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Tax policy effects on entrepreneurship in canada, 1984-2009: A dynamic panel provincial data approach [*]

Marco Lugo[†]

Résumé/abstract

In this paper, we examine the effects of fiscal policy on entrepreneurship outcomes in the Canadian provinces for the 1984 – 2009 period. This is the first paper to assess the impact of taxation on entrepreneurship in Canada by using intensive-margin measures (i.e. entrepreneurial income and employment) instead of more commonly used participation measures, as they are thought to be more closely related to policy goals such as entrepreneurial sustainability. A dynamic panel data approach is employed in order to account for potential trends in both taxation policy and entrepreneurial outcomes. The results are consistent with previous literature of the United States and indicate that if the trends, caused by incomplete labour mobility among other things, are indeed important then tax policy has no statistically significant impact on the measured entrepreneurial outcomes.

Mots clés/keywords : entrepreneurship, tax policy, dynamic panel estimators.

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1 Introduction

Entrepreneurial activity is formally defined by the Organisation for Economic Co-operation and Development (OECD) as "the enterprising human action in pursuit of the generation of value, through the creation or expansion of economic activity, by identifying and exploiting new products, processes or markets"[1]. Indeed, entrepreneurship delivers economic growth and adds value to society by exploiting previously ignored opportunities for mutually beneficial exchange.

This important role played in production, innovation and economic growth has attracted attention from policymakers and politicians who, looking to stimulate such activity, often adorn their speeches with talk about the importance of taxes for entrepreneurship and job creation. Even Olivia Chow, Member of Parliament of Canada for the centre-left New Democratic Party who resigned her seat earlier this year in order to run for Mayor for Canada's largest city, Toronto, used a campaign speech to declare: "Small businesses are essential to create jobs in our city. And as your new mayor […]. I'll respond to entrepreneurs to help them get started and cut taxes to help them grow"[2]. The relevant empirical question is thus: what is the effect of tax policy on entrepreneurship?

The framework of analysis used in this report draws on Bruce *et al.* (2014). The paper uses dynamic estimation methods in order to account for potential endogeneity and focuses on the

[1] Ahmad, Nadim and G. Seymour, Richard, 2008."Defining Entrepreneurial Activity: Definitions Supporting Frameworks for Data Collection". OECD Statistics Working Paper.
[2] Olivia Chow, Campaign news, Authorized by the official agent for the Olivia Chow Mayor Campaign, 28 March 2014, accessed 20 July 2014, <http://www.oliviachow.ca/olivia_will_cut_small_business_tax>

intensive margin by using entrepreneurial outcomes in various forms as the model's dependent variable.

Canadian data is used in order to replicate the study and see if the results hold in a Canadian context. Generally, the results are quite similar, tax policy is not found to have a significant impact on entrepreneurial outcomes.

2 Literature review and analytical framework

In the paper inspiring this research, Bruce *et al.* (2014) build on extensive previous research on the effects of tax policy on entrepreneurship in the United States by making several important contributions. First, they argue that there exists a dynamic aspect (serial correlation) to tax policy and entrepreneurship and address this observation by using two dynamic panel estimators previously proposed by (1) Arellano and Bond (1991) and (2) Arellano and Bond (1995) and Blundell and Bond (1998). Secondly, while most of the literature focuses on extensive margin (participation) measures of entrepreneurial activity, they are the first to use non-farm proprietors' income as a measure of entrepreneurial success. This is in order to account for the hypothesis that policymakers in general are probably more preoccupied with sustainable entrepreneurial activity and jobs than with entrepreneurial participation itself. Finally, they also extend the period studied in the literature by including more recent data.

Their econometric estimates imply that the impact of tax policy, as measured by sales taxes, maximum personal income taxes, maximum corporate income taxes and tax amnesty, on entrepreneurial success is not quantitatively important. They attribute these results to the dynamic panel estimators which take into account the serial correlation caused by factors such as labour-market frictions and client loyalty and to the extension of the period studied. However, they do find a few significant non-tax policy related instruments such as reducing property crime rates as well as fostering a stronger business climate.

Turning to previous research on tax policy and entrepreneurship, extensive margin measures were broadly addressed by many different studies. Schuetze (2000) uses North American microdata for the 1983 – 1994 period and finds that increases in the average personal income tax rate have positive and large effects in male self-employment in both Canada and the United States, he points to the substitution of wage income for self-employment income, where income is relatively easier to conceal and thus to shelter from the higher taxes. He also finds that periods of high unemployment are positively associated with entry into self-employment, as the unemployed either seize the occasion to become self-employed or are "pushed" into that status as an employment of last resort.

Using the Panel Survey of Income Dynamics (PSID) for 1979 – 1993, Gentry and Hubbard (2000) find that although the marginal tax rate *per se* is not negatively associated with lower entrepreneurship entry rates consistently across the different specifications, convexity of the tax

schedule (*i.e.*, progressivity) strongly discourages both entry and business ownership, especially for those in the upper-middle-income households.

Bruce and Gurley (2005) use discrete-choice methods and duration analysis on longitudinal tax return data from the Internal Revenue Service (IRS) and find evidence that increases of marginal income tax rates on wage income increase the probability of entry while increases of marginal tax rates on entrepreneurship income decrease the probability of entry. Bruce and Mohsin (2006) apply time series analysis using data from the Bureau of Labor Statistics' (BLS) Current Population Survey (CPS) and tax return data from the IRS for the 1950 – 1999 period and find a statistically significant but small negative impact of higher top income and capital tax rates on entrepreneurship entry.

Using panel data for the 1989 – 2002 period and a fixed-effects model, Bruce and Deskins (2012) analyze state tax policy effects on participation and employment and conclude that both top marginal corporate income tax rates and sales tax rates do not have statistically significant effects on participation. They do find that higher top marginal income tax rates reduce the state's share of the national entrepreneurial stock. Contradicting Gentry and Hubbard (2000), they find that states with more progressive individual income tax rates tend to have a higher share of participation. They attribute this contradictory result to differences in data and methods but also to several other possibilities. First, the fact that greater progressivity in tax schedules usually comes with greater risk sharing and thus it could act as an incentive to entrepreneurship. Second, income redistribution preferences, as signaled by a more progressive tax schedule, may be positively correlated with

risk-taking attitudes and entrepreneurship. Finally, they argue that their tax rate progressivity index might capture convexity at a lower level in the tax bracket distribution than Gentry and Hubbard's (2000) since the top marginal individual income tax rate is already included in their model. Then, if the progressivity index captures lower initial marginal rates and such a tax structure incentivizes entrepreneurship, it is indeed possible than progressivity as they measure it, can be positively associated with higher participation. Progressivity might also encourage shifting from wage income to entrepreneurial income for tax evasion purposes and therefore increase participation numbers.

Table 1: Summary of Literature Review

Entrepreneurship measure	Approach	Author(s)	Tax effects	Tax control variables	Period	Country
Intensive margin	Dynamic panel	Bruce *et al*. (2014)	None	Top marginal PIT, CIT rates. Sales tax rates. Tax amnesty. Sales factor weight.	1978 - 2009	US
Extensive margin	Microdata	Schuetze (2000)	Positive	Average PIT rates	1983 - 1994	Canada/US
	Panel	Gentry and Hubbard (2000)	Negative	Convexity of the tax schedule	1979 - 1993	US
	Discrete-choice/duration analysis	Bruce and Gurley (2005)	Positive (for taxes on wage income), negative (for taxes on entrepreneurship income)	Marginal income tax rate on wage income and entrepreneurship income	1979 - 1990	US
	Time series	Bruce and Mohsin (2006)	Negative	Federal income taxes, capital gains taxes, estate taxes, payroll taxes, corporate income taxes	1950-1999	US
	Panel	Bruce and Deskins (2012)	None (on participation), negative (on entrepreneurial stock)	Top marginal PIT, CIT rates. Sales tax rates. Estate taxes. Sales factor weight.	1989 - 2002	US

Like Bruce *et al.* (2014), in order to account for the serial correlation potentially caused by the presence of incomplete labour mobility and client loyalty among other things, the Arellano-Bond (AB) (1991) dynamic panel estimator is used as the main functional form. Formally, it takes the following form:

$$Y_{i,t} = \gamma_1 Y_{i,t-1} + \gamma_2 Y_{i,t-2} + X_{i,t}\beta + Z_{i,t}\delta + \alpha_i + \tau_t + \epsilon_{i,t}$$

Where $Y_{i,t}$ is entrepreneurial outcome of interest in province *i* at time *t* and $Y_{i,t-k}$ is the k^{th} lag of the dependent variable. The vector $X_{i,t}$ includes several measures of province tax policy and vector $Z_{i,t}$ includes different economic and demographic characteristics of the province. α_i is a parameter for fixed-effects for the provinces and τ_t is a fixed-effects parameter for time. Finally, $\epsilon_{i,t}$ is a well-behaved error term.

3 Data

As the focus of this report is on the intensive margin measures, entrepreneurship is measured, not by participation indicators such as the share of the population by province who report to take part in entrepreneurial activity but by the entrepreneurial income and employment reported. This definition has the advantage of addressing the policymaker's concern of sustainable entrepreneurship. Entrepreneurial income is defined as the "net earnings of proprietors from their own businesses in all industries except agriculture. It includes the net income of private

consultants, accountants, lawyers, doctors[3] and other independent professionals"[4]. It only includes income from unincorporated ventures and it is derived from Canada Revenue Agency's (CRA) personal income tax forms (T1). CRA does adjust this data using other sources in some cases if underreporting is found to be an issue. It would clearly be unrealistic to assume that CRA has a 100% detection rate of underreporting. The implication is discussed in the results section.

Employment estimates come from the Canadian Labour Force Survey. Unlike Bruce *et al.* (2014), data availability makes it impossible to consider employment measures for the whole period used for the income measures. None of the provinces have unincorporated self-employment farm employment[5] numbers for the 1981-1986 period and many years have been partially or entirely supressed to meet confidentiality requirements imposed by the *Statistics Act*. Newfoundland and Labrador has no available data whatsoever and only Quebec, Ontario, Manitoba, Saskatchewan and Alberta have no suppressed data in the 1987-2009 period. Therefore, all estimates for employment and productivity are obtained with a much smaller sample size than those using income.

[3] The inclusion of physicians is problematic since they are considered as self-employed workers paid by the provincial governments. It would be difficult to consider them as entrepreneurs and therefore an adjustment has been made. Physician remuneration net of overhead costs has been subtracted from entrepreneurial income in order to obtain a more accurate number. Physician remuneration data for the whole period of analysis comes from the Canadian Institute for Health Information and an estimate of overhead costs (34%) for 1997-1998 comes from Buske (2001) and is assumed constant for the whole period. This method of adjustment tends to underestimate entrepreneurial income excluding MD income due to the fact that since 2002 (2007 in Quebec) doctors have been allowed to incorporate and work as employees of their own companies and thus fall under the wage income classification. However, estimation using the pre-incorporation period does not yield different results.

[4] http://www.statcan.gc.ca/pub/13-017-x/2008001/themes/ch05/5213351-eng.htm

[5] It is necessary to obtain entrepreneurial employment which is obtained by subtracting unincorporated farm self-employment from total unincorporated self-employment.

All financial variables have been set in 2009 dollars using the corresponding provincial consumer price index. The mean non-farm net mixed income (entrepreneurial income) by province is presented *per capita*, as a share of total income and by the provincial share of the national[6] entrepreneurial income in Table 2 for 1984 and 2009. Figure 1 presents the evolution of the average *per capita* value for each province for the whole period. All provinces saw advances in *per capita* entrepreneurial income with Quebec, Alberta, Saskatchewan and British Columbia showing the strongest gains. Entrepreneurial income as a share of total income only saw increases in Ontario, Quebec, Alberta and British Columbia. Finally, except in Alberta, the provincial entrepreneurial income as a share of the national entrepreneurial income generally fell sharply.

Table 2: Provincial Non-Farm Net Entrepreneurial Income, 2009 dollars, Canada, 10 provinces, 1984 – 2009

	Per capita		As a Share of Total Personal Income		Provincial Share of National Non-Farm Entrepreneurial Income	
Province	**1984**	**2009**	**1984**	**2009**	**1984**	**2009**
Alberta	852.65	1151.06	0.0374	0.0382	0.0791	0.1021
British Columbia	1026.82	1410.47	0.0534	0.0534	0.1316	0.1395
Manitoba	1064.53	1025.41	0.0506	0.0462	0.0418	0.0299
New Brunswick	553.10	526.34	0.0374	0.0310	0.0172	0.0122
Newfoundland and Labrador	880.82	850.30	0.0641	0.0391	0.0200	0.0109
Nova Scotia	1074.50	750.35	0.0558	0.0366	0.0348	0.0185
Ontario	1104.56	1435.98	0.0474	0.0545	0.3976	0.4271
Prince Edward Island	1134.38	809.81	0.0668	0.0411	0.0053	0.0029
Quebec	893.05	1360.23	0.0473	0.0530	0.2364	0.2269
Saskatchewan	934.89	1195.93	0.0470	0.0464	0.0350	0.0284

[6] Excluding the territories.

Figure 1: Evolution of Mean *Per Capita* Values of Non-Farm Entrepreneurial Income, 2009 dollars, thousands, Canada, 10 provinces, 1984 – 2009

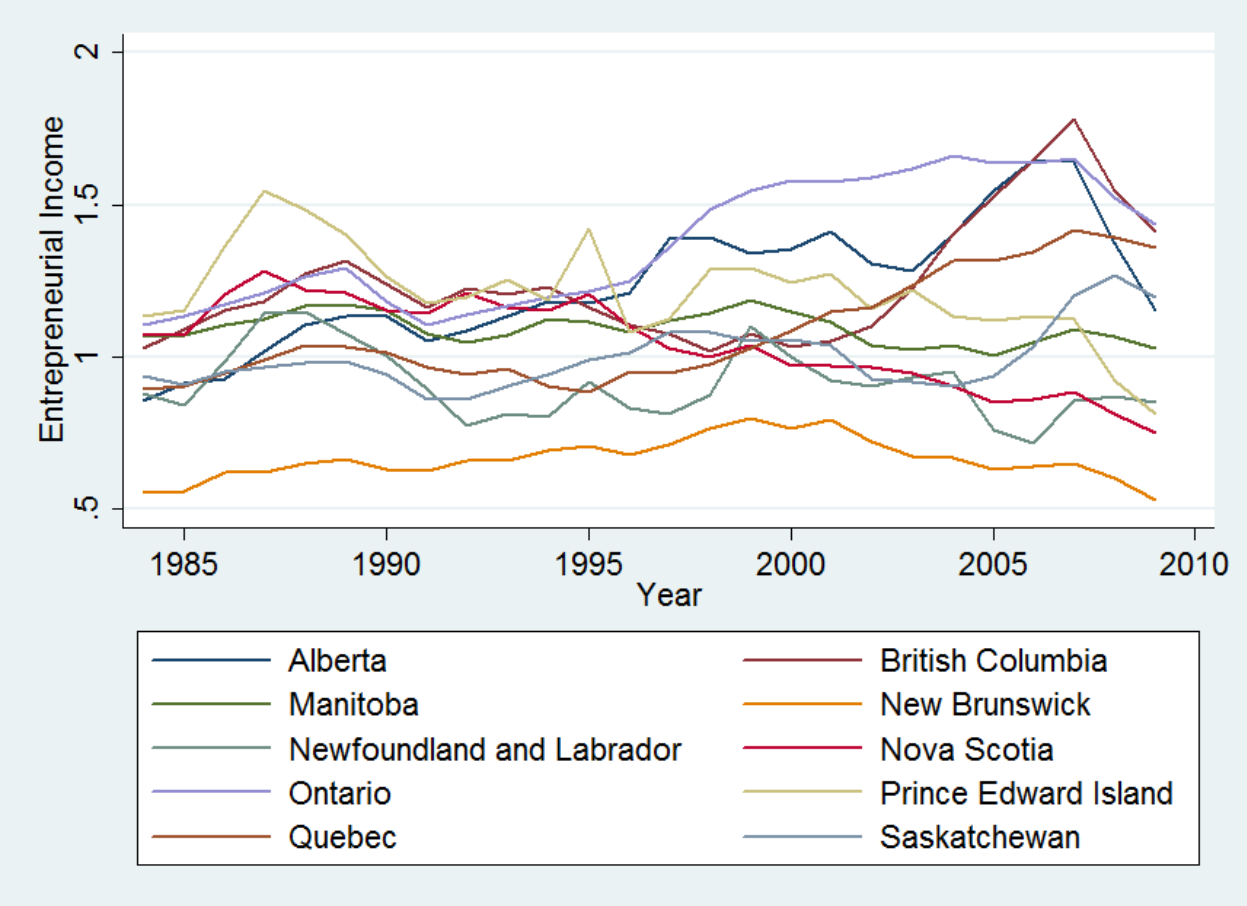


Table 3 contains employment data for the 1987-2009 period for all provinces as well as for entrepreneurial productivity, which is obtained by dividing entrepreneurial income by entrepreneurial employment. As mentioned above, data availability limits the timespan and therefore certain provinces only show the most recent year available instead of 2009.

Table 3: Provincial Non-Farm Entrepreneurial Employment and Productivity, Canada, 10 provinces, 1989 – 2009

	Non-Farm Entrepreneurial Employment Share of Total Employment		Provincial Share of National Non-Farm Entrepreneurial Employment		Non-Farm Entrepreneurial Productivity (income/employment)	
Province	**1987**	**2009**	**1987**	**2009**	**1987**	**2009**
Alberta	0.0603	0.0662	0.0650	0.0680	24645.14	45906.61
British Columbia	0.0880	0.1126	0.0900	0.1143	23237.51	33646.17
Manitoba	0.0750	0.0682	0.0816	0.0714	22924.90	43456.27
New Brunswick*	0.0756	0.0726	0.0773	0.0741	17306.96	27926.21
Newfoundland and Labrador	n.a	n.a	n.a	n.a	n.a	n.a
Nova Scotia**	0.0825	0.0754	0.0843	0.0765	26651.75	33976.63
Ontario	0.0644	0.0912	0.0660	0.0923	28864.43	43433.30
Prince Edward Island	0.0674	0.0627	0.0758	0.0663	36940.18	40915.65
Quebec	0.0665	0.0801	0.0683	0.0813	25470.04	44384.91
Saskatchewan	0.0725	0.0730	0.0904	0.0796	20891.57	45238.06

* Last year available is 2005

** Last year available is 2008

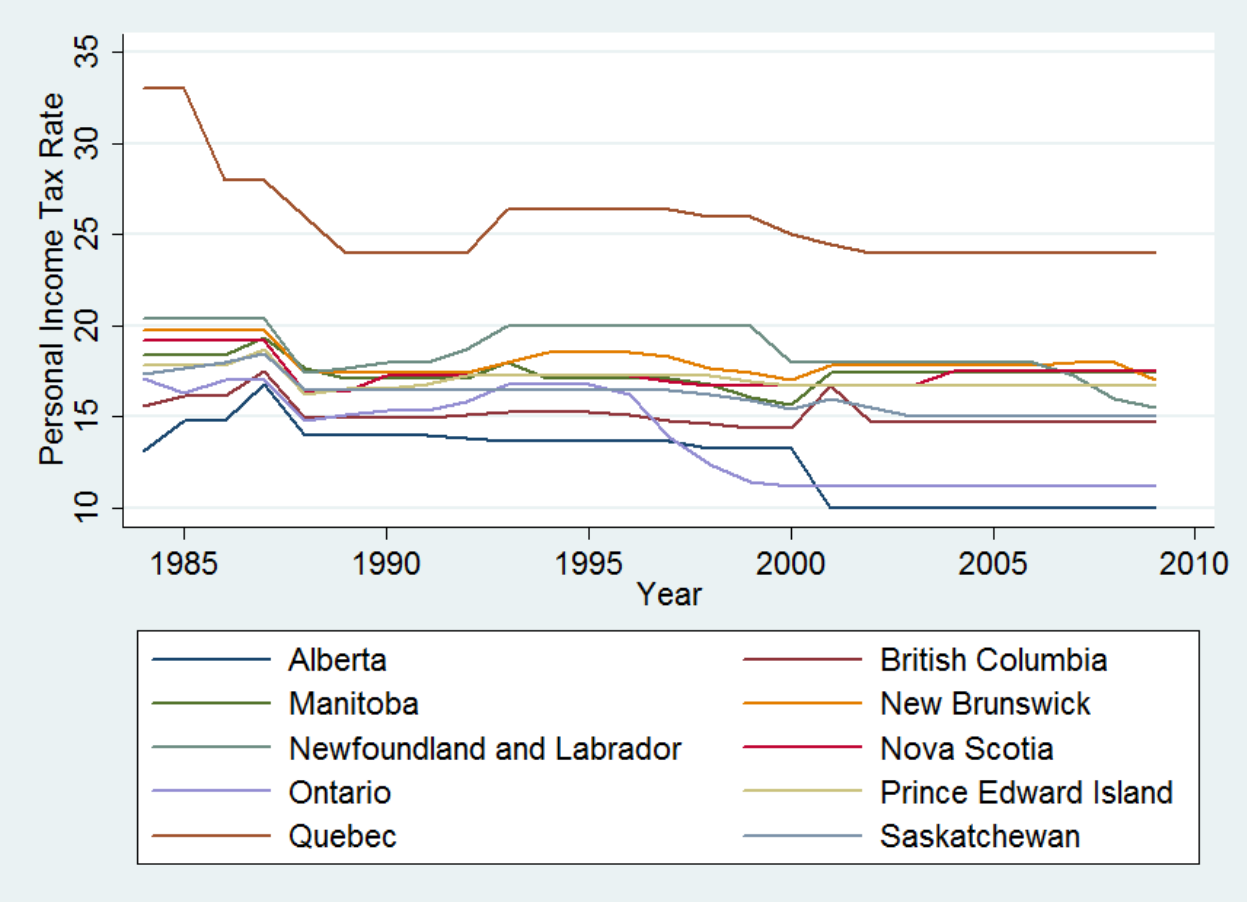
The main interest of this research project is the effect of tax policy on entrepreneurship. Accordingly, three tax related variables are included. They are: the provincial top marginal personal income tax (PIT) rate; the provincial top marginal corporate income tax (CIT) rate and the real[7] rate of provincial sales taxes.

The PIT rate can have an ambiguous effect on entrepreneurial effort. The substitution effect would translate higher real income due to lower taxes into a higher level of effort. At the same time, assuming leisure is a normal good, the higher income would also translate into more leisure

[7] Taking account of the tax-on-tax system used by Prince Edward Island and Quebec. For some years in the sample, these two provinces impose their sales tax on top of the national Goods and Services Tax (GST), making the real rate higher than the statutory rate. Both provinces eliminated this practice shortly after the end of the period of analysis used in this research.

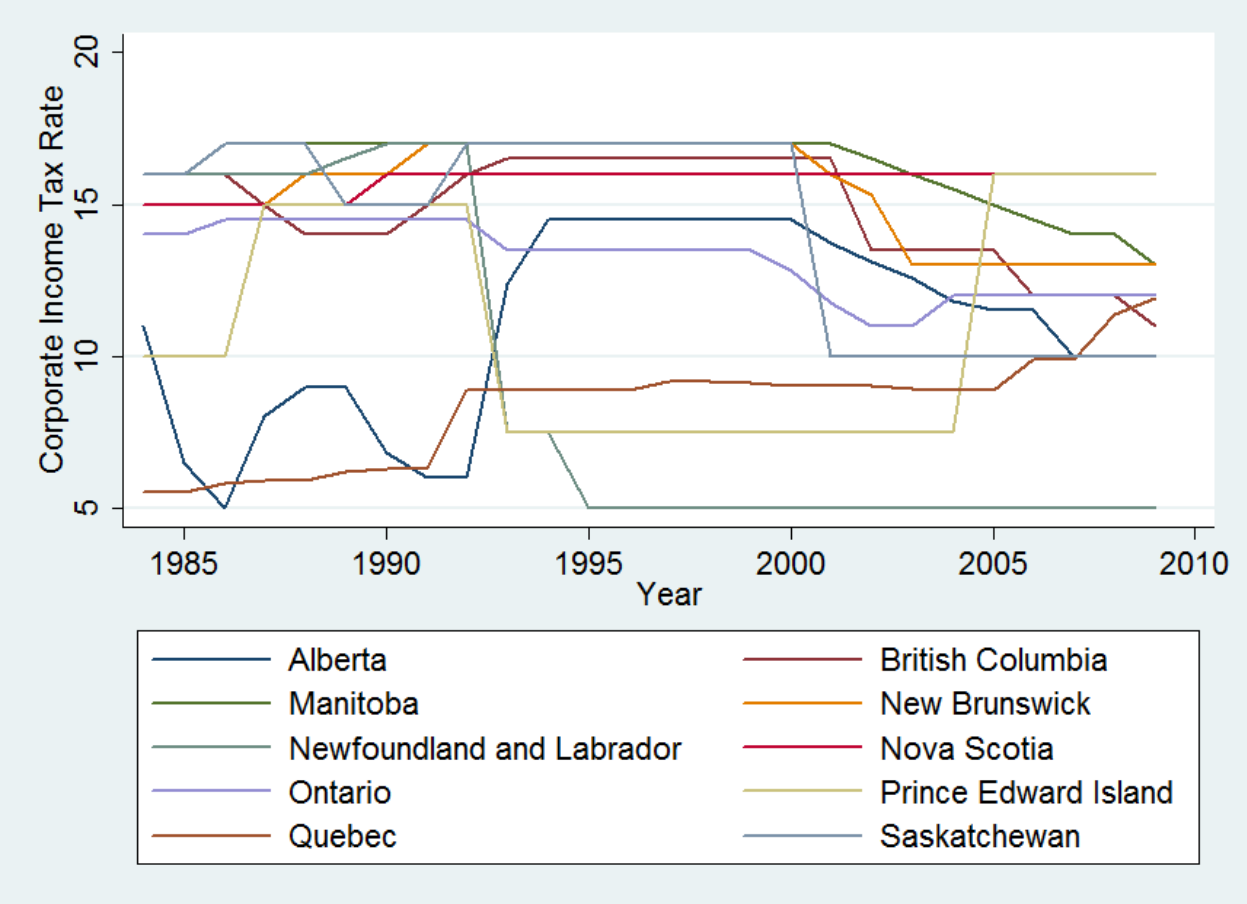
consumption and therefore into a lower level effort. The net result depends on the size of the two effects relative to each other. The high cost of detecting tax evasion by the self-employed makes it easier to hide income from the tax authorities, this can create additional effects to changes in the PIT rate. First, a higher PIT rate can push the self-employed to compensate by either starting to underreport income or underreporting by an even higher margin than it was already the case. Second, it can also create incentives to switch from wage labour to self-employment in order to be able to better bear the higher tax burden by failing to report their full income. The evolution of the PIT rate is shown in Figure 2 below.

Figure 2: Evolution of Personal Income Tax Rates, Canada, 10 provinces, 1984 – 2009



The net impact of the CIT rate on entrepreneurial income again depends on whether the income or the substitution effects dominates. However, the CIT-PIT mix chosen by policymakers can also influence the legal structure of the business venture. Profit maximization can lead businesses to organize in such a way that they minimize taxes and thus if the PIT rate is higher than the CIT rate, businesses expecting losses can operate under an unincorporated arrangement in order to be able to deduct business losses against other income while those expecting profits can opt for incorporation in order to face the lower tax rate. If CIT rates are higher than PIT, businesses that would have otherwise incorporated may choose to remain unincorporated in order to reduce the tax burden. The evolution of the CIT rate is shown in Figure 3 below.

Figure 3: Evolution of Corporate Income Tax Rates, Canada, 10 provinces, 1984 – 2009



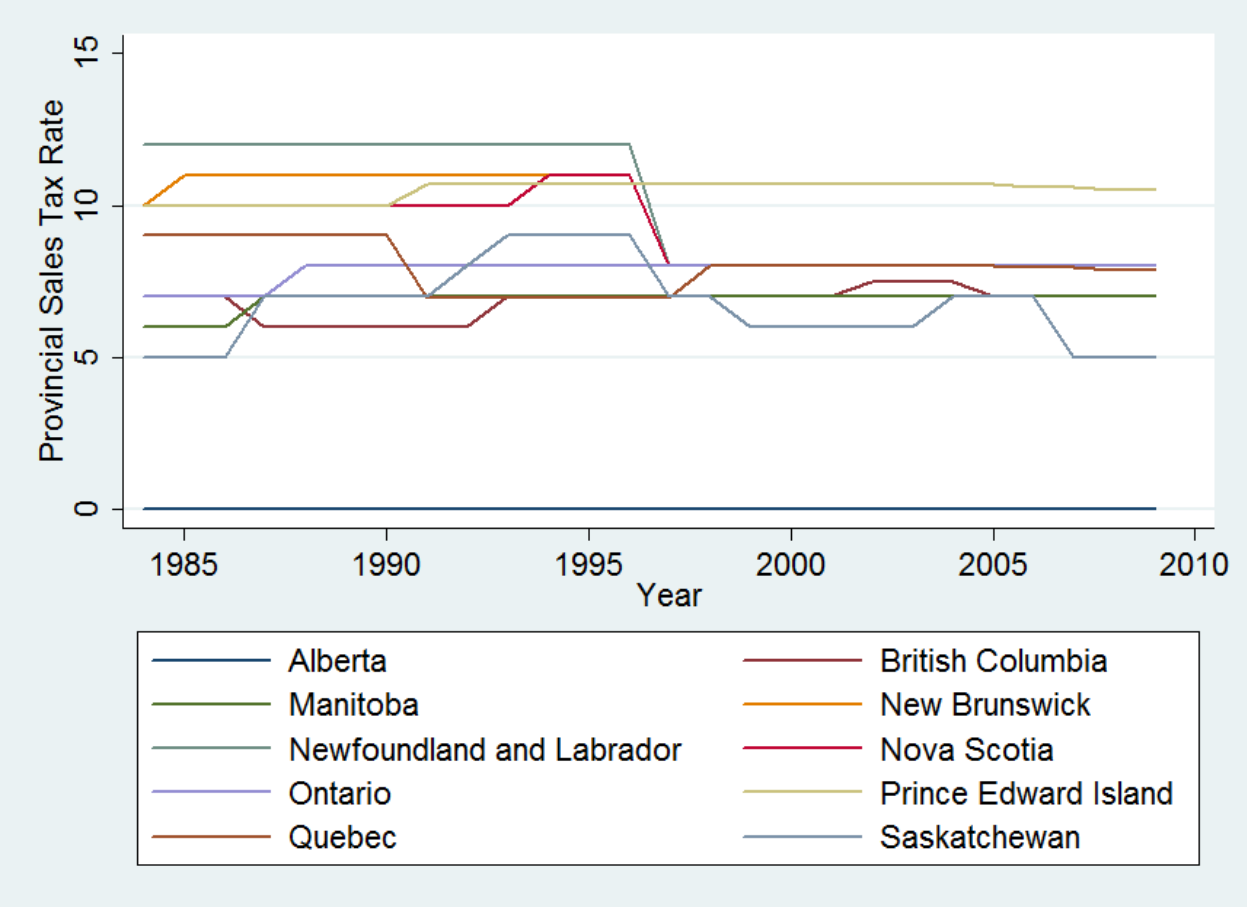
Sales tax rates are included as theory and evidence point to locational distortions created by differences in taxation. Sales tax differentials and competitive markets can push businesses to establish themselves in lower tax jurisdictions to reap the benefit of the additional business volume due to lower prices made possible by lower costs (Davis, 2011)[8]. Businesses' bottom line also depends on the ability to pass tax rates through to consumers in the form of higher prices. In a competitive environment the incidence of the tax is likely to be greater on the producer than on the consumer and the inverse is true in a non-competitive setting. A study by Boisvert and Thirsk (1994) finds evidence of federal sales taxes having higher incidence on Canadian producers in Canada-United States border cities[9] than in non-border cities[10] due to competition arising from international cross-border shopping. Figure 4 below shows the evolution of the provincial sales tax rates for the 1984 – 2009 period.

[8] Spatial equilibrium theory would suggest that at least a share of this benefit would be capitalized in property values and therefore ultimately be borne as a cost in the form of higher property taxes. While a vast literature has previously addressed the capitalization of local property taxes on residential land and housing values, little has been done in the area of sales taxes. On this matter, Man and Bell (1996) find that sales taxes are capitalized into the value of owner-occupied housing but to a lesser extent than local property taxes. There are, to the best of the author's knowledge, no studies on the capitalization of sales taxes on commercial property values.

[9] Saint John, Montreal, Ottawa, Toronto, Thunder Bay, Winnipeg, Regina, Vancouver

[10] St. John's, Charlottetown, Halifax, Quebec City, Saskatoon, Saskatoon, Edmonton, Calgary

Figure 4: Evolution of Sales Tax Rates, Canada, 10 provinces, 1984 – 2009



Several non-tax variables are used in the model. The female percentage of the total population is included in order to account for differences between male and female participation to self-employment as women tend to be less active in self-employment[11] than men. The percentage of the population over 64 years old is included for various reasons. There is evidence that participation in self-employment activities increases with age and its incidence is the highest above

[11]In June 1981, women made up 28.2% of all the self-employed in Canada, the same percentage climbs to 36.1% in June 2014. Data from Statistics Canada 2014, Labour Force Survey estimates, employment by class of worker and sex, seasonally adjusted and unadjusted. Calculations by the author.

55 years old (Kamhi and Leung, 2005). People in the mentioned age group may take advantage of the social network and accumulated financial capital they have built over the years to become self-employed. Population density is included to account as a proxy for competitiveness.

The property crime rate is included as it can reduce the expected profit of entrepreneurs, either by actual material losses due to crime or by translating into higher property insurance rates. Due to data availability, for the 1984-2000 period, actual property crime offences data is used while for the more recent 2001-2009 period, property crime incident data is used. The first is a subset of the latter[12]. They are combined in order to obtain data for the whole period, a dummy variable is used to indicate the shift in the measurement method[13]. Figure 2 and Figure 3 respectively show the evolution of actual offences and reported incidents.

Per capita public expenditures are included as a proxy for the level of public services offered. Public expenditures, in some occasions, can be interpreted as a subsidy to business when used for services that reduce operation costs and facilitate business (e.g., security, transportation and schooling) but may also represent a burden on business if taxes are used for purposes unrelated to the business or if the relevant public services are provided in an excessively ineffective fashion (*i.e.*, if the cost borne in taxes by the business is higher than the benefits received).

[12]Actual offences are made up of reported crime incidents that are not dismissed as unfounded.
[13] It is equal to 0 for the 1984-2000 period and 1 for the 2001-2009 period.

4 Results and discussion

4.1 Effect of tax rates

Results for the main specification (Arellano-Bond dynamic panel) are presented in Table 5, Arellano-Bover/Blundell-Bond results are available in Table 5 and, for comparison purposes, fixed effects estimates are presented in Table 7. All estimates use robust standard errors in order to account for possible heteroskedasticity. Test statistics for second-order and higher-order autocorrelation failed to reject the null hypothesis that there is no serial correlation in the residuals. Accordingly, two lags were used to remove higher-order serial correlation.

Table 5: Arellano-Bond Estimates

	(1) Per Capita	(2) Share of Total Income	(3) Provincial Share of National NFEI	(4) Provincial Share of Total Employment	(5) Provincial Share of National NFEE	(6) NFEE productivity
Top CIT rate	-0.00316	-0.000103**	-4.83e-05	-0.000364	-0.000299	-85.85
	(0.00232)	(5.17e-05)	(9.68e-05)	(0.000238)	(0.000248)	(89.40)
Top PIT rate	-0.00341	0.000159	-8.88e-05	0.000649	0.000667	-334.5
	(0.00380)	(0.000137)	(0.000216)	(0.000627)	(0.000685)	(341.9)
Sales tax rate	0.00998	0.000459*	0.000566**	6.34e-06	0.000303	140.7
	(0.00686)	(0.000239)	(0.000287)	(0.000448)	(0.000343)	(147.5)
Crime rate	-9.22e-06	-1.84e-07	5.10e-07	-4.25e-07	-5.39e-07	-0.198
	(7.80e-06)	(3.07e-07)	(3.97e-07)	(5.95e-07)	(6.37e-07)	(0.366)
Crime dummy	0.0140	0.000134	-0.000881	-0.00287	-0.00361	2,244**
	(0.0170)	(0.000602)	(0.000928)	(0.00233)	(0.00232)	(1,016)
% of population over 64	0.0244***	0.000744**	0.000951*	0.00479***	0.00510***	125.9
	(0.00762)	(0.000360)	(0.000529)	(0.00142)	(0.00142)	(635.2)
Female percentage	-0.0675	-0.00161	-0.00152	0.00281	0.00317	-3,931
	(0.0437)	(0.00175)	(0.00168)	(0.00285)	(0.00331)	(3,362)

Table 5: Arellano-Bond Estimates, continued

	Per Capita	Share of Total Income	Provincial Share of National NFEI	Provincial Share of Total Employment	Provincial Share of National NFEE	NFEE productivity
Population density	-0.00100	-3.64e-05	0.000168	0.00195	0.00219	-882.8
	(0.0140)	(0.000751)	(0.000797)	(0.00166)	(0.00181)	(1,240)
Unemployment rate	0.00457**	0.000171	9.63e-05	0.000947**	0.00105**	-546.3**
	(0.00214)	(0.000157)	(0.000189)	(0.000431)	(0.000429)	(259.5)
Job growth	0.0146***	0.000316**	0.000392**	-0.000481	-0.000510	97.19
	(0.00408)	(0.000161)	(0.000169)	(0.000376)	(0.000404)	(139.1)
Public expenditures	-0.00865*	-0.000707***	-0.000165	-0.00189***	-0.00208***	424.3
	(0.00474)	(0.000250)	(0.000315)	(0.000557)	(0.000581)	(393.6)
Agriculture share of GDP	0.539	0.00659	0.00483	0.0922***	0.120***	-35,402
	(0.675)	(0.0257)	(0.0232)	(0.0187)	(0.0230)	(38,915)
Manufacturing share of GDP	0.178	-0.000234	-0.00202	0.0407	0.0421	-8,720
	(0.389)	(0.0132)	(0.0154)	(0.0310)	(0.0310)	(19,413)
First lag	0.923***	0.744***	1.153***	0.648***	0.623***	0.656***
	(0.139)	(0.109)	(0.0639)	(0.129)	(0.124)	(0.142)
Second lag	-0.190*	0.00407	-0.298***	-0.0825	-0.0834	0.00863
	(0.107)	(0.0663)	(0.0627)	(0.0590)	(0.0654)	(0.101)
Observations	250	250	250	154	154	154
Provinces	10	10	10	9	9	9

Robust standard errors in parentheses

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

Table 6: Arellano-Bover/Blundell-Bond Estimates

	(1) Per capita	(2) Provincial Share of Total Income	(3) Provincial Share of National	(4) Provincial Share of Total Employment	(5) Provincial Share of National NFSE	(6) Non-farm self-employment productivity
Top CIT rate	-0.000804	-2.42e-05	5.86e-05	-9.72e-05	-5.47e-05	-84.57
	(0.00137)	(3.94e-05)	(9.61e-05)	(0.000165)	(0.000209)	(69.99)
Top PIT rate	0.00137	0.000253	8.93e-06	-0.000271	-0.000290	-292.4
	(0.00507)	(0.000181)	(0.000162)	(0.000313)	(0.000339)	(214.9)
Sales tax rate	0.00277	0.000261	0.000244	-0.000489	-0.000387	346.1***
	(0.00350)	(0.000170)	(0.000219)	(0.000391)	(0.000423)	(118.9)

Table 6: Arellano-Bover/Blundell-Bond Estimates, continued

	(1) Per capita	(2) Provincial Share of Total Income	(3) Provincial Share of National	(4) Provincial Share of Total Employment	(5) Provincial Share of National NFSE	(6) Non-farm self-employment productivity
Crime rate	-8.99e-08	-2.25e-07	4.39e-07	-6.69e-07	-7.79e-07*	-0.0604
	(5.46e-06)	(2.91e-07)	(3.27e-07)	(4.38e-07)	(4.59e-07)	(0.374)
Crime dummy	0.00676	0.000279	-0.000763	-0.00226	-0.00267	1,815
	(0.0180)	(0.000515)	(0.000858)	(0.00187)	(0.00198)	(1,417)
% of population over 64	0.00833	0.000158	0.000486	0.00264***	0.00295***	-47.29
	(0.00822)	(0.000327)	(0.000415)	(0.000842)	(0.00101)	(315.3)
Female percentage	0.00599	0.000400*	-0.000226	0.000599	0.000617	285.5**
	(0.00483)	(0.000206)	(0.00115)	(0.000418)	(0.000421)	(114.7)
Population density	-0.00272	-2.40e-05	-0.000184	-0.000156	-0.000302	-56.25
	(0.00186)	(9.90e-05)	(0.000250)	(0.000258)	(0.000294)	(176.4)
Unemployment rate	-0.000570	-6.01e-05	3.61e-05	0.000773*	0.000833*	-504.7*
	(0.00434)	(0.000185)	(0.000188)	(0.000432)	(0.000484)	(264.6)
Job growth	0.0134***	0.000293**	0.000349**	-0.000523	-0.000528	87.82
	(0.00249)	(0.000147)	(0.000176)	(0.000438)	(0.000462)	(175.4)
Public expenditures	-0.0164***	-0.000899***	0.000255	-0.00184**	-0.00193**	339.9
	(0.00607)	(0.000282)	(0.000284)	(0.000885)	(0.000920)	(363.1)
Agriculture share of GDP	0.214	0.00376	-0.0152	0.00651	0.0349	-17,315
	(0.513)	(0.0216)	(0.0221)	(0.0275)	(0.0313)	(38,966)
Manufacturing share of GDP	0.0343	-0.000967	0.0136	0.0311	0.0300	-14,995
	(0.268)	(0.0123)	(0.0141)	(0.0238)	(0.0218)	(21,848)
First lag	0.958***	0.734***	1.316***	0.752***	0.738***	0.688***
	(0.147)	(0.113)	(0.0492)	(0.0948)	(0.0906)	(0.123)
Second lag	-0.106	0.0335	-0.320***	-0.0845	-0.102	0.0571
	(0.147)	(0.102)	(0.0504)	(0.0824)	(0.0794)	(0.0908)
Observations	260	260	260	165	165	165
Provinces	10	10	10	9	9	9

Robust standard errors in parentheses

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

Consistent with Bruce *et* al. (2014), results show tax policy control have no statistically significant effects on *per capita* entrepreneurial income. Higher top marginal CIT rates are negatively associated with the provincial share of total income. Higher sales tax rates are positively associated with a higher entrepreneurial income as a share of total income and with a higher provincial share of national entrepreneurial income. However, the size of these effects is relatively small. Arellano-Bover/Blundell-Bond estimates yield different results. While the effects' directions are the same, statistical significance disappears and thus makes it difficult to conclude that tax policy as measured by CIT, PIT and sales tax rates, does have an effect on entrepreneurial outcomes. Results in Table 6 also associate a higher top marginal PIT rate with lower entrepreneurial productivity and higher sales tax rates with a stronger entrepreneurial productivity but, again, these effects are isolated and not consistent across specifications. It is worth noting that if in fact, CRA fails to capture 100% of entrepreneurs underreporting their income and the reported income is not perfectly inelastic with respect to PIT rates, the PIT tax coefficient might be biased downwards. This does not appear to be a problem as the PIT coefficients remain statistically non-significant across the different specifications even if biased downwards.

Fixed effects results are added for comparison purposes as most literature, including the comparison reference for Bruce *et al.* (2014)[14], uses them in order to assess tax policy effects on entrepreneurial outcomes. Indeed, if underlying trends were proven to be irrelevant for entrepreneurial performance, fixed effects would be the preferred model. Its results negatively associate top marginal PIT rates with lower *per capita* entrepreneurial income.

[14] Bruce and Deskins (2012)

Table 7: Fixed Effects Estimates

	(1) Per capita	(2) Provincial Share of Total Income	(3) Provincial Share of National	(4) Provincial Share of Total Employment	(5) Provincial Share of National NFSE	(6) Non-farm self-employment productivity
Top CIT rate	-0.00992	-8.69e-05	-0.000634	-0.000411	-0.000229	-403.1
	(0.00568)	(0.000218)	(0.000468)	(0.000468)	(0.000445)	(224.2)
Top PIT rate	-0.0250**	-0.000407	-0.000999	0.000210	0.000534	-456.3
	(0.00990)	(0.000233)	(0.00102)	(0.000754)	(0.000814)	(429.4)
Sales tax rate	0.0135	0.000478	0.000213	0.00184	0.00214	-719.1
	(0.0186)	(0.000645)	(0.000561)	(0.00153)	(0.00149)	(445.7)
Crime rate	-3.30e-05	-1.18e-06**	1.44e-06*	-1.56e-06	-2.19e-06	0.0694
	(2.01e-05)	(4.83e-07)	(7.74e-07)	(1.28e-06)	(1.25e-06)	(0.619)
Crime dummy	-0.00217	0.000664	-0.00603**	-0.00743*	-0.00780**	4,630**
	(0.0547)	(0.00147)	(0.00263)	(0.00362)	(0.00338)	(1,462)
% of population over 64	0.0514*	0.000632	-7.26e-05	0.00608**	0.00593**	1,843*
	(0.0243)	(0.000732)	(0.00272)	(0.00223)	(0.00222)	(983.5)
Female percentage	-0.296**	-0.00946**	-0.0104	0.00547	0.00728	-14,237***
	(0.104)	(0.00418)	(0.00815)	(0.0101)	(0.0103)	(3,505)
Population density	0.0471*	3.18e-05	0.0100***	0.00771**	0.00804**	-59.48
	(0.0241)	(0.00177)	(0.00156)	(0.00304)	(0.00314)	(1,409)
Unemployment rate	-0.0115*	2.80e-05	-0.000413	0.000914	0.000939	-585.8**
	(0.00580)	(0.000235)	(0.000571)	(0.00108)	(0.00107)	(250.2)
Job growth	0.0209***	0.000523*	0.000827*	-0.000823	-0.000903	347.2
	(0.00583)	(0.000266)	(0.000438)	(0.000808)	(0.000808)	(296.0)
Public expenditures	-0.0231*	-0.00150***	-0.00177**	-0.00352***	-0.00369***	1,171**
	(0.0121)	(0.000439)	(0.000660)	(0.000978)	(0.00103)	(389.0)
Agriculture share of GDP	1.351	0.0411	0.0129	0.0685	0.133**	-71,930*
	(1.468)	(0.0635)	(0.0454)	(0.0602)	(0.0565)	(33,269)
Manufacturing share of GDP	-0.00659	-0.0180	-0.0532	0.110	0.0959	-39,868*
	(0.962)	(0.0292)	(0.111)	(0.0700)	(0.0742)	(18,584)
Constant	16.03**	0.552**	0.597	-0.307	-0.400	735,719***
	(4.995)	(0.203)	(0.370)	(0.480)	(0.492)	(158,354)
Observations	260	260	260	192	192	192
R-squared	0.562	0.541	0.430	0.534	0.576	0.813
Provinces	10	10	10	9	9	9

Robust standard errors in parentheses

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

4.2 Effect of economic and demographic variables

Per capita public expenditures have several effects that are consistent across the different dynamic panel estimation methods used. Results in both Table 5 and Table 6 negatively associate higher *per capita* public expenditures with both *per capita* entrepreneurial income and entrepreneurial income as a share of total income. The share of public expenditures corresponding to welfare transfers was included in order to test for the hypothesis that provinces with higher *per capita* public spending may also have a higher amount of welfare transfers which would in turn take a higher share of total income and therefore lower the entrepreneurial income's share of total income. However, welfare transfers were found to have no significant impact. The same impact is found for entrepreneurial employment as a share of total employment and for the provincial share of national entrepreneurial employment. It is possible that the provinces with higher spending also have a bigger share of public service employment in their economies. A confirmation of the hypothesis would beg the question: does public service employment have a crowding out effect on entrepreneurial employment? There is some evidence that public service employment does crowd out private sector employment (Behar and Mok, 2013) but this does not necessarily translate into a crowding out effect of entrepreneurial employment as evidence points to a positive link between risk aversion and public employment (Buurdam *et al*., 2009) and entrepreneurs are generally perceived as risk bearers (Skriabikova *et al.*, 2014).

Consistent with Bruce *et al.* (2014), a higher unemployment rate is positively associated with both entrepreneurial employment measures, possibly as those who fail to find wage employment turn

to other alternatives, namely, self-employment. A higher rate of employment growth, signaling a positive economic climate, is positively associated with all entrepreneurial income measures.

Unsurprisingly, Table 5 and Table 6 both associate a higher percentage of population in the standard retirement age group of 65+ positively with both entrepreneurial employment measures. Arellano-Bond estimates also associate the percentage of population of at least 65 years of age with a higher *per capita* entrepreneurial income and with a higher entrepreneurial income share of total income. However, the effects on income, while also positive, lose statistical significance in the Arellano-Bover/Blundell-Bond estimates.

While Bruce *et al.* (2014) find that one of the only possible policy tools for stimulating entrepreneurial income is working to reduce the property crime rate, the same cannot be concluded in this research. There is a possibility that measurement error for the reported incidents biases the coefficients towards zero, however, estimations using exclusively the period in where actual offence data is available do not yield different results. It is widely believed that crime rates are higher in the United States than in Canada, however, this is only true for violent crimes. Property crimes are generally higher in Canada than in the United States (Gannon, 2001). More importantly, property crime rate variance is higher in Canada than in the United States[15].

[15] For 2009, the relative standard deviation of the property crime rate in the United States was of 22.5% while that of the Canadian provinces was of 29.9%. Calculations by the author.

Arellano-Bond estimate results indicate that the industrial composition of the provinces, measured by the agricultural and manufacturing shares of gross domestic product does affect entrepreneurial employment. A higher agricultural share of gross domestic product is positively associated with both a higher entrepreneurial employment as a share of total employment and a higher provincial entrepreneurial employment share of the national entrepreneurial employment. However, these results are not robust as Arellano-Bover/Blundell-Bond estimates fail to echo the same conclusions.

As De Hoyos and Sarafidis (2006) point out, cross-dependence in the disturbances can pose severe problems in dynamic panel estimators. In such a case, estimators are no longer consistent. It is true however that it is not sufficient for error cross-dependence to exist in order to void the estimator's consistency property. If the cross-dependency is weak[16], as is the case for the data used in the analysis, the dynamic GMM estimators are still consistent (Sarafidis, 2013)[17].

5 Conclusion

Using provincial-level panel data from 1984 to 2009, this paper examines the effects of tax policy on entrepreneurial income, employment and productivity in Canada by using dynamic panel data estimators. Consistent with the results obtained by Bruce *et al.* (2014) for the United States,

[16] Weak being defined as asymptotically uncorrelated (*i.e.*, correlation systematically becomes weaker over time).
[17] For completeness purposes, the Pesaran (2006) Common Correlated Effects Mean Group (CCEMG) estimator was also used without any changes to the results obtained in Tables 5 and 6. Results are available from the author.

personal income, corporate income and sales tax rates seem to play a rather small if not insignificant role in intensive-margin measures of entrepreneurship in Canada.

These findings suggest that much of the effort made by politicians to try to help entrepreneurs by cutting taxes are not the most effective way to accomplish such a goal. Results show that fostering economic growth might be a better alternative to improve entrepreneurial activity.

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Appendix

Table 4: Variable Definitions and Means

Variable	Definition	1984	1987	2009
NFEI	Non-farm entrepreneurial income ($1000s)	1,688,134	2,213,412	6,018,172
pc_NFEI	Per capita non-farm entrepreneurial income ($1000s)	0.952	1.107	1.052
NFEI as share of total income	Non-farm entrepreneurial income as a share of total income	0.0507	0.0543	0.0440
Provincial share of national NFEI	Provincial NFEI as a share of national NFEI	0.0999	0.0999	0.0999
NFEE	Non-farm entrepreneurial employment (in thousands)	n.a.	92.789	195.486
NFEE as a share of total employment	Non-farm entrepreneurial employment as a share of total employment	n.a.	0.0725	0.0791
Provincial share of national NFEE	Provincial NFEE as a share of national NFEE	n.a.	0.0776	0.0819
Top CIT rate	Top marginal provincial corporate income tax rate (%)	13.45	13.84	11.79
Top PIT rate	Top marginal provincial personal income tax rate (%)	19.17	19.52	15.90
Sales tax rate	Provincial sales tax rate (%)	7.60	7.90	6.94
Crime rate	Provincial property crime rate, rate per 100,000 habitants	5195.67	5286.55	4719.03
Crime dummy	=1 if crime rate measured as reported incidents	0	0	1
% of population over 64	Percentage of population aged older than 64 (%)	10.51	11.19	14.30
Female percentage	Female percent of population (%)	50.13	50.23	50.50
Population density	Provincial population density (people per square km of land)	7.5858	7.7501	8.8523
Unemployment rate	Provincial unemployment rate (%)	12.53	10.81	8.74
Job growth	Employment growth (%)	1.76	2.05	-0.98
Public expenditures	*per capita* provincial public expenditures ($1,000s)	14.797	15.631	18.780
Agriculture share of GDP	Agricultural share of provincial gross domestric product	0.0548	0.0508	0.0270
Manufacturing share of GDP	Manufacturing share of provincial gross domestric product	0.1149	0.1238	0.0900