. On the year dimension, there is variation but since tax does not vary a lot of from year to year the source of variation is weak. Beside, the Canadian territories including Yukon, Northwest Territories and Nunavut where provincial corporate tax rate is imposed directly by the federation, the other provincial governments within Canada has capability of imposing their own tax. I use two instruments variable: legislative power and unemployment rate to estimate the effect of corporate small business tax rate and general tax rate on level of bankruptcies.

4 Empirical Approach

All of the data that is used for this study is administrative data so the quality of the data is high.

In this paper, i employ the fixed effect OLS and instrument variable 2SLS approaches

to estimate the bankruptcies elasticity of provincial corporate income tax rate. The study "Taxation and top incomes in Canada" by Kevin Milligan and Michael Smart, 2014, has inspired my fixed effect OLS model estimation. The study is also on the aggregate level. However, their study is about the relationship between the tax revenue and tax on the top 1 percent of population income. The degree of exogeneity in their study between of the dependent variables (Tax revenue) and independent variable (tax rate on 1 percent income) is higher. Therefore, their study is more suitable at aggregate level comparing to my study. Because of this reason, I propose another strategy through IV estimation to estimate the effect of corporate tax rate. The problem as discussed in the introduction section is that there is no marginal effective tax rate or a way to calculate the the average tax rate applying for each industry in each province in each year. There are two level of tax brackets exist for each industry, province and year, the small business tax and the general tax rate. The study will then be separated into studying of the effect of small business tax on bankruptcies and the effect of general tax on bankruptcies. The reason why the model for both tax rate will not be run is because both of our instruments variables are significantly related to the both small business and the general tax rates. However, we expect the effect of both tax rate to go in the same direction that is both general tax rate and small tax rate increase then the level of bankruptcies will increase. With that assumption, if both of them have significance positive relationship on tax then even though the estimate coefficient cannot separate the effect for each. The coefficient should still be positive significant with an bias upward if i decide to regress small business tax and general tax separately. If, however, the effect is not significant in both case that means that both the general tax and small business tax has no significant effect on the level of bankruptcies.

4.1 Small business tax

The first regression is the regression with panel data. The fixed effect model where the dependent variable will be the natural logarithm of the number of bankruptcies of each industry in each state within each year plus one. The reason for me to add one

to the natural logarithm is because there are records of zero bankruptcy in certain province that would result in the natural logarithms of bankruptcies going missing when computed. The estimation from this regression would not show purely the bankruptcies elasticity of corporate tax rate. Second approach is to have use the Tobit model to estimate the model. However, the second part of the estimation will require instrument variable. Therefore, there might underlining problem associated with the estimation of the reduced form using a Tobit. For consistency i used the dependent variable as the natural logarithm of number of bankruptcies plus one.

The basic economic relationship we estimate is between the reported bankruptcies of an industry i within a province p in each year t

$$\log(b_{ipt} + 1) = \beta_0 + \beta_1 * S_{ipt} + \gamma_{ipt} + \theta_{ipt} + \lambda_{ipt} + \varepsilon_{ipt}$$

We have b_{ipt} is the number of bankruptcies by industry, province and year. β_1 is the bankruptcies elasticity of small business tax. γ_{ipt} is the industry fixed effect, θ_{ipt} is the province fixed effect and λ_{ipt} is the year fixed effect. Industry fixed effect would capture all the policy change in the industry. Province fixed effect would capture the characteristics of each province and year fixed effect will capture the characteristics of each year from 2011 to 2017.

The second regression that i am running is the IV regressions with two instrument variables: legislative power of a provincial government and the second is the unemployment rate of a province. There reason why i choose two instead of one instrument variable is that i want to test the exclusion restriction of these variable.

It's known that the belief of the different provincial government body is different. In general speaking in Canada, the far right is government is Conservative. The far left is Democrat and Liberal is centre (to the left of Conservative and to the right of Democrat). The far right tax belief is tax should be lower for business. On the other hand, on the left, the tax belief is that stronger tax rate should be imposed on the wealthy therefore archiving equality in the economy. Because of the different in beliefs, i will make an assumption that the legislative power of the government will affect the corporate tax rate and only through corporate tax rate does legislative power has any effect on bankruptcies. The second instrument variable is the unemployment

9

of a province. On the general theory, if there are high unemployment, a provincial government will cut down on the level of tax so that the firm can have more reserve to hire more people which leads to an increase in demand of the economy. However, the exclusion restriction assumption might be violated in case of unemployment, since the unemployment rate creates lower demand for the industry and therefore leading to bankruptcies itself. To make sure that the exclusion restriction is satisfied, i test them in the robustness check. Also i also test for the strength of the instrument in that section.

Instrument Variable Model:

First Stage:

$$S_{ipt} = \pi_0 + \pi_1 * legis_{ipt} + \pi_2 * unemploment_{ipt} + \gamma_{ipt} + \theta_{ipt} + \lambda_{ipt} + \varepsilon_{ipt}$$

In the first stage equation. S_{ipt} is the small business tax, the dependent variables will be estimated using legislative power and unemployment rate. π_{ipt} is the coefficient that estimate the effect of legislative changes over the small business tax rate. π_2 is the coefficient estimate the effect of the unemployment rate onto small business tax. $legis_{ipt}$ is the legislation power by industry province and year. γ_{ipt}, θ_{ipt} and λ_{ipt} are the industry, province and year fixed effect. Reduced form:

$$\log(b_{ipt}+1) = \alpha_0 + \alpha_1 * legis_{ipt} + \alpha_2 * unemployment + \gamma_{ipt} + \theta_{ipt} + \lambda_{ipt} + varepsilon_{ipt}$$

In the reduce form, we have $\log(b_{ipt} + 1)$ as the dependent variable. $\frac{\alpha_1}{\pi_1}$ will be yield the estimation of coefficient of interest which is the bankruptcies elasticity of small business tax. Similarly since this is the over-identification model, we have $\frac{\pi_2}{\alpha_2}$ will also yield he estimation of the coefficient of interest. We can compare this two result to see if there are further confirm our estimation.

4.2 General Tax

Estimation of the bankruptcies elasticity of general tax is the same as of the small business tax. The first model is the OLS estimation with industry, province and year fixed effect. The second model is the estimation model with two instrument variables:

legislative power and the unemployment rate. The first estimation is the fixed effect OLS estimation.

$$\log(b_{ipt} + 1) = \beta_0 + \beta_1 * G_{ipt} + \gamma_{ipt} + \theta_{ipt} + \lambda_{ipt} + \varepsilon_{ipt}$$

Where similar as before, b_{ipt} is the number of bankruptcies by industry,province and year. β_1 is the bankruptcies elasticity of general tax. γ_{ipt},θ_{ipt} and λ_{ipt} are the industry,province and year fixed effect. The second estimation will also be be using the same instrument variables: legislative power and unemployment. I will combine two first stage equation and 2 reduced form equations.
First Stage:

$$G_{ipt} = \pi_0 + \phi_1 * legis_{ipt} + \phi_2 * unemploment_{ipt} + \gamma_{ipt} + \theta_{ipt} + \lambda_{ipt} + \varepsilon_{ipt}$$

In the first stage, G_{ipt} is the general tax rate by industry,province and year. ϕ_1 is the estimation of the effect of legislative power change on general tax, ϕ_2 is the estimation of the effect of unemployment rate on general tax. γ_{ipt},θ_{ipt} and λ_{ipt} is the industry, province and year fixed effect respectively. Reduced form:

$$\log(b_{ipt}+1) = \alpha_0 + \alpha_1 * legis_{ipt} + \alpha_2 * unemployment + \gamma_{ipt} + \theta_{ipt} + \lambda_{ipt} + varepsilon_{ipt}$$

In the reduced form. The dependent variable will be $\log(b_{ipt}+1)$. the ratio $\frac{\alpha_1}{\phi_1}$ will be the estimation the bankruptcies elasticity of general tax. The model is over-identified so the ratio $\frac{\alpha_2}{\phi_2}$ can also be used to estimate the bankruptcies elasticity of general tax. The two estimation result can be combined to test for whether the exclusion restriction is satisfied.

5   Data

5.1   Source

Our bankruptcies data come from Government of Canada. The data is available at aggregate level by industry, province and year. There are ten provinces in Canada. The duration of our study is 2011 to 2017. There are 20 aggregate economic sectors

available for the study. The number of total observation is 1400, for 10 province, 20 industry and 7 year of study. There are, however, 404 observation with zero bankruptcies or about 1/3 of the observation sample providing relatively ambiguous information. By ambiguous information, I mean that there is an ambiguity in observation with zero bankruptcies, it could mean that there is no firm in the industry in one state in one year, so therefore it should not be included in the study. On the other hand, it could also mean that there are many firms in the industry but the industry is healthy enough so that no firm will have to go bankrupted, so in this case the observations are important for the estimation. Since one third of the observations have this attribute. There are some ambiguity for our result.

The provincial income tax rate for both small business and general tax rate is available on multiple sources. The most complete data source is data extracted from organization named Deloitte Touche Tohmatsu Limited, a UK private company. Since the data of the tax rate and the bankruptcies coming from different source and tax data is only separated into manufacturing or non-manufacturing industry, i will have to match tax data for every industry. There are three main tax for each province: general tax (not including manufacturing), small business tax and general tax for manufacturing. Quebec,however, has separated small business tax for manufacturing firm.

I constructed the IV variable by collecting data from Canadian Election Database. For each province, there is a selected government body. There are not a lot of variation within one province over the year but different province has different legislative body, this is where the main source of variation. Since the degree of left or right wing in each province is not completely measured, but for most provinces in the period of study, there are three mainly governing bodies: Conservative, Democrat and Liberal(except for Quebec). I will rank the governing body from left to right where most left are Democrat which will be assigned as 0. Liberal are those in the middle and will be assigned as 0.5 and Conservative are those in the most right and will be assigned 1. For Quebec, during the period of studying, there are two main party that held the
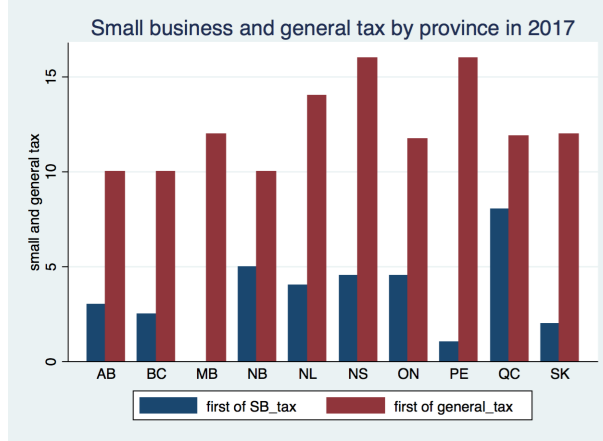
Figure 1: Provincial small business and general tax in 2017

legislative power, the first is Parti québécois which will be in the right-wing which will be assigned 1 and Parti Libéral du Québec which is the Liberal government and will be assigned 0.5. Table 1 shows the change in legislative power for every province in Canada except the territories.

Unemployment rate is another instrument variable that i include in the regression. Unemployment data is constructed by the collecting the data from Labour Market Statistic that is available on the Newfoundland Labrador Canada website. The data are available only on the province level, 10 provinces and year, from 2011 to 2017. So for every industry in the same state, the unemployment data will be the same as the unemployment rate of the province. Table 2 shows the unemployment rate for each province period from 2011 to 2017.

6   Main Result

In this section i will compare the result of both OLS and IV regressions. The regression that i will run for the IV will be 2SLS. The section is separated into two parts: small business tax estimation and general tax estimation.

13

Table 1: Provincial Party and duration of power in 2011-2017

Province	Year	Result
Alberta	2011-2014	Progressive Conservative Association of Alberta
Alberta	2015-2017	Alberta New Democratic Party
British Columbia	2011-2017	British Columbia Liberal Party
Manitoba	2011-2015	New Democratic Party of Manitoba
Manitoba	2016-2017	Progressive Conservative Party of Manitoba
New Brunswick	2011-2013	Progressive Conservative Party of New Brunswick
New Brunswick	2014-2017	New Brunswick Liberal Association
Newfoundland and Labrador	2011-2014	Progressive Conservative Party of NFL
Newfoundland and Labrador	2015-2017	Liberal Party of Newfoundland and Labrador
Nova Scotia	2011-2012	New Democratic Party
Nova Scotia	2013-2017	Nova Scotia Liberal Party
Ontario	2011-2017	Ontario Liberal Party
Prince Edward Island	2011-2017	Liberal Party of Prince Edward Island
Quebec	2011	Parti Libéral du Québec
Quebec	2012-2013	Parti québécois
Quebec	2014-2017	Parti Libéral du Québec
Saskatchewan	2011-2017	Saskatchewan Party

6.1 Small business tax estimation result

From the results, there is no significant relationship between the small business tax and the bankruptcies. Thereby, this shows that for small business tax does not increase the level of the firm risk (which is measured in this study by the bankruptcies rate). An explanation for this is provided through study on debt and liability study. Since for small business tax, the company liabilities are linked directly to the owner

Table 2: provincial unemployment from 2011 to 2017

Year	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
2011	12.6	11	9	9.5	7.9	7.9	5.5	4.9	5.4	7.5
2012	12.3	11.2	9.1	10.2	7.7	7.9	5.3	4.7	4.6	6.8
2013	11.6	11.6	9.1	10.3	7.6	7.6	5.4	4.1	4.6	6.6
2014	11.9	10.6	9	9.9	7.7	7.3	5.4	3.8	4.7	6.1
2015	12.8	10.4	8.6	9.8	7.6	6.8	5.6	5	6	6.2
2016	13.4	10.7	8.3	9.5	7.1	6.5	6.1	6.3	8.1	6
2017	14.8	9.8	8.4	8.1	6.1	6	5.4	6.3	7.8	5.1

Table 3: OLS and 2SLS result for small business tax estimation

VARIABLES	OLS	2SLS
SB_tax	-0.0122	-0.201
	(0.0183)	(0.271)
Constant	2.785***	3.356***
	(0.192)	(0.88)
Observations	1,400	1,400
R-squared	0.823	0.816

Robust standard errors in parentheses

** p<0.01, ** p<0.05, * p<0.1

liabilities. There is a strong assumption in our hypothesis that the firm will be willing to take in more debt leading to higher firm risk which will lead to bankruptcies. However, as the level of liabilities of the small firm is the same as the owner's liabilities, small firm will take less aggressive debt position to shield away from tax. Another explanation is that small firm is relatively restricted when it comes to borrowing. Hence, owner of small firm does not have the option of the borrowing to shield away from its tax.

The OLS and 2SLS results are both clustered by industry and province level but not year because we believe that the for every industry of each province are in similar for every year.

The R-squared is 0.823 in the OLS model and 0.816. In both case, the R-squared appears to be healthy showing the estimation model is able to capture the variation of the response of the natural of log of bankruptcies around its mean relatively accurate. Before going into the next section, i want to mention that in the appendix section. I explore some other method of regression and there is a surprising finding about the effect of small business tax on the level bankruptcies.

Table 4: OLS and 2SLS result for general tax

VARIABLES	OLS	2SLS
general_tax	0.0713***	0.0245
	(0.0262)	(0.0464)
Constant	1.997***	2.490***
	(0.324)	(0.488)
Observations	1,400	1,400
R-squared	0.825	0.824

Robust standard errors in parentheses

** p<0.01, ** p<0.05, * p<0.1

6.2 General tax estimation result

In this section, i report the OLS and 2SLS results for the estimation of the general tax effect on bankruptcies. The two results are be compared side by side. There is a different in the OLS result in this case compared to the 2SLS result. For general tax estimation, the OLS result agree with my hypothesis. That is with a 1 percent increase in the general tax, we expect the level of bankruptcies raise by 7.13 percent. However, when we use 2SLS model, there are no significant relationship detected between the our bankruptcies and general tax. This shows that there is potential of omitted variable bias in my OLS result. Since there is no significance in the result using the instrument variable, it shows that there is no relationship between the general tax and the number of bankruptcies.

Once again, the i cluster the effect on industry and province level because i expect similarity between each industry and province over the the period of study.

The R-squared is 0.825 in the OLS model and 0.824. Similar to small business tax estimation, the R squared appears to be healthy showing the estimation model is able to capture the variation of the response of the natural of log of bankruptcies around its mean relatively accurate.

Table 5: Models estimate the strength of the instrument variable on small business tax

VARIABLES	Model 1	Model 2	Model 3
legis	0.204***	0.221***	
	(0.0738)	(0.0636)	
unemployment	-0.0174		-0.0400*
	(0.023)		(0.0206)
Observations	1,400	1,400	1,400
R-squared	0.911	0.911	0.91

Robust standard errors in parentheses

** p<0.01, ** p<0.05, * p<0.1

In the appendix section, i will explore another model to estimate the effect of general tax.

As discussed above, There might be entangle effect of small tax and general tax on our estimation. That is the omitting small tax while estimating for general tax effect might create a bias. However, i expect the bias to be upward that is increase in tax will lead to an increase in number of bankruptcies. However, in both of our regression the result is not significance. That is even with potential upward bias of small tax on general tax and upward bias of general tax on small tax, and we cannot reject the null hypothesis that there is no relationship between the both small, general business tax and bankruptcies. Therefore, it is most likely that both small and general business tax have no effect on the level of bankruptcies.

6.3 Robust check and relevance of the result

There are couple of check that i would like to use. First, is the level of strength of my instrument variables: Table 5 shows the level of strength of instrument variables on small business tax. There are three models in this case. The first model is the first

stage regression of small business tax on both legislation and unemployment rate. We can observe that the legislative power have significance effect on small business tax while unemployment rate does not have significant effect. The direction of the effect is not what i would expect, however. In this case, if the legislative in one province switches from being a Conservative to being a Democrat (changing from 1 to 0) then the small business tax rate will reduce by 0.2 percent on average. It is surprising because it is commonly agreed that the Conservative has more lenient view on the tax compared to Democrat. One possible explanation that i can provide is that Democrat believe in income equality so therefore for small business, the tax level in Democrat province is more lenient while for general tax it is more harsh comparing to the Conservative province. Another explanation can be that the standard deviation is actually quite large comparing to the size of effect itself. This means the right sign of the estimator can still be negative even though the estimation coefficient is positive . Note that, if the province switch from a Conservative to a Liberal legislative then the effect is only half that is the small tax rate will reduce by 0.1 percent.

In model 2 and model 3, i regress small business tax with legislative power and unemployment rate separately. Legislative is significant when regress by itself or together with unemployment while unemployment rate is significantly only when regressed by itself. This shows that legislative power is a better instrument than unemployment rate.

In all three model, the R-squared is 0.911 which shows that the a three model is able to capture healthy level of variation of the small tax around its mean.

The next robust check that i will do is to check for the strength of the instrument variables on the general tax in Canada. I will once again regress the general tax on the both legislative power and unemployment in model one. in model 2 and 3 i will regress general tax on legislative power and unemployment separately

As we can see in table 6, when regress general tax on both variables legislative power and unemployment rate. The result shows significance on estimation with legislative power while showing no significance with estimation of the unemployment.

Table 6: Models estimate strength of the legislative and unemployment rate on general tax

VARIABLES	Model 1	Model 2	Model 3
legis	-1.214***	-1.239***	
	(0.109)	(0.0986)	
unemployment	0.025		0.160***
	(0.0394)		(0.0445)
Observations	1,400	1,400	1,400
R-squared	0.891	0.891	0.871

Robust standard errors in parentheses

** p<0.01, ** p<0.05, * p<0.1

In model one, the effect shows that if the legislative power switch from being Conservative (which in my study is 1) to Democrat(which is associated with 0), then the tax rate is increase by 1.2 percent on average, The standard deviation is less than the absolute size of the estimation coefficient which increase the probability that the size of the effect is negative. The sign of the effect is accurately predicted that is the right wing is more lenient when it comes to tax so tax rate should reduce if the government body switch from being Democrat to being a Conservative.

In model 2 and 3, i regress general tax with legislative and unemployment separately. It shows that both legislative power and unemployment rate are significant by itself. Combining this result from model 1, it shows that legislative power has strength as a instrument variable comparing to unemployment rate.

In all three models, R-squared are 0.87 to 0.89 showing that all three model are capable of capturing the variation of the general tax around its mean.

Table 7: Exclusion Restriction Test on both small business and general tax

VARIABLES	Small Business	General Tax
legis	0.0509	0.0395
	(0.0585)	(0.0564)
unemployment	0.0313	0.0342*
	(0.0204)	(0.0198)
Observations	1,400	1,400
R-squared	0.001	0.002

Robust standard errors in parentheses

** p<0.01, ** p<0.05, * p<0.1

6.4 Exclusion Restriction Test

In this section i test for the exclusion restriction using the over identification test for both small business tax and general tax. Table 7 shows the result from running the over identification test for exclusion restriction using both legislation and unemployment as the instrument variables. In both case multiplying the level of the R-squared with the number of observation which is 1400, we have for small business tax the Chi-squared score is 1.4 with degree of freedom of 1 which is associated with the p-value of 0.236724. This shows that the instrument variables satisfy the exclusion restriction when they are used to estimate the effect of small business tax. For general tax, R-squared is 0.002, when multiply this with 1400 observation will results in the Chi-square score of 2.8 which is associated with 0.094264 p-value (degree of freedom is 1). This also means that we cannot restrict the null hypothesis and therefore the exclusion restriction is satisfied when i use the two instrument variables to estimate the effect general tax. In both of the estimation of the effect of small business tax

7 Conclusion

In this study, i want to explore the effect of provincial tax onto the number of bankruptcies in Canada. There are two levels of tax a small business or the lower rate tax and the other is the general tax or the higher rate tax. I estimate the effect of small business tax rate and general tax rate separately. From both of the estimations, i find no significance relationship between the small tax rate and general tax rate on the number of bankruptcies. This is confirmed with the study of David A. Guenther, Steven R. Matsunaga, Brian M. Williams (2013), that there is no relationship between the firm risk and tax aggressive behaviour of the firm. For small business, since liabilities are linked to owner debt, the owner will have to take the level of debt position with much more conservative approach. That further explains why small business will have no relationship with the firm.For small business firm who is qualified for small business tax, there is also restriction on the level of debt availability. Therefore, the option of using debt to shield from tax is not feasible for them. For general tax however might not affect all the firm in our study for the bankruptcies. First of all, there are 832 industries with the aggregate asset less than 500000 which is the level of income that is qualified for small business tax (not including 404 observations with 0 bankruptcies) so the large proportion of the industry contain bankruptcies of the small business firms. Since the majority of the bankruptcies are small, it is expected that the general tax should not have any effect on number of bankruptcies.

In the appendix section, i explore other possibilities that might affect my estimation.

8 Appendix

8.1 Auto correlation of the bankruptcies as a dependent variable

During the process of writing the paper, I realize potential problem that associate with bankruptcies as the dependent variable.

The problem is on aggregate level, the number of bankruptcies might be an auto correlated to its previous year. The reason why there is auto-correlation between them is that if the number of firms going bankruptcies in year 2011 will not exist in year 2012 which reduce the pool of firms existed in 2012. This leads to a reduction in the level of bankruptcies in year 2012. Also, there is delay in the effect of tax on bankruptcies. So that if the tax rate change in 2011 then effect might become prominent in year 2013. When regressing the bankruptcies in year 2013 with its lag (year 2012), I allow a smooth linear effect of the tax on the bankruptcies. If the lag variable is not included, then there is a possible problem that my result will be biased if i did not take into the effect of this auto correlation.

This is the 2SLS model that will capture the auto correlation effect of both general tax and small business tax.

8.1.1 Small business tax

The 2SLS model will hold this form

First stage:

$$S_{ipt} = \sigma_0 + \sigma_1 * legis_{ipt} + \sigma_2 * unemployment_{ipt} + \sigma_3 * lag \log(b_{ipt} + 1) + \gamma_{ipt} + \theta_{ipt} + \lambda_{ipt} + \varepsilon_{ipt}$$

All the variables are similar as before except σ_1 will estimate the effect of legislative power on small business tax, $_2$ will estimate the effect of unemployment rate on the small business tax, σ_3 will estimate the effect of lag variable of the natural log of the bankruptcies rate on small business tax. $lag \log(b_{ipt} + 1)$ is the lag variable of the

Table 8: 2SLS and OLS estimation of small business tax with lag variable

VARIABLES	2SLS	OLS
SB_tax	-0.384**	-0.0239
	(0.188)	(0.0215)
lag of bankruptcies	0.554***	0.556***
	(0.0449)	(0.0464)
Observations	1,200	1,200
R-squared	0.859	0.877

Robust standard errors in parentheses

** p<0.01, ** p<0.05, * p<0.1

natural log of bankruptcies. Reduced form:

$$\log(b_{ipt}+1) = \delta_0 + \delta_1 * legis_{ipt} + \delta_2 * unemployment_{ipt} + \delta_3 * lag\log(b_{ipt}+1) + \gamma_{ipt} + \theta_{ipt} + \lambda_{ipt} + \varepsilon_{ipt}$$

As before, all the variables are the same except that δ_3 will be the auto-correlation coefficient that is capture the relationship of the natural log of bankruptcies and its lag variable. $\frac{\delta_1}{\sigma_1}$ will estimate the effect of small business tax on the bankruptcies. Since this is an over identification estimation, $\frac{\delta_2}{\sigma_2}$ will also estimate the effect of small business tax on bankruptcies. The OLS fixed effect model holds this form

$$\log(b_{ipt}+1) = \psi_0 + \psi_1 * S_{ipt} + \psi_2 * lag\log(b_{ipt}+1) + \gamma_{ipt} + \theta_{ipt} + \lambda_{ipt} + \varepsilon_{ipt}$$

All the variable is similarly explained as above, ψ_1 will be the estimation of the effect of small business tax on bankruptcies. In table 8, The hypothesis is confirmed that there is auto-correlation exist with the number of bankruptcies since the coefficient of the lag variable is significantly different than zero and similar in both OLS and 2SLS regressions. However, surprisingly when regress using 2SLS using the lag variable, the effect of the small business tax is weakly significant and negatively related to the number of bankruptcies. Using the 2SLS, we can say that with 1 percent increase in small business tax, the number of bankruptcies will reduce by 38 percent. In all honesty, the sign and the size of the effect is hard to explain. One possible explanation is

Table 9: 2SLS and OLS estimation of general tax with lag variable

VARIABLES	2SLS	OLS
general_tax	0.0485	0.0424**
	(0.0436)	(0.0186)
lag of bankruptcies	0.553***	0.553***
	(0.0452)	(0.0465)
Observations	1,200	1,200
R-squared	0.877	0.877

Robust standard errors in parentheses

** p<0.01, ** p<0.05, * p<0.1

that firm that is at the smaller size are operated with owner taking full responsibility on the level of the capitalization of the firm. So in this case, with higher tax rate, the owner does not take aggressive measure of borrowing more to shield from tax but instead do more saving for further investment increasing the margin of safety for the firm. In addition to this theory, smaller firm will have less access to liabilities and the option of finance through introducing stock is also not available. With lack of access to liabilities and higher tax rate will force owner to make more saving and safer decision on their investment. This will reduce the level of firm risk that is faced by the firm. However,this is only hypothesis and need further study. Another explanation is that regressing of small business tax is biased by the general tax However, as explained above, I expect the effect of both small tax rate and general tax rate to be both positive so if there is omitted bias coming from the general tax, the bias would be upward but in this case the sign of the coefficient is negative so there might be other source of the variation that have not been captured in the model.

8.1.2 General tax

A similar model will be used to estimate for general tax. In table 9, auto-correlation coefficient are significant and the size are very similar to small business tax study.

This further confirm the hypothesis that there are auto correlation in number of bankruptcies within one industry and one province.

The OLS is still significant but when we used the 2SLS model to estimate, the significance is gone. That shows that there is some other omitted variable in the OLS regression beside the lag variable that affect the bankruptcies level which i have not been able to capture. I conclude that there is no relationship between the general tax level and the number of bankruptcies.

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