Political Determinants of Tax Policy: Evidence from the Canadian Provinces

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Abstract

This paper uses the methodology presented in Ashworth and Heyndels (2002) and Lucinda and Arvate (2007) to test for the significance of opportunistic and partisan budget cycling within Canadian provincial tax data. The results of the empirical analysis support the existence of opportunistic cycles, but fail to provide evidence for ideological manipulation. In order to conduct the analysis an index that measures the yearly turbulence in each province's tax structure is developed, and used as the dependant variable. The results of the empirical analysis show that economic determinants such as the tax burden; growth in GDP and inflation; and the growth in natural resource revenues are all significant determinants of changes in tax structure. However, these results are found to be highly sensitive to the outlier provinces. When Saskatchewan and Quebec, the provinces with the highest and lowest average turbulence respectively, are removed from the sample the results change dramatically. When excluding Saskatchewan from the sample all of the economic determinants remain significant, but most of the political variables lose their explanatory power. The results after removing Quebec are similar to those of Saskatchewan, except for the addition of inflation as an insignificant variable.

Section 1: Introduction

The study of political budget cycles has been a popular topic within public economics literature. The primary focus of these studies has been the use of fiscal policy in attempt to influence voting behaviour, or to align spending along ideological positions. These inter-temporal behaviours are known as opportunistic and partisan budget cycles respectively, and have been supported by ample empirical evidence across various national and subnational jurisdictions. However, most of this literature has dealt with the expenditure side of budget cycles, whereas one could argue that changes to tax policies receive greater public attention than spending announcements. As such there is cause to warrant investigation into the impact of political factors on the revenue collection side of fiscal policy. This paper looks to add to the existing literature by exploring the significance of budget cycling through taxation in the Canadian provinces.

The existence of budget cycles in provincial taxation is examined through the analysis of an index developed by Ashworth and Heyndels (2002), referred to as tax structure turbulence. This variable measures the year to year change in the share of the total tax burden that is captured by each of the various tax instruments utilized by the provincial governments. The impacts of economic determinants such as growth in: GDP; inflation; the total tax burden; and other government revenue sources are estimated along with political determinants including elections, regime changes, and political fragmentation. The results of the estimation find evidence for the existence of opportunistic tax structure manipulation, but fail to provide support for partisan cycles. The results also find that the economic determinants have a significant impact in the degree of tax structure turbulence.

The remainder of this paper is constructed as follows: Section 2 provides a review of literature regarding tax structure turbulence and political revenue policy cycling with section 2.1 looking at the theoretical treatments and section 2.2 outlining some of the empirical work that has been conducted on the subject. Section 3 looks closer at the concept of tax structure turbulence. The turbulence index is computed and summary findings are reported and analyzed. Section 4 develops the theoretical anchor that is required for the empirical model, and justification is provided for the variables that are included in the estimated model. Section 5 then goes into the details of said empirical model and the estimation technique. The basic results from the analysis are reported and analyzed in 5.3 and sensitivity tests are performed on the results in section 5.4.

Section 2: Literature Review

Outside of the analyses conducted by Ashworth and Heyndels (2002) and Lucinda and Arvate (2007), little empirical work has been done on tax structure manipulation within the context of the political budget cycle literature. Landon and Ryan (1998) examine the political costs of taxation and expenditure in the Canadian provinces, and more recent works by Geys and Vermeir (2007, 2008) look empirically at the political consequences of incumbent tax choices in the United States and Germany respectively. However, a majority of the research focus has been placed on the expenditure side of partisan and opportunistic cycles, and those who have focused on the revenue such as Alesina, Cohen, and Roubini (1992, 1993) have looked at the aggregate level of taxation, or the overall tax burden.

Looking at the theoretical literature provides possible insight into the reasons behind this lack of attention. Section 2.2 briefly details some of the theoretical models that have either directly or indirectly made arguments with strong assumptions or implications regarding tax structure and its determinants. Section 2.2 discusses some of the empirical literature that has been conducted in order to test some of the theories presented in 2.1 on various governments around the world.

2.1: Theoretical Treatments

The tax smoothing model developed in Barro (1979) implies that tax structure turbulence should be minimal in the long run. The model assumes that "the government's objective is... the minimization of the present value of the resources consumed by the process of revenue generation" (Barro 1979, Page 944). This social cost of revenue is minimized subject to administrative costs, and the overall budget constraint, which equates the present value of taxation to the present value of current government expenditure and outstanding debt (ibid, page 942). Solving for the first order conditions shows that the marginal social cost of taxing will be positive. Thus the government will only collect as much revenue as it must in order to meet the long run inter-temporal budget constraint, and this rate should persist over the long run (Lucinda and Arvate 2007, Page 2). One of the effects of this smoothing of the tax rates over time is that tax revenues will grow at the same pace as GDP, resulting in little tax structure turbulence (ibid). The logical conclusion reached from this model is that exploring the determinants of tax structure manipulation should not yield significant results.

Mankiw (1987) builds off of Barro (1979)'s work in order to present a tax smoothing model that attempts to explain both fiscal and monetary policy. This model assumes that "the government raises revenue from two sources. The first source of revenue is a tax on output, such

as an income tax or a sales tax. The second source of revenue is seigniorage, the printing of new money. Both ways of raising revenue cause deadweight social losses" (Mankiw 1987, Page 328). Therefore, since both of the revenue collection options carry deadweight social losses; there should be a point at which the marginal social cost of taxation and inflation intersect. In summary Mankiw (1987) presents a model that reaches similar conclusions to Barro (1979) regarding tax structure turbulence: There shouldn't be any significant change. The main difference in conclusions reached in this version of the model, compared to the one presented by Barro (1979), is that both tax rates and inflation smooth out to a level that when combined with tax revenue meets the long term budgetary requirements of the state. These rates are also expected to hold steady over the long run.

The Barro (1979) and Mankiw (1987) tax smoothing models assume that the various tax bases will grow at the same rate as GDP over both the short and the long run. This assumption is not likely to hold, with one widely accepted occurrence that provides a counter-factual being the growth of the service industry in the first world starting in the second half of the 20th century. Growth in the service sector lead to an increase the tax base for consumption taxes, and caused the relative cost for implementation of measures such as the GST/HST to decrease. Therefore, the growth rate assumption can be exempted from the tax smoothing models, allowing them to account for turbulence on a systemic level (Ashworth and Heyndels 2002, Page 353).

However, the tax smoothing models are not alone in their assertion that tax structure should remain constant. The model of taxation by inertia provides another argument that there should be little to no change in tax structure. The basic idea behind this model, as presented by Rose (1985), is that the tax system is only subject to small incremental changes. The foundation of the tax framework is the result of the aggregation of previously passed laws which are simply

administered by the current revenue collecting institutions. The inertia model predicts that "the simplest thing for politicians to do is to do nothing, that is, to maintain the nation specific tax structure it has inherited (and can therefore blame upon) its predecessors" (Rose 1985, Page 293). By extension the model of inertia predicts that any changes to the tax structure must be a result of economic determinants, rather than political interference.

The probabilistic voting model presented by Hettich and Winer (1999) allows for more turbulence than the models discussed above. This model assumes that politicians will engage in vote maximizing behaviour, which requires giving more weight in their considerations to groups with greater influence over election outcomes. Therefore the probabilistic voting model allows for tax structure turbulence, as governments will continually tweak the tax system in order to account for constantly changing degrees of influence for the various subgroups being taxed within society. In other words "Political parties balance... competing aims in choosing a revenue system... they prefer to differentiate among heterogeneous tax payers, with an aim of raising revenue with as little loss of electoral support as possible" (Hettich and Winer 1999, Page 195). As such the probabilistic voting model is consistent with tax structure turbulence due to both economic and political determinants.

Universalism constitutes another theory that predicts the existence of tax structure turbulence. The universal hypothesis is that jurisdictions that share proximity, culture, and strong trade relationships such as the European Union should experience a convergence in their tax structures over time, taking into consideration that countries are at different stages in their economic development (Rose 1985, Page 291). As such universalism can be used to argue for the convergence of tax structures between closely related jurisdictions due to both economic and political motivations. For example, Rose (1985) argues that that universalism makes a case for

tax policy convergence within OECD nations (Page 291). This argument could also be applied to the Canadian provinces, which share greater similarity to each other than OECD nations culturally, politically, institutionally, and geographically.

2.2: Empirical Treatments

Landon and Ryan (1999) use Canadian provincial data from 1961 to 1990 to analyze the empirical evidence of political budget cycles in taxation and expenditure. The model that the authors construct assumes that individual voters maximize their utility subject to spending on transfers to: local governments; hospitals; business; and individuals, as well as the amount of revenue collected by government from taxing: personal income; corporate income; motor fuel; property; and licences and fees. These independent variables are applied to two different representations of voter preferences, with the first being the percentage of the vote obtained by the opposition party in provincial elections, and the second is the probability of incumbent re-election, measured as a dummy variable that equals 1 during years governed by a re-elected incumbent (Page 94). In the first specification Landon and Ryan (1999) find that the motor fuel tax, and licensing and fees affected voting preference, but the effects of expenditures are more predominant (Page 96). The probit model ran in the second specification finds that the impact on the probability of re-election is significant for multiple tax variables. Income, motor fuel, and sales taxes all prove to be statistically significant and negative, implying that a higher tax burden in these areas decreases the odds of re-election. On the other hand, increases in licensing and fees are found to positively affect the likelihood of re-election (Page 100). Therefore the authors conclude that there is a visible correlation between taxation and political outcomes in the provinces. By extension it can be seen that incumbents have an incentive to adjust the tax rates in

order to better increase the odds of electoral success, and thus political determinants of tax structure turbulence should be statistically significant.

The political costs of collecting tax is the focus of Geys and Vermeir (2008)'s analysis of German national and subnational data. The study looked at 3 different hypotheses related to the impacts of changes in the tax burden on the popularity of both incumbent and opposition parties. They also considered 1 hypothesis on the effects of federal tax burden on the popularity of German subnational governments. The results show that inflation only has a minimal impact on popularity, but that unemployment is highly significant and negative. However, the conclusions of interest within the context of tax structure turbulence are those reached for the tax revenues, and divided government variable. The divided government variable in Geys and Vermeir (2008)'s analysis is estimated to be insignificant for voting behaviour, but useful in separating the taxation effects. In cases where the opposition party controls the second house (known as the Bundesrat), the tax variables proved to be significant for the popularity of both government and opposition parties, whereas only the popularity of the incumbent government is effected when the incumbent controls both houses (Page 12). This could be interpreted as meaning that the incumbent perceives that there is an incentive to engage in opportunistic revenue cycling when the degree of political dispersion is low, but sees the political benefits of such policies as negligible when the dispersion is high. The authors also determine that taxes levied by the federal government do not impact voting preferences at the subnational level, or vice versa (Page 14). Geys and Vermeir (2008)'s findings for inflation; taxation in relation to divided government; and taxation by various levels of government seem to imply a high degree of understanding among German voters on where to place the blame, or praise for specific policies.

Ashworth and Heyndels (2002) examine the tax structure of 18 OECD countries in order to test for the significance of opportunistic and partisan cycles. The authors develop an index that measures the tax structure turbulence for a given jurisdiction, which is then interpreted as a gauge for political budget cycles within the revenue collection system. Fixed and random effects panel estimation is estimated in order to analyze the various economic and political determinants of tax structure turbulence including: GDP, inflation, the tax burden, political dispersion, and of course opportunistic and partisan cycles. The basic results of their estimation showed that the magnitude of change in real GDP, the aggregate tax base, and inflation were all significant and had a positive correlation with changes in the tax structure (Ashworth and Heyndels 2002, Page 362). These results are consistent with the theoretical models presented by Barro (1979), but more notably Mankiw (1987) and Hettrich and Winer (1999). As for the political determinants, "it can be seen that there is evidence of a stagnating effect of elections. This indicates that the tax system is not manipulated strategically in election years to gain political support" (Ashworth and Heyndels 2002 Page 362). The authors were unable to find any significance in the variables that test for partisan cycles, but the degree of political fragmentation is highly significant and negative, lending credence to the theory that coalition governments are less willing or able to pass tax reforms (ibid, Page 363).

The index and approach used in Ashworth and Heyndels (2002) is replicated in the analysis conducted by Lucinda and Arvate (2007), where it is utilized to examine the tax structure turbulence of Latin American countries. The specifications are the same with the exception of how the degree of political dispersion is measured. The former used the method outlined in Roubini and Sachs (1989), where one includes 3 dummy variables that represent an escalating number of political parties involved in coalition governments. The latter uses a simple

dummy variable, where 1 represents a situation where the same party controls both elected branches of government and 0 otherwise (Lucinda and Arvate 2007, Page 12). The results that are reported for Latin American countries are for the most part as expected. Elections have a negative coefficient, supporting the hypothesis of opportunistic cycles, and a change in ideological regimes had a significant positive impact, suggesting the existence of a partisan cycle (Page 25). Oddly the analysis finds no significance in GDP growth or the rate of inflation, which Barro (1979) and Mankiw (1987) suggest should be among few of the only causes of tax structure turbulence, should it exist at all. The open variable is also significant, and is negative. This result for openness is reasonable, as it could be argued that countries with more open trade policies have an incentive to keep their tax system stable and predictable, since certainty enhances economic competitiveness.

In order to examine the political costs of tax policy, Geys and Vermeir (2007) analyze the historical approval ratings for U.S. incumbent presidents. The effects of both the total tax burden and tax structure turbulence, as constructed by Ashworth and Heyndels (2002), are independent variables along with the budget deficit, and two lagged dependant variables. The authors also include a vector of control variables that includes both economic and political determinants such as GDP growth, inflation, and euphoria experienced at the beginning of a new regime. The analysis finds that all of the economic control variables have an insignificant impact on approval ratings. The authors do however find that political determinants are significant. This outcome is not particularly surprising given that in this case the dependent variable is political in nature. The more interesting results are those reported for the fiscal and revenue variables. Budget deficits are significant and have a negative impact on approval ratings, and the same result applies to tax structure turbulence: "this supports the contention that shifts in the tax structure impose a

political cost for the incumbent, even when these changes are revenue-neutral" (Geys and Vermeir 2007, Page 19). Since tax structure turbulence has an effect on the re-election odds of an incumbent, regardless of the net effect of those changes, it becomes easy to see how an incumbent would then have incentive to avoid tax changes near elections. Thus Geys and Vermeir (2007) provide support to the hypothesis that opportunistic election cycles occur in revenue collection.

Section 3: Tax Structure Turbulence in the Provinces

In order to examine whether provincial governments use the tax system to engage in opportunistic and partisan budget cycling, this paper will employ the same procedure as Ashworth and Heyndels (2002), and Lucinda and Arvate (2007) to produce a variable they refer to as *tax structure turbulence* (TURB). TURB is an index that measures the annual degree of change in provincial tax structures via the change in the share of total tax burden that is consumed by each form of taxation. The index is an application of Hymer's (1962) mobility index, which is has been used in industrial economics to measure the annual turbulence in an individual firm's market shares (Ashworth and Heyndels 2002, Page 348). The TURB index is defined as:

$$\Delta R_t^i = \sum_{j=1}^{n} | R_{j,t}^i - R_{j,t-1}^i | \qquad 2 \geq \Delta R_t^i \geq 0 \qquad (1)$$

Where:

- $R_{j,t}^i$ is the percentage of province i's total tax revenue collected by tax j, in year t.
- R_t^i is the vector of revenue shares $\left(R_{1,t}^i, R_{2,t}^i, \ldots, R_{n,t}^i\right)$ for each province i in year t.
- $1 \geq R_{1,t}^i \geq 0$
- $\sum R_{j,t}^i = 1$

The value of ΔR_t^i falls between 0 and 2, where 0 represents no change, and 2 represents an overhaul in the distribution of tax revenues from the previous year.

Using formula (1), the tax structure turbulence has been calculated for the period of 1989 to 2008 for each of the ten provinces. The data used in the computations has been retrieved from Statistics Canada's online database CANSIM, where detailed information on provincial revenue sources is published.[1] This tax revenue data is broken down into sixteen different tax measures which are grouped into five broad categories: income, consumption, property and related, health and drug insurance, and other. These two levels of aggregation have been used to produce two dependant variables for examination: TURB5, which has been calculated using the data aggregated into the 5 main categories; and TURB16 which is calculated using each of the sixteen individual tax measures.

TURB16 has a mean value of 0.074, with a maximum of 0.105 in 2001 and a minimum of 0.054 in 1990. The mean of 0.074 indicates that provincial tax structures change by an average of 3.7% per year over the sample period. This value exceeds the 2.4% reported for OECD countries (Ashworth 2002, Page 349), but is lower than the approximate mean of 4.5% observed in Latin America (Lucinda and Arvate 2007, Page 26). TURB5 has a mean of 0.039, with a minimum of 0.025 in 1995 and a maximum of 0.059 in 2003. The lower values observed for TURB5 compared to TURB16 support the conclusion that the index has "...only a relative meaning as it relates directly to the (number of) revenue categories which we consider" (Ashworth and Heyndels 2007, Page 349). In other words since TURB5 contains fewer and more

[1] Provincial revenue data was gathered from Statistics Canada Table 385-0001

encompassing tax categories than TURB16, it is less sensitive to changes recorded between tax instruments.

The two series in Figure (1) follow a similar trend for a majority of the sample period. There are however a couple of noteworthy deviations. The most noticeable divergence occurs in 1995 when TURB16 spiked to approximately 5%, its second highest peak in the sample, whereas TURB5 reached its series minimum of 1.25%. The second major point of deviation is in 2003 when Turb16 was in the middle of a downward trend, whereas TURB5 spiked to its series maximum of 2.95%. The divergence in 1995 can be explained by a reallocation of revenue collected from one tax instrument to another within the same category. For example, a reduction in personal income tax revenue occurring in the same year as a proportional increase in corporate tax revenue would lead to an increase in the TURB16 index but at the same time leave the "income tax" category, and by extension the TURB5 index unchanged. The divergence in 2003 is a more interesting case. The likely explanation for these results is that the ratio of turbulence within categories versus the turbulence between categories experienced a temporary shock, where there were less total movements in the tax system than the prior year but more movement between broad categories.

Figure (2) shows the median TURB16 for each of the ten provinces. The first eight provinces listed show little difference in their turbulence, with New Brunswick sitting at the top of the range with 0.075, and Ontario at the bottom with a median of 0.056. The two outlier provinces are Quebec and Saskatchewan, with values of 0.041 and 0.128 respectively. Quebec's turbulence is not excessively low when compared to the other provinces. The average change in Quebec is 2.05% compared to 3.75% for all provinces. Saskatchewan on the other hand warrants further investigation with an average turbulence almost twice that reported for the entire sample.

Saskatchewan's turbulence is over 50% higher than New Brunswick's, twice as large as Ontario's, and 3 times as large as Quebec's.

Figure (3) shows the progression of the Saskatchewan's TURB16 over the sample period. For most of the period the province showed turbulence levels comparable to the other regions, with the exceptions occurring in 1999, and 2001-2002. Average turbulence during these years is 14% (TURB16 of 0.28), with 2002 yielding a 21.5% change from the previous year. The spike in 2001-2002 can be explained by the sweeping personal income tax reforms announced in Saskatchewan's 2000 budget. The province repealed its flat tax rate and replaced it with a progressive income tax system, and introduced other measures such as the sales tax credit (Saskatchewan 2000).

It is interesting to note that Saskatchewan had a minority government in the provincial legislature from 2001 to 2004, which is the same period that showed the abnormally high turbulence values. This result contradicts the arguments put forth by the likes of Barro (1979), Mankiw (1987), and Ashworth and Heyndels (2002) that minority governments should be negatively correlated with turbulence due to indecisiveness created by political fragmentation. The impact that minority government has on TURB will be discussed in section 4, and then analyzed in greater detail in section 5.

Election years for the Saskatchewan legislature are denoted in Figure (3) as red data points. Aside from the elections held in 1991 and 2007, there appears to be a negative correlation between turbulence and elections, with each of the 1995, 1999, and 2003 observations serving as local minima. These results would seem to reinforce the hypothesis that electoral cycles have an effect on tax structure, with incumbent governments avoiding tax reform in election years due to

the negative attention received from placing focus on the tax system (Geys and Vermeir 2007, Page 2).

The relatively high levels of TURB16 seen in the years prior to an election support the theory of an opportunistic budget cycle. "In opportunistic (or electoral) business cycle models... politicians maximize their popularity or their probability of re-election by following pre-election expansionary fiscal policies in order to please the fiscally illuded voters" (Serletis and Afxentiou 1998, Page 29). The opportunistic manipulation in this case is occurring in taxation rather than expenditure. The local spike in turbulence leading up to election years shows the incumbent governments desire to strategically set the tax structure in such a way as to maximize their potential votes, just as the probabilistic voting model would suggest. The increases in TURB16 seen in years following an election provide support for the existence of a partisan budget cycle, where the partisan approach to studying political budget cycles "examines the macroeconomic implications of electoral cycles when different political parties have different ideological and economic preferences" (Shi and Svensoon 2003, Page 69).

Section 4: Theoretical Anchor

Section 4 will outline the methodology used to construct the empirical specification estimated in section 5 of this paper, and provide justification for the inclusion of the selected economic and political determinants. The approach that is taken is a variation of the method applied in Ashworth and Heyndels (2002); and in Lucinda and Lucinda (2007). Using this approach enables the investigation into the effects of various economic and political determinants of tax structure turbulence, and is anchored primarily off of the theoretical models presented by Barro (1979); Mankiw (1987); and most notably Hettrich and Winer (1999).

It should be noted that the model described by Barro (1979) defines tax rates as the share of GDP consumed by taxation. This definition means that the model considers the aggregated tax level rather than the composition of each specific tax group, which is the focus of this paper. Conceptually the model still holds relevance to this analysis, as changes in the aggregate tax burden are expected to be major contributor to tax structure turbulence. This will be discussed in greater detail in section 4.1

4.1: Selecting Economic and Political Determinants of Tax Structure Turbulence

The first and most obvious choice for determinants of tax structure turbulence is the absolute value of the change in tax burden relative to GDP. The absolute value is used because the TURB indices use the absolute values of the differences between periods in their calculation. This means that TURB only measures the magnitude of changes in tax shares, and not the direction of change. As a result a positive change of x% will have the same net impact on TURB as a -x% change. This treatment is consistent with the tax smoothing models in Barro (1979); and Mankiw (1987); as well as the probabilistic voting model (Hettrich 1999); as they all argue that tax structure only remains constant when the tax burden doesn't change (Ashworth 2002, Page 354). Secondly, it is argued in Section 2 that the tax base for the various instruments will not necessarily grow at the same rate. A change in the total tax base is expected to cause a change in the individual revenue shares for a subset of the tax instruments and by extension, cause a change in TURB.

Tax structure turbulence occurs as a result of various economic and political determinants beyond just the aggregate tax base. The economic variables included in the empirical model are: the change in real GDP growth, the change in the inflation rate, the change in real natural resource rents, and the change in real federal transfers. All of these economic variables are

applied as absolute values, as the nature of the TURB indices implies that the magnitude of change is the factor of importance, rather than the direction of change.

The openness of the economy is not included as an economic variable because this analysis is dealing with subnational governments, where the openness theoretically should not be significant since all of the jurisdictions are subjected to the foreign trade policy of the federal government. This omission is supported by the analysis conducted by Ashworth and Heyndels (2002), where they found no significance in their openness variable in OECD nations. Lucinda and Arvate (2002) found openness to be significant. However, this outcome can be explained by the dramatic changes in trade policy that many Latin American countries underwent throughout the 1990s (Lucinda and Arvate 2007, Page 14).

The first economic variable included in the analysis is real GDP growth. The evolution of the economy rarely leads to equal growth across all sectors. In modern history strong persistent growth has usually been fuelled by one or a few markets, with recessions initiated by bursting of the bubbles that form in these markets. Examples include the housing bubble that burst in the United States in 2007; and dot.com bubble of the late 1990s; one could argue that a new commodities bubble is in the process of forming, as this market has been the driving force behind the current economic recovery. During these booms and busts the sizes of tax bases grow or contract at different rates due to the asymmetric market growth. During the housing bubble for example, property and property transfer taxes would increase due to the climbing values of real estate. Provinces with HST implemented would also see sales tax revenue increases from this real property market growth. Therefore GDP is expected to be a significant determinant for TURB.

Inflation has a similar effect as the tax burden and GDP in that it impacts TURB by directly impacting the expansion or contraction of the tax bases through increases in the aggregate tax collected. With the key difference being that inflation only reflects the change in size of tax bases due to changes in the price level, whereas GDP and the tax burden measures of changes in real output and revenues respectively.

The expectation that inflation will impact turbulence comes about due to the fact that some tax bases are more responsive to inflationary pressures than others. For example property taxes and consumption taxes such as: retail sales taxes, value added taxes, motor fuel taxes, and other generic consumption taxes will be affected by inflation to a greater extent than income tax revenues. This difference occurs because the size of consumption and property taxes levied is a function of price or the assessed value of the asset being taxed. Income taxes on the other hand can be sticky in the short run due to the incidence of collective and individual fixed term labour agreements.

Although natural resource revenues were not included as an explanatory variable by Ashworth and Heyndels (2002) or Lucinda and Arvate (2007), they warrant inclusion in this analysis due to the relative impact natural resource exploration and extraction have on the fiscal situation for multiple provinces, particularly those in western Canada where there is an abundance of petroleum, potash, and timber. Higher revenue obtained through this source reduces the need to rely on revenue from taxation in order to fund government services and programs, whereas unexpected decreases in these revenues can create the need to raise additional revenue through tax in order to maintain the long term fiscal plan. It is also the case that increasing resource and exploration rents imply increases profits and/or output for resource

companies, which would then impact the income tax bases. Thus natural resource revenues are expected to have a significant effect on tax structure turbulence.

Inspecting the TURB16 and natural resource revenues for Saskatchewan provides support for the inclusion of these figures in the regression model. Based on inspection of figure (4), which plots Saskatchewan's absolute change in natural resource rents with TURB16, the variables appear to be positively correlated. Saskatchewan is an example where this effect could be overstated though, since the province is sparsely populated and natural resources make up a significant percentage of the provincial budget. Figure (5) plots the growth in natural resource revenues and turbulence for Ontario, a province that receive very little of its annual budget from resource rents. On inspection there does not appear to be a positive correlation in this case, in fact 1991 and 2003 provide glaring examples of negative correlation. However, there could be correlation in the smaller fluctuations that dampen, or even overpower this impact. The correlation coefficient between TURB and natural resources returned a value -0.1326 for Ontario, indicating the existence of a weak negative correlation. Thus after inspecting two provinces with differing reliance on natural resources, mixed evidence on the impact of natural resources is produced with the high reliance province having a positive effect and the low reliance province having an effect that is negative. What both examples have in common though is that natural resource rents are correlated with TURB, meaning that there is still an expectation that this variable will prove significant.

Another variable that has been added to the regression is the absolute change in federal transfer payments. The argument for the inclusion of this variable is similar to those presented for natural resource revenues in the sense that federal transfers make up a significant portion of a provincial budget. However, unlike the case with natural resources, federal transfers are a

significant source of revenue for all of the provinces and not just those graced with an abundance of resources. On average, between Federal transfers and natural resource rents the former also makes up a larger percentage of provincial revenues, with some provinces receiving upwards of 50 % of their total budget through transfer payments. For example, averaged over the 20 year sample period the federal transfers to Newfoundland provide an almost identical amount of revenue as what has been raised by taxes. In fact federal transfers act as a slightly larger source of financing, representing an average 101% of raised taxes over the sample period.

Turbulence can also be induced by political determinants. This analysis considers the impacts three political variables: opportunistic manipulation, ideological manipulation, and the dispersion of political power.

Opportunistic manipulation is thought to occur due to the desire incumbent governments have to increase their odds of re-election (Ashworth 2002, Page 355). The probabilistic voting model also makes this assumption through its assertion that governments will adjust tax rates so as to shift the tax burden away from societal groups perceived to have increased in voting influence. There is empirical evidence that shows that incumbent politicians in the United States have a tendency to increase taxes when there is a long timeline before the next election; or during times of fiscal crisis (Brockington 2010, Page 2). However, there have also been arguments presented by Rose (1985) and Geys and Vermeir (2007) that reach an opposing conclusion. These authors argue that governments will avoid altering the tax system due to the negative attention that is garnished from the public's focus on taxation issues, regardless the effect that these changes have on their tax burden. This is the conclusion reached in the model of inertia, and can be argued to support the existence of both a fixed cost to tax reform; and grievance asymmetry, a concept where voter's negative reaction to an increase in their tax

burden is greater than the positive reaction gained from a proportional decreases (Geys and Vermeir 2007, Pages 2, 6).

Ideological manipulation encompasses the principle that different political parties have differing opinions and/or options on the optimal use of tax instruments. For example Brockington and Donovan (2010) find evidence in British municipalities of a disparity in the political costs of tax reform based on political party, with the labour party receiving less political strife for tax increases than their conservative counterparts. As such some parties may be more likely to change the tax structure than others, if there is a perception that the new regime is ideologically affiliated with tax increases or decreases. It is also possible that this variable could be significant due to varying party preferences over some forms of taxation over others. Therefore ideological manipulation is expected to be statistically significant.

The final political variable used in this analysis is the dispersion of political power. There is conflicting reasons as to why this variable is expected to be significant. The first theory is that legislatures that are controlled by coalition or minority governments are in a weaker position to push through tax reforms than regimes that yield a majority in the house. Most empirical studies on political budget cycling have used this theory in order to justify their inclusion of political dispersion in their analysis (Ashworth and Heyndels 2002; Lucinda and Arvate 2007; Geys and Vermeir 2007; Roubini and Sachs 1989). The second theory is that political dispersion forces more compromise when dealing with controversial issues such as tax policy, which in turn can lead to less frequent but more cluttered tax adjustments.

Section 5: Empirical Analysis

The remainder of this paper will focus on setting up; applying; and discussing the results of the empirical model that will be employed in order to examine the determinants of the dependant variable TURB16. Section 5.1 outlines the structure of the model and the results that are expected. The next section discusses the estimation technique and its deviation from those used in Ashworth and Heyndels (2002) and Lucinda and Arvate (2007); 5.3 highlights the basic results of the analysis; and Section 5.4 details the outcomes of various sensitivity tests that are conducted on those results.

5.1: Explanation of the model

Using the TURB16 as defined and discussed in Section 3, along with the variables outlined in Section 4.1, the model can be specified as:

$$\Delta R_t^i = \beta_t^1 + \beta_1 TB_{t,t-1}^i + \beta_2 GDP_{t,t-1}^i + \beta_3 \text{INFLATION}_{t,t-1}^i + \beta_4 TRANS_t^i + \beta_5 NR_t^i + \beta_5 ELECTION_t^i + \beta_6 GOV_{t-1}^i + \beta_7 MINORITY_{t-1}^i + \beta_8 MINELECTION_t^i + \beta_9 MINGOV_t^i + \varepsilon_t^i$$

Where ΔR_t^i symbolizes TURB16. The structure and expected results for the independent variables in the regression are described in greater detail below.

Tax Burden (TB)

TB represents the change in tax burden as a percentage of GDP. The variable is expected to be positive since an increase in the tax burden's share of GDP implies growth in at least one of the tax bases, and most likely implies growth in more than one. Since the variable is defined as an absolute value, variations in the number of tax rates that change should only affect the magnitude of the coefficient and not the direction. Growth cannot be assumed to be equal across all tax bases and thus there should always be some degree of TURB as a result to fluctuations in TB. It is important to note that the tax smoothing and probabilistic voting models allow, in some

cases with adjustments, for changes in the total tax burden to be endogenous. Although for the purposes of this paper the endogeneity is extended to draw conclusions about tax structure, it also has implications regarding the possible political determination of TB. As such, there is a strong possibility that the TB variable is jointly determined with TURB. Although this paper does not empirically examine this issue, it could prove to be an interesting issue for future research.

GDP

The growth rate of GDP is expected to be positively correlated with TURB. This follows from the principle that fluctuations in economy cause increases in the various tax bases that are utilized by current tax policies. Thus, even if there is no change in the relative rates of taxation, turbulence in the revenue collected will occur. The strength of the economy can also have an impact on the political decision to alter the tax structure. Periods of sustained prosper can induce an incumbent to reduce taxes for political gain without facing the political consequences of deficit. Reductions in corporate and personal income tax rates that occurred on the Canadian federal level throughout the turn of the millennium provide an example of this effect. On the same token, a struggling economy can act to compel government to implement tax policy that is perceived as being more conducive to economic recovery.

Inflation

The observations for inflation are on a provincial specific level, as it is a more accurate measure for the purposes of this analysis than the national CPI. Inflation is expected to be positive, as growth in the price levels will impact tax bases that rely on sales or value more dramatically than they will for those that rely on incomes. By extension it is then reasonable to expect that larger fluctuations in inflation will have a larger impact on TURB16.

Natural Resources (NR)

NR is expected to have a positive impact on TURB16 because changes in revenue obtained from non-taxing sources will create discrepancies between the revenue collected from taxes and the revenue required to meet budgetary obligations. Therefore, an incumbent has incentive to consider their expected revenue from other significant sources when deciding on its taxing needs. However, although the Saskatchewan data analyzed in section 4 aligned with this argument, the data for Ontario was much less supportive.

Federal Transfers (TRANS)

The rate of change in federal transfer payments is expected to have a positive coefficient as larger variations in this source of revenue will impact the government's fiscal position much the same way as it is expected to for NR. This will force incumbents to adjust other sources of revenue, such as taxation, to maintain their long term fiscal plan. This variable is expected to be larger in magnitude and greater in significance than NR, since TRANS makes up a larger percentage of total revenue and has more predictability in the value of its future contributions.

Election

The impact of opportunistic manipulation is captured through ELECTION, which equals 1 during an election year and 0 otherwise. The sign on this coefficient could turn out to be positive or negative, as there are two different opportunistic considerations that could be driving the outcome. Due to the probabilistic voting cycle's argument that the incumbent attempts to secure re-election odds through the shifting of tax burden, there is rationale for expecting the ELECTION coefficient to be positive. However, the sign can also be expected to be negative due to the high fixed costs to tax reform and the perception of grievance asymmetry. Which effect will prevail is dependent on whether the incentive to shift tax burdens to remitters with less

voting sway outweighs the perceived fixed cost to reform (Ashworth and Heyndels 2002, Page 356).

Regime Change (GOV)

The ideological manipulation effect that is inherent in the concept of partisan budget cycling is measured through GOV, which equals 1 for years where the political regime changed and 0 otherwise. More specifically, the dummy variable equals 1 if the regime changed in the first 6 months of that year, or in the final 6 months of the previous year. This specification is applied because of the time lag incurred between election victories and the opportunity to announce tax changes (Ashworth and Heyndels 2002, Page 358). This variable is lagged by one year in the regression model due to the assumption that there is a period gap between the time a new tax measure is announced and the date it is brought into force. This is a common convention as most tax changes take time to implement. The sign on GOV is expected to be positive, since new regimes will find it advantageous to make ideological changes to the tax system early in their term, so as to allow significant time to pass for public discontent to fade before facing re-election.

Political Fragmentation (MINORITY)

MINORITY equals 1 in years when government is formed by a party that controls a minority of seats in the house, and 0 otherwise. This treatment of political fragmentation varies from that of Ashworth and Heyndels (2002), where they used the Roubini and Sachs (1989) method involving the use of three different dummies variables to represent differing degrees of political dispersion. The Roubini and Sachs (1989) method is not feasible for this analysis since coalition governments are extremely uncommon, and in some provinces there are cases of extended periods where there existed, in practice, a two party system. A similar substitution is

made by Lucinda and Arvate (2007) in their examination of tax structure turbulence in Latin American countries. Using a minority dummy variable to represent the degree of political fragmentation is also supported by the conclusions of Edin and Ohlsson (1991), who argue that the Roubini and Sachs (1989) method fails to capture the effects of majority governments, but instead shows the impact of the minority. Therefore this model employs a variable that in a sense strictly defines the substantial difference in governance between situations where one party has a majority in the provincial legislature; compared to a situation where the governing party controls a minority of seats.

MINORITY is lagged by one year in the regression, because like the ELECTION variable it is measuring actions taking place within the legislatures. Since the outcomes of the legislative process don't come into force until they can be implemented, lagging the variable is necessary in order to truly capture the effect. The sign on the coefficient for this variable is expected to be negative due to the increased challenge to passing tax reforms that is created from the lack of decisiveness during minority governing. However, there is a theoretical case to be made for political fragmentation having a positive effect on tax structure turbulence. Ashworth and Heyndels (2002) argues that "when they do succeed in adapting the level of tax revenue, fragmented governments will more likely use different tax instruments simultaneously (to serve the different interests of government parties)" (page 357). This result does not necessarily imply a negative impact on turbulence as the authors assert. The TURB16 variable measures multiple small changes to tax instruments as well as larger changes to just a few. As such the impact of political horse trading could have either a positive or negative effect on turbulence, depending on the specifics of the case being examined.

The Interaction Variables (MINELECTION, MINGOV)

Along with the three political variables outlined above, the model also employs two political interaction variables: MINORITY multiplied by ELECTION, each lagged by one year (MINELECTION); and MINORITY multiplied by GOV, with GOV lagged by one year (MINGOV). These variables are included because "Political dispersion is expected to weaken the effects of election years and regime shifts" and as such..."The corresponding coefficients are therefore expected to be negative if the electoral or ideological coefficients are positive. If the electoral coefficient is negative, revealing the dominance of fixed cost-effect, then the interaction coefficient is expected to be positive" (Ashworth and Heyndels 2002, Page 359).

Table (1) summarizes the expected signs of the outlined political and economic variables on an inter-temporal basis. As it can be seen all of the economic variables are expected to be positive in all periods of the budget cycle, whereas political variables are expected to have an inter-temporal component to them. The expectations for the economic determinants are formed because larger shocks in each respective variable should lead to larger fluctuations in the various tax bases, and this should not have differing signs based on period. On the other hand the election variable is expected to have inter-temporal differences due to the nature of election cycles.

5.2: Selecting an Estimation Technique:

This section outlines some of the estimation techniques that are available for the purpose of testing for opportunistic and partisan budget cycles in provincial tax structures. There are multiple different approaches to estimating panel data. Those that will be discussed in this section include the: pooled ordinary least squares (OLS); fixed and random effects; and the seemingly unrelated regression (SUR) estimation techniques. Each of these techniques are discussed in greater detail below.

It should be noted that Ashworth and Heyndels (2002), and Lucinda and Arvate (2007) argue that the application of the fixed and random effects is the most appropriate estimation technique for specifications like the one presented in Section 5.1. Their argument is that these estimators obtain robust results that accurately distinguish between both the country specific, and time specific effects contained within specifications in cases where the OLS assumptions about unobservable effects do not hold. They believe this situation to be the case when working with specifications of this type.

Pooled OLS Estimation

The pooled regression model takes the general form:

$$Y_{it} = X'_{it}\beta + Z'_{i}\alpha + \varepsilon_{it}$$

Where X is the typical matrix of explanatory variables, absent a constant term, and β are your coefficients. The Z represents a matrix containing a constant term as well as other variables representing cross-sectional or group specific effects in the data. The variables included in Z can be either observable or unobservable (Greene 2008, Page 182).

The OLS estimation is appropriate to apply when the Z matrix contains only a constant term. As such the OLS regression reduces to the form:

$$Y_{it} = X'_{it}\beta + c_i + \varepsilon_{it}$$

Where c_i represents the Z matrix that is reduced down to just the constant term, which as can be seen is equivalent to the standard OLS regression from non-panel treatments (ibid, Page 193). Therefore, in order for the OLS regression to be unbiased, we must assume that the constant term is identical for all of the provinces and over all periods. This assumption can become problematic

because when a variable is omitted from the analysis, it is captured in the constant term. As such if we are to assume that the constant term is indistinguishable between provinces, then by extension we must conclude that every province and time specific effect is observable, and as such there are no omitted relevant variables. The Pooled OLS estimation also requires that the other assumptions made about OLS hold (ibid, Page 183).

Fixed Effects Estimation

The fixed effects estimator addresses the problem that arises when the constant terms are not equal across all cross sections and/or periods. The estimator handles this issue by allowing the constant term to vary based on cross section or period in order to more accurately account for the unobserved effects that are specific to each individual time or cross section (Heij 2004, Page 693). The fixed effects estimation method can be represented as:

$$Y_{it} = X'_{it}\beta + \alpha_i + \delta_t + \varepsilon_{it}$$

Where α and δ represent the cross section and time specific constant variables respectively. The specification requires that one of the time dummies be dropped in order to avoid the problem of collinearity (Greene 2004, Page 197).

The argument can be made for the fixed effects model within the context of analyzing provincial tax structures. Applying a cross sectional fixed model would account for the likely possibility that there are provincial specific affects occurring (Ashworth and Heyndels 2002, Page 360). The period fixed effects estimation could also be valid, as there are exogenous factors that are applied equally to all cross sections that may vary over time. For example Federal tax and expenditure decisions should impact all provinces at the same time, and more or less to the same relative degree.

Random Effects Estimation

One important thing to note about the fixed effects method discussed above is that in order for it to produce the most appropriate estimator, it must be assumed that the unobservable variables are correlated with the observable ones in X_{it}. There are cases where this assumption cannot be maintained, and the unobserved variables are in fact not correlated with the observable variables. When this circumstance arises, the random effects estimator generates the most robust results (Greene 2008, Page 183). The random effects model takes the form:

$$Y_{it} = X'_{it}\beta + \alpha_i + u_i + \varepsilon_{it}$$

This specification "would be appropriate if we believed that sampled cross-sectional units were drawn from a large population" (ibid, Page 200). The greatest advantage to this estimation method is that it allows you to regress variables included in the Z matrix without creating the problem of perfect collinearity. Thus the random effects model can estimate some of the individual specific effects that the fixed effects model misses (Heij 2004, Page 695). However, this approach does not explain our analysis as well conceptually. For the purposes of this analysis, the cross sections are not a random sample from the population, but the entire population as all provinces are included.

Seeming Unrelated Regression (SUR) estimator

The SUR estimator is a more generalized version of the fixed and random effects estimators discussed above. The SUR method is applied in a case where it is assumed that the

observations within a cross section are not serially correlated, but the observations between cross sections may be serially correlated (ibid, Page 684). The approach takes a specification of the form:

$$Y_i = X'_i\beta + \varepsilon_i$$

This model is then run for each cross section unit, *i*.

The SUR method of estimation is usually performed using generalized least squares (GLS), but when all of the regressors are the same for each equation, the OLS is also appropriate. However, it is probably best practice to apply GLS in any case, as it will always perform at least equally as well as its OLS counterpart (Greene 2008, Page 257). One important note about the SUR estimator is that it can only be estimated when the number of period observations exceeds the number of cross sections (ibid, Page 687). This should not be a problem within the context of the analysis in the following section.

5.3 Basic Results

In order to examine the effects of opportunistic and partisan budget cycling in Canadian provinces, a panel regression of time-series-cross-section data is run on the provincial tax, economic, and political variables. There are 20 period observations on each of the 10 provinces totalling 200 observations. Once the tax and economic data is converted into first difference (via construction) there are 190 observations left to include in the analysis. The first differencing process should also remove any potential for non stationarity within these variables. The empirical work has been conducted using Eviews 7. All values reported in tables are bold if they are significant. Two stars next to the coefficient will denote that the variable is significant at 5%, whereas a single star represents significance at 10%.

The "primary regressions" that will be reported on are produced using GLS estimation with cross section SUR weights, as this specification has been found to provide the most robust results from this sample. Therefore the regressions have been corrected for heteroskedasticity and period correlation. The results of the estimation are posted in table 2 in the appendix. A few sample regressions from some of the other specifications outlined in section 5.2 are also provided. These are included for the sake of comparison.

The results from the primary specifications are shown in columns 1 and 3, with the third column excluding the variables found to be insignificant. Columns 2 and 4 show the same specifications, but with a White cross section covariance applied to the standard errors. Below the coefficient estimates there are various statistics listed regarding the robustness of the specifications. As seen in the table, all of the primary regressions pass tests of significance and have an acceptable R^2. Looking at table 3, the constant is listed as 0.02678, which is approximately 36% of the average TURB16 reported as 0.074 in Section 3. This shows that a sizable portion of the tax structure turbulence cannot be explained by the independent variables in this analysis.

TB proves to be highly significant and to have a positive impact. This is an expected result and supports the evidence presented in other literature. GDP is also significant in all of the primary specifications but always reports to be negative, which is highly unexpected. This result would seem to support the assumption of Barro (1979) that all tax bases grow at the same rate. However, the sign on GDP is inconsistent with the value reported for TB, as well as the findings of other empirical literature on tax structure including Ashworth and Heyndels (2002), the developers of the specification being estimated. The coefficient for INFLATION is expectedly significant and positive, thus providing more counter evidence to the theory that the tax bases

grow at the same rate. The estimate for the NR variable also confirms expectations. The coefficient is significant and positive, supporting the hypothesis that revenue from non-taxing sources impact revenue collection. All of the economic variables mentioned above are significant at 5%. The coefficient for TRANS proves to be insignificant in every specification. This is unexpected given the results for natural resources. The theory put forward is that federal transfers would have a similar but more pronounced effect than NR, given that it is a larger source of non-tax revenue.

Turning to the political determinants, the coefficient on GOV is highly insignificant. Thus we fail to provide any support for the hypothesis that there are ideological preferences regarding tax structure, and as such it would seem that Canadian provincial parties do not engage in partisan budget cycles. This outcome is consistent with the results in Ashworth and Heyndels (2002), where they also found no evidence of partisan cycles. However, Lucindo and Arvate (2007) use a representation of this variable that is more analogous to the treatment in this paper, and their analysis of Latin American countries found regime change to be significant and positive.

The coefficient for ELECTION is significant and positive. The negative sign of the coefficient indicates that incumbent governments avoid changing the tax system when they are coming up for re-election. This result supports the assumptions in the probabilistic voting model, and provides evidence for the existence of opportunistic budget cycles. This also shows that the fixed cost to reform may be perceived as too high. This outcome is also consistent with the findings in Latin America (Lucinda and Arvate 2007), and those for OECD countries (Ashworth and Heyndels 2002).

MINORITY has an estimated value that is highly significant, but it does not have the sign that was expected. The common theory, and that which has been backed up by previous empirical literature, is that fragmented government should reduce tax structure turbulence. The results here would seem to suggest otherwise. This outcome supports the idea that opposition parties force more compromise when changing the tax system and that a horse-trading situation occurs, leading to a larger number of taxes being altered and thus higher turbulence.

The political interaction variables provided mixed results. The combination of MINORITY and GOV turned out to be insignificant, which is not too surprising given how insignificant GOV proves to be. The interaction of MINORITY and ELECTION is significant, and has the expected impact. Ashworth and Heyndels (2002) argue that this variable should be negative because "Political dispersion is expected to weaken the effects of election years and regime shifts. The corresponding coefficients are therefore expected to be negative if the electoral or ideological coefficients are positive" (Page 359). This result does not mesh with Lucinda and Arvate (2007) who find both interaction variables to be significant and positive.

Section 5.4 Sensitivity Tests

This section will further analyze the empirical model by testing its sensitivity to: the level of aggregation of the dependant variable; sensitivity to outlier provinces; and the model's stability across time periods. The results are as follows:

Sensitivity to the Degree of Aggregation

This test is conducted by replacing the TURB16 dependant variable with TURB5. Recall from section 3 that the TURB5 index is constructed by measuring the difference between the 5 broad categories of taxation, whereas TURB16 is calculated using each of the 16 individual tax

instruments. As such TURB5 should be less sensitive to changes in the tax system than TURB16. This assumption is supported by the analysis in Section 2. Referring again to Figure (1), it is noticeable through inspection that TURB5 is substantially smaller in magnitude than TURB16 across the entire sample period. As a result of this difference in the sensitivity in measurement, the TURB5 regression could be thought of as a more rigorous test of the economic and political determinants. Less movement implies that stronger correlations will be required in order to be found significant.

The results of the TURB5 regressions are provided in table (3) in the appendix. The results actually appeared more promising at first, with only the coefficients on NR and INFLATION deemed insignificant. However, when NR is removed from the explanatory variable list, the significance of ELECTION, TRANS, and GOV evaporates. This shows that the TURB5 index produces results that are less robust than our main estimates from section 5.3.

Sensitivity to Outlier Provinces

The next test is on the model's sensitivity to removing outlier cross sections from the analysis, which in this case is Saskatchewan and Quebec. The 2 provinces will be removed and have their results scrutinized separately. Table (4) provides the regressions with both outliers removed.

The results show that the model is highly sensitive to removing outlier provinces. When Saskatchewan is excluded from the analysis, all of the political determinants become insignificant. The economic variables all remain significant at 5%. This would seem to indicate that the importance of political determinants is being inflated by the Saskatchewan observations. This result is not surprising given the specifics of the province's evolution in TURB16, as

outlined in section 3 as well as in figure (3). As section 3 outlines, Saskatchewan experienced a spike in turbulence around the turn of the millennium, which coincidently is shortly after a minority government is elected into office.

The results estimated after excluding Quebec fair no better. In fact with exception to the R^2, the regression without Quebec performs more poorly than its Saskatchewan counterpart. None of: INFLATION, NR, TRANS, or the interaction variables prove to be significant. A second estimation is performed on this data excluding NR and TRANS, and the results were no more promising.

Thus it can be concluded that these estimators are highly sensitive to adjustments in the cross section units that are included in the analysis. Although Saskatchewan's removal produced values that could be interpreted within the context of the political budget cycle literature, the results for Quebec are less interpretable.

Stability across Time

In order to test the stability of the specification across different time periods the sample is split into 2 regressions. The first regression covers the period from 1989 to 1998, and the second reports on the results from 1999 to 2008. The results of these regressions are available in Table (5) in the appendix.

The results were significantly different than the combined sample. However, both sub-samples reacted to the sample reduction in the same fashion. INFLATION; ELECTION; NR; TRANS; GOV; MIN; and MINGOV were all found to be insignificant in both specifications. The only difference is that the first period regression finds MINELECTION to be significant, whereas the second one does not. Since both periods reacted to test the same way, it is difficult to

argue that there are larger period specific effects in the data. However, the dramatic difference in the results when compared to the full sample does not fare well for the model's robustness.

Conclusions

This paper went about testing for the presence of opportunistic and ideological/partisan determination within the tax structure turbulence in Canadian provincial governments. A model was constructed based off of the work of Ashworth and Heyndels (2002) and Lucinda and Arvate (2007) wherein an index that measures tax structure turbulence is constructed and then used as a dependant variable, regressed on numerous economic and political determinants.

The analysis determined that economic factors play a strong role in determining the outcome of turbulence. This result provides further support for the theories presented by Barro (1979), Mankiw (1987), Hettrich and Winer (1999), and Rose (1985). However, the results for GDP indicate that the variable has a negative influence on turbulence, a result that is highly inconsistent with other literature.

Political determinants also prove to be significant in tax structure, with the coefficients for opportunistic budgeting, and the degree of political dispersion yielding significant results. However, the sign for political dispersion is estimated to be positive, thus providing evidence for the hypothesis that fragmented government actually increases tax structure turbulence. The coefficient for regime changes proved to be insignificant, meaning that this analysis was unable to provide any supporting evidence ideological manipulation.

This work leaves questions open for further investigation. For example the impacts of specific tax measures would be an interesting subject for further analysis, as would the effects of

other specifications of political determinants, such as those discussed in other empirical literature discussed in section 2.

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Tables and Figures

Figure (1)

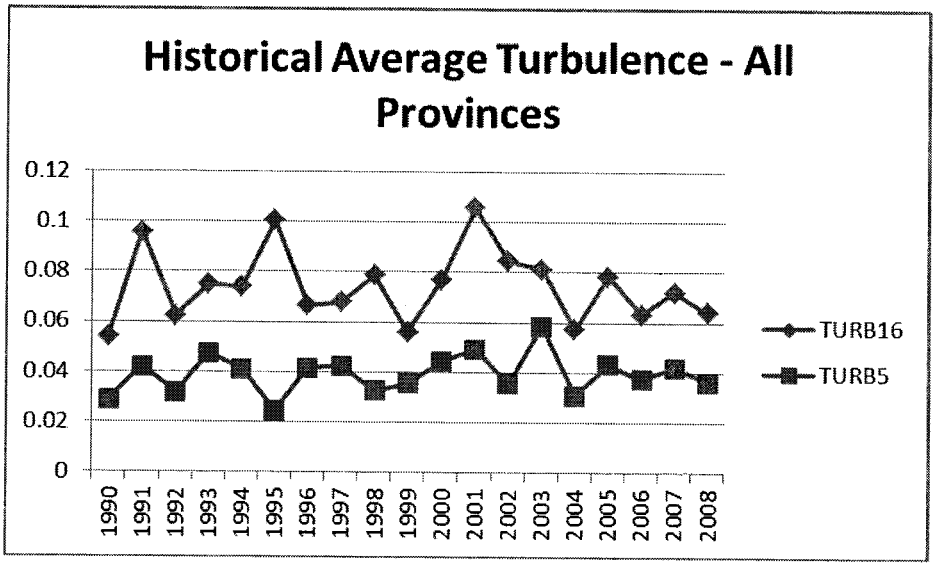

Figure (2)

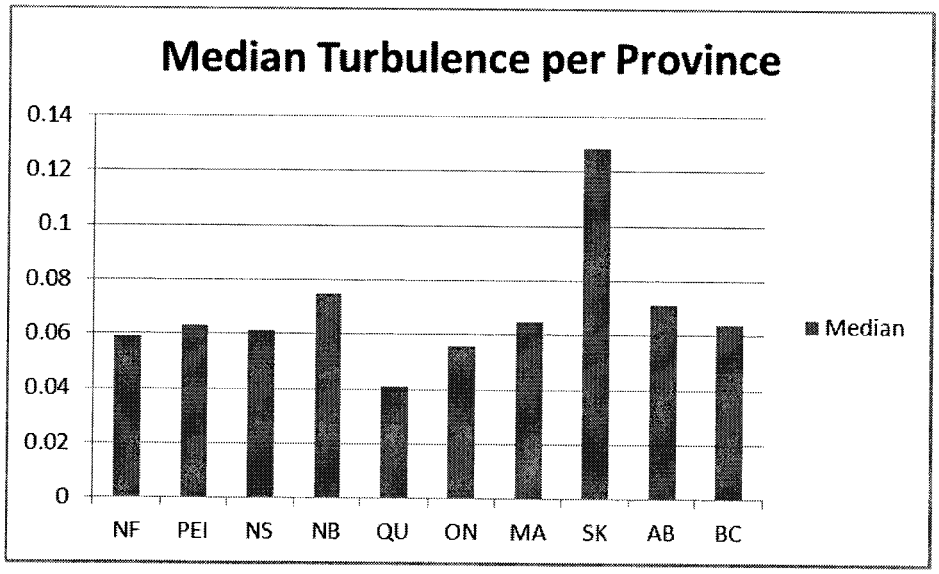

Figure (3)

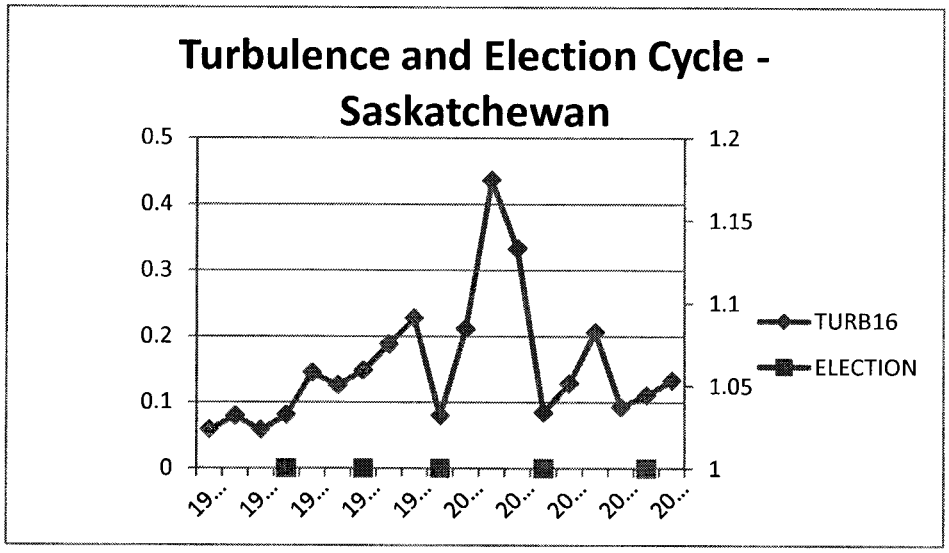

Figure (4)

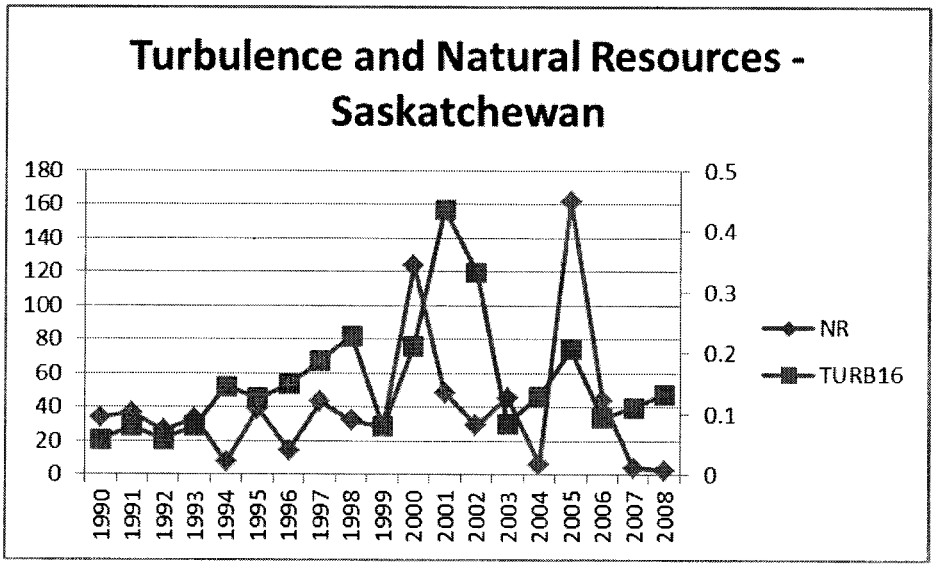

Figure (5)

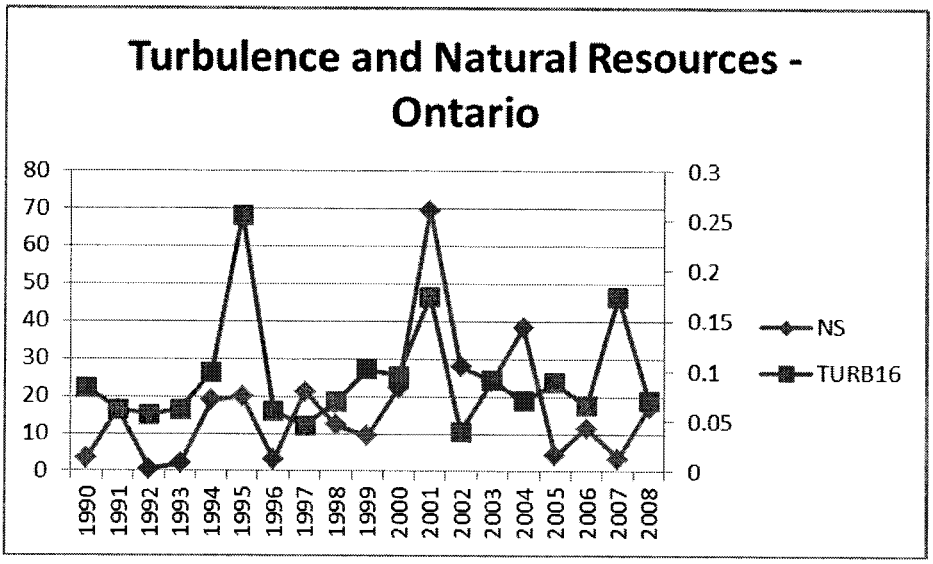

Table (1)

Expected Signs of Dependant Variables							
Year	…	Tm	E	T1	T2	…	tn
Change in tax Burden (absolute value)	+	+	+	+	+	+	+
Economic Determinants							
Real Growth (absolute value)	+	+	+	+	+	+	+
Inflation (absolute value)	+	+	+	+	+	+	+
Change in federal transfers (absolute value)	+	+	+	+	+	+	+
Change in Natural Resource Revenues (absolute value)	+	+	+	+	+	+	+
Political Determinants							
Opportunistic Manipulation			+ -				
Partisan Manipulation			+				
Minority Government	-	-	-	-	-	-	-

Table (2)

Primary Regressions

	Turb16						
	Pooled SUR	Pooled SUR	Pooled SUR	Pooled SUR	Fixed province, provincial SUR	Fixed province, provincial SUR	Fixed province, provincial SUR
	Coeff	*Coeff*	*Coeff*	*Coeff*	*Coeff*	*Coeff*	*Coeff*
C	**0.024863****	**0.024863****	**0.026782****	**0.026856****	**0.048765****	**0.033744****	**0.035814****
TB1	**0.00859****	**0.00859****	**0.008724****	**0.008735****	**0.006885****	**0.005868****	**0.007799****
GDP	**-0.001317****	**-0.001317****	**-0.001063****	**-0.001181****	**-0.001602****	0.000679	**-0.001673****
INFLATION	**0.008086****	**0.008086****	**0.007333****	**0.00727****	**0.002863****	**0.004191****	**0.006433****
ELECTION	**-0.005006****	**-0.005006****	**-0.005411****	**-0.004693****	-0.004594	-0.001724	**-0.003229****
NR	**0.0000922****	**0.0000922****	**0.0000967****	**0.000101****		**0.000152****	**0.000101****
TRANS	1.13E-04	1.13E-04					
GOV(-1)	-0.001809	-0.001809			-0.001901		
MIN(-1)	**0.056883****	**0.056883****	**0.053627****	**0.054055****	0.017429	**0.037807****	**0.033039****
MINELECTION	**-0.068584****	**-0.068584****	**-0.06143****	**-0.061542****	**-0.030548****	**-0.035464****	**-0.033894****
MINGOV	0.034687	**0.034687****		**0.02774****	**0.026012****	**0.008902****	**0.028573****
R^2 (Adjusted)	0.823	0.823	0.829	0.829	0.61	0.78	0.84
LR	NA	NA	NA	NA	7.25**	5.9*	17.6**
F test	**70****	**70.3****	**104.3****	**91.89****			
Cov	ordinary	White (cross section)	Ordinary	White (cross section)	White (cross section)	White (cross section)	White (cross section)

Table (3)

Results with TURB5 as Dependant Variable

	Turb5	
	Pooled SUR	Pooled SUR
C	**0.026837****	**0.03142****
TB1	**0.002941****	**0.003183****
GDP	**-0.002049****	**-0.001749****
INFLATION	0.000484	-0.000992
ELECTION	**-0.002095**	0.000718
NR	3.98E-05	
TRANS	**0.000225****	0.000134
GOV(-1)	**0.015841****	0.004573
MIN(-1)	**0.04174****	**0.026995****
MINELECTION	**-0.059825****	**-0.040364****
MINGOV	**0.070184****	**0.066974****
R^2 (Adjusted)	0.449	

Table (4)

Regressions absent Saskatchewan and Quebec Outliers				
Turb16				
	minus Saskatchewan		minus Quebec	
	Pooled SUR	Pooled SUR	Pooled SUR	Pooled SUR
C	**0.043947****	**0.043635**	**0.044577****	**0.047484**
TB1	**0.005736****	**0.005801**	**0.007005****	**0.007096**
GDP	**-0.001586****	**-0.001587**	**-0.001034***	**-0.001202**
INFLATION	**0.003473****	**0.003655**	**0.003022***	0.002147
ELECTION	0.000223	-0.001136	-0.007435	**-0.009591**
NR	-6.47E-05	-0.0000537	2.95E-05	
TRANS	-5.38E-05	-7.06E-05	5.51E-05	
GOV(-1)	-0.001698	-0.001899	-0.000242	0.000663
MIN(-1)	-0.000754	**-0.009266**	**0.020225****	**0.016978**
MINELECTION	-0.017263		0.034262	
MINGOV	0.012324		-0.017749	
R^2 (Adjusted)	0.43	0.43	0.48	0.52

Table (5)

Regression Split into 2 periods: 1989 -1998 and 1999 to 2008		
Turb5		
	Pooled SUR	Pooled SUR
	1989 - 1998	*1999 - 2008*
C	**0.029229****	**0.032372****
TB1	**0.00144****	**0.004835****
GDP	**0.000743***	**-0.002614****
INFLATION	0.000613	-0.000276
ELECTION	0.001546	-0.003663
NR		
TRANS		
GOV(-1)		
MIN(-1)	0.000833	0.022879
MINELECTION	**-0.035845**	-0.028517
MINGOV		
R^2 (Adjusted)	0.42	
LR		