Quantifying the Impacts of a Wealth Tax in Canada

by

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Abstract

With the help of a dynamic general equilibrium model calibrated for the Canadian economy, we look at the potential impacts of implementing a wealth tax on the wealthiest Canadians. The emphasis is put on the government's ability to collect revenues from this form of taxation. We also study whether such a tax would be welfare improving for society as a whole. In an extension to the model, we introduce endogenous wealth tax evasion and analyze how this affects our results. We find that a wealth tax may lead to welfare gains provided that the proportional tax rate is less than 1%. A more aggressive tax would be counterproductive to the economy's ability to produce goods and would eventually lead to an economy where most agents are worse off. On the other hand, we also find that the potential welfare gains from wealth taxation are nullified when we account for wealth tax evasion.

1 Introduction

Wealth inequality has been on the rise around the world in recent decades (Saez and Zucman (2016); Piketty et al. (2018)). The phenomenon is often associated with the United States, but even more egalitarian countries such as Canada, which implemented robust safety nets and redistributionist policies, do not escape this trend (Davies and Di Matteo (2021)). However, whether anything should be done about rising wealth inequality remains a subject of debate since inequality may simply be an inevitable part of operating in a market economy. Furthermore, some argue that relative inequality is not a source of concern as long as those at the bottom of the wealth distribution still manage to live decently (Frankfurt (2015)).

Meanwhile, the emergence of the COVID-19 crisis and widespread use of lockdown measures to restrain the spread of the disease has put has revealed the stark differences between the haves and the have-nots. Indeed, it was those at the bottom of the distribution of wealth and income that most often suffered from the negative consequences of these measures. The crisis also led to unprecedented fiscal and monetary measures in order to support households through these troubled times. So far, such measure have been financed largely through debt. How should these measures be paid for in the long run? Would asking a bigger contribution out of those who have come out unscathed from the crisis be a good solution, or would it lead to even bigger economic woes?

This essay investigates the effects of implementing a wealth tax in a model economy. The wealth tax was proposed as a possible measure to fund some of the COVID-19 spending by several policymakers around the world. More specifically, we study the potential consequences if such a policy was to be implemented in Canada at the national level. We seek to answer several research questions of interest for policymaking. For instance, could a wealth increase the federal government's total tax revenues (or would the tax have such a negative impact on the economy that it would lead to a loss in revenues)? Would such a policy lead to an overall increase in the country's welfare? What would be the optimal rate of wealth taxation? Given that this tax is applied on the wealthiest member of society, would it lead to a fall in entrepreneurship? How would this policy impact wealth inequality. Would a wealth tax lead to an increase in fiscal evasion from the richest Canadian, and how would this impact the economy?

We attempt to answer these research questions with the help of a dynamic general equilibrium model calibrated for the Canadian economy. Our model features a continuum of infinitely-lived agents facing idiosyncratic risk to their labour productivity and entrepreneurial ability. Agents choose whether they want to be wage-earning workers or entrepreneurs that invest in risky projects for which they hire an optimal amount of capital and labour. There is no perfect insurance to protect the agents. As such, agents save into risk-free assets to insure themselves against negative shock to productivity, but also in order to invest in their business. Finally, a central government taxes consumption, labour and capital income, and assets in order to finance its own consumption and transfers to households. Furthermore, in an extension to the model, the wealthiest agents are allowed to evade taxes by hiding assets in a tax shelter in exchange for a fixed cost and a variable cost on funds that are moved in and out of the tax shelter. Additionally, the presence of entrepreneurs in the model allows us to introduce heterogeneous returns to capital, which is necessary to differentiate a wealth tax from the tax on capital income.

The fact that agents are heterogeneous along the dimension of wealth allows us to calibrate the model to match Canada's wealth distribution in our baseline specification. We then extend the model to include a proportional wealth tax on the assets of the wealthiest agent in the model economy. This method allows us to analyze the effect of the tax on variables and objects of interest such as the final distribution of wealth, consumption, government tax revenues, total output, and societal welfare after redistribution of the tax revenues.

We find that a wealth tax on the top 1% of wealth holders followed by redistribution of tax proceeds may lead to welfare gains provided that the proportional tax rate is less than 1%. Such a tax would lead to an increase in total tax revenues in the long run. However, we also find that any wealth tax more aggressive than 1% would be counterproductive to the economy's ability to produce goods and would eventually lead to reduced societal welfare. We find little evidence that such a tax would lead to a fall in the proportion of agents who choose to become entrepreneurs.

Additionally, by analyzing the transitional dynamics following the implementation of the wealth tax, we show that gains in welfare and tax revenues are stronger immediately after the implementation of the tax as the policy lead to a sharp initial increase in consumption. However, the change in consumption gradually becomes negative over the following periods as the tax leads to lower asset accumulation, and thus, lower total output. We find that much of the fall in output comes from the corporate sector while the entrepreneurs see a rise in output brought by a fall in wages which makes hiring labour cheaper. However, we also find that the gains to welfare are nullified when extending the model to include a form of endogenous wealth tax evasion.

The essay is structured as follows. Section 2 provides a brief review of the literature on wealth taxation, its effect on the economy and modelling approaches for this type of question, as well as the state of wealth inequality in Canada. Section 3 presents the various features of the baseline modelling approach used to answer the research questions. Section 4 describes how model parameters were calibrated in order to match several features of the Canadian economy. In Section 5, we present the analysis of the model results and attempt to answer the research questions. As such, we simulate the introduction of a wealth tax in the economy and show the impact on the steady state values of several economic variables. We also analyze the transitional dynamics from the initial steady state to an economy with a wealth tax. Finally, we present an extension to our baseline model featuring endogenous wealth tax evasion and examine whether this changes our results. Section 6 concludes and offers suggestions for further research. Finally, further details on the algorithm used to solve the model are presented in Appendix I.

2 Related Research

This essay is related to existing research along different lines of the macroeconomic literature. Firstly, it builds on the literature on wealth inequality, capital taxation, and capital income taxation. The research on these topics has been growing over the last decades but has grown more so in popularity thanks in part to Piketty (2014) that brought it forward to the larger public, and more recently because of the 2020 US presidential campaign during which call for a wealth tax were growing in popularity among Democratic candidates. Economists have long disagreed on the efficiency of wealth taxation. Early work by Chamley (1986) and Judd (1985) argues that, based on standard economic theory, governments should not tax capital (or at least not in the long run). The survey articles by Chari and Kehoe (1999) and Atkeson et al. (1999) show that this result is robust if one relaxes some of the stringent assumptions made by Judd and Chamley.

On the other hand, other researchers see capital taxation in a more positive light. For instance, introducing uninsurable idiosyncratic risk leads Aiyagari (1995) to suggests that taxing capital may be optimal to cure the economy from overaccumulation of capital brought by the precautionary savings behaviour of households. Hubbard et al. (1986) also demonstrate that financial market frictions, such as borrowing constraints, may render the taxation of capital desirable. Using a life-cycle model, Conesa et al. (2009) find that an optimal tax rate on capital income of 36%, when combined with with a progressive labour income tax code. Guvenen et al. (2019) studies the different properties of capital income and wealth taxation. They argue that under heterogeneous return to capital, replacing the capital income tax with a wealth tax, in a manner that is revenue-neutral, provides significantly higher lifetime welfare.

The literature proposes several possible modelling approaches to answer the question pertaining to this essay, the most basic of which is the seminal work of Aiyagari (1994) whose model features uninsurable idiosyncratic risk to labour productivity, thus wealth accumulation, and a defined production sector. However, the main issue with Aiyagari-style models is that they generate distributions of wealth that do not feature the long right tail of the wealth distribution seen in many countries (Vermeulen (2018)). Several approaches have been proposed in order to simulate more realistic distributions of wealth. One such approach which was mentioned above is to build heterogeneous returns to capital within the model. A common way to achieve this is by introducing "entrepreneurs" in the economy as in Quadrini (2000) and Kitao (2008), which are agents that combine their managerial ability with their capital and hire labour in order to produce goods (these goods may be final goods sold to households as in Kitao (2008) or intermediary goods sold to a corporate firm as in Guvenen et al. (2019)). As such, entrepreneurs with high ability earn greater returns on their wealth, which helps to generate a more realistic distribution of wealth.

Finally, as this essay is dedicated to studying the impact of wealth taxation in Canada, let us have a brief look at the state of the literature on wealth inequality for this country. Unfortunately, studying wealth inequality in Canada is made difficult by the poor quality of its data on wealth (Brzozowski et al. (2010)). There are few researchers that have tried to estimate the extent of wealth inequality using different vintages of the Survey of Financial Security. Morissette et al. (2002) argue that wealth inequality went up in Canada from 1984 to 1999. They show that the Gini coefficient for net wealth went up from 0.678 to 0.72. For comparison, Rodriguez et al. (2002) estimate the wealth Gini for the US to 0.803, which is markedly more unequal than Canadian wealth inequality. Furthermore, Davies and Di Matteo (2021) demonstrates that wealth inequality is higher in Canada than in the UK and much of continental Europe, but lower than Austria or Germany, and much lower than the US. The latter paper also identifies that surveys (e.g. the SFS) have limitations in estimating the distribution of wealth. These surveys are subject to both sampling and non-sampling errors that may affect the upper tail of the wealth distribution. Both Davies and Di Matteo (2021) and Wodrich et al. (2021) have tried to solve this issue and approximate the true Canadian distribution of wealth by adjusting the SFS wealth distribution with data from a list of the wealthiest Canadian families. Both papers find that the SFS underestimates the extent of wealth inequality in Canada. The former estimated that the top 1% owns 28.7% of wealth, while the latter puts it at 25.6%.

3 Specification of the Baseline Model

We begin by describing the various components of the baseline model (i.e. the model with no wealth tax.) The wealth tax is later introduced in Section 5.2.

3.1 Overview

The economy is constituted of a continuum[1] of infinitely-lived agents with identical preferences. There is no population growth. Agents face uncertainty with respect to their labour productivity as in Aiyagari (1994) and Huggett (1993). Agents are endowed with a unit of labour which they supply inelastically in exchange for a wage. In every period, agents make two main decisions that impact their future state: 1) A consumption-saving decision; 2) Whether to supply their labour in exchange for a wage or to operate their own business as entrepreneurs and earn profits as in Kitao (2008) and Quadrini (2000). Furthermore, those agents who choose to be entrepreneurs solve a parallel optimization problem to maximize their profits. Finally, a government agency taxes consumption, labour and entrepreneurial income, and assets to finance governmental consumption and transfers to households.

3.2 Preferences

Agents maximize the net present value of their expected lifetime utility, which is given as:

$$E_0 \left\{ \sum_{j=0}^{\infty} \beta^j u(c_{t+j}) \right\} \tag{1}$$

Where $\beta \in (0,1)$ is a constant discount factor and c_t is consumption at period t (for

[1]This continuum is of unit measure.

simplicity, there is only one consumption good.) $u(c_t)$ corresponds to the utility from consumption which is assumed to follow a CES form: $u(c_t) = c_t^{1-\sigma}/(1-\sigma)$, where σ is the coefficient of relative risk aversion and also controls the elasticity of intertemporal substitution. This specification of the utility function follows the usual optimality condition, $u'(c) > 0$, $u''(c) < 0$, and also respects the Inada conditions.

3.3 Endowment

At the beginning of every period, each agent is endowed with a level of labour productivity, ϵ_t, and entrepreneurial ability, θ_t. The former factor is multiplied to the agent's labour to obtain the amount of "efficient labour", while the latter factor represents how productively the entrepreneur can combine labour and capital to generate output. Both labour productivity and entrepreneurial ability follow specified stochastic processes that are known to the agents.

- **Labour productivity process**: Labour productivity is assumed to follow an AR(1) process in logs. That is, for agent i we have $\epsilon_t^i = \exp(z_t^i)$, and:

$$z_t = \rho z_{t-1}^i + v_t^i \tag{2}$$

  where $v_t^i \sim N(0, \sigma_v^2)$ and ρ is an auto-regressive coefficient that regulates the persistence of labour productivity shock, and σ_v^2 controls the variance of the labour productivity shock. Given that the model is solved in discretized form, this process is approximated by a five-state Markov-chain using the method of Tauchen (1986).

- **Entrepreneurial ability process**: This process is modelled using a four state-state Markov chain following the method of Kitao (2008). The state vector is proportional to $[0, 1-x, 1, 1+x]$, where $x \in (0,1)$. The vector is scaled by a factor of $\bar{x}$. The transition matrix P_θ is built such that entrepreneurial ability develops gradually over time:

$$P_\theta = \begin{bmatrix} p_{11} & (1-p_{11}) & 0 & 0 \\ p_{21} & p_{22} & (1-p_{21}-p_{22}) & 0 \\ 0 & p_{32} & p_{33} & (1-p_{32}-p_{33}) \\ 0 & 0 & (1-p_{44}) & p_{44} \end{bmatrix} \tag{3}$$

where p_{ij} is the probability of drawing θ_j given a current ability of θ_i. An important feature of this specification is that entrepreneurial ability is allowed to jump up and down by at most one grid to the neighbouring θ, which further emphasizes that ability is gained (or lost) gradually over time.

3.4 Technology and Production

Production takes place in two sectors: a sector composed of many identical competitive firms (the corporate sector) and a non-corporate sector composed of heterogeneous entrepreneurs. Both sectors compete for resources (i.e. capital and labour). The difference between the two sectors are outlined below:

- **Corporate Sector**: This sector consists of identical competitive firms. The firms' production is given by a constant-return-to-scale Cobb-Douglas production function, $Y = F(K, N) = AK^\alpha N^{1-\alpha}$, where K and N correspond to the amount of capital and efficient labour employed in the production of Y units of goods, and α corresponds to the capital share. The firms pay households a wage, w, for their labour and a rental rate of r for the capital supplied. Given the competitive nature of this sector, both factors of production earn their marginal product. Finally, the parameter A corresponds to the level of Total Factor Productivity. A is assumed to be constant and is set equal to 1. As such, the economy features no aggregate uncertainty. Finally, the firm's capital depreciates at the constant rate of δ. Therefore, the corporate firms solve the following static problem in every period in order to maximize their profit, π^C:

$$\pi^C = \max_{K,N} \{F(K,N) - wN - rK - \delta K\} \tag{4}$$

- **Entrepreneurial Sector**: Entrepreneurs produce goods according to the following technology:

$$y = f(k, n, \theta) = \theta(k^{\alpha} n^{1-\alpha})^{v} \tag{5}$$

where k is entrepreneurial capital and n is the amount of efficient labour units employed by the firms. We assume that $v \in (0, 1)$. As such, the entrepreneurs' production function features decreasing return-to-scale. This implies that entrepreneurs can retain $(1 - v)$ from their output as rent for managing their investment project. Furthermore, θ plays an important role in determining the profit-maximizing level of output since a high level of ability will lead to higher production for equal k and n. Note that entrepreneurs may only own one business at a time and are unable to reduce their risks to returns by investing in several projects.

3.5 Government and Taxation

The model features a government[2] that taxes households' labour and capital income, assets[3], and consumption. Assets and consumption are taxed at fixed rates τ_a and τ_c, respectively. As for labour and capital taxation, a two-parameter tax function as in Benabou (2002) and Heathcote et al. (2017) is used in order to capture the progressive nature of income taxation

[2]This single government stands for all levels of government in Canada (i.e. Federal, provincial and municipal governments).

[3]This tax on net assets corresponds to already existing forms of asset taxation in Canada such as property taxes.

under the Canadian fiscal system:

$$I_{after\_tax} = \gamma_0 (I_{gross})^{1-\gamma_1} \tag{6}$$

As such, the household average tax rate, $\tau(I)$, and marginal tax rate, $T'(I)$, are given by:

$$\tau(I) = 1 - \gamma_0 (I_{gross})^{-\gamma_1} \tag{7}$$

$$T'(I) = 1 - \gamma_0 (1-\gamma_1)(I_{gross})^{-\gamma_1} \tag{8}$$

The parameter γ_1 regulates the progressiveness of the tax system where a number closer to 0 means a more progressive tax system. This parameter is set to $\gamma_1 = 0.193$ following the estimates of tax progressiveness by Holter et al. (2019) for Canada. Meanwhile, the parameter γ_0 is a scale parameter that is calibrated so that income taxes account for 65% of the government's total tax revenues.

The government uses its tax revenues to finance its spending, G, for which households do not derive any utility. These expenditures amount to 24% of GDP, which corresponds to the empirical total government spending on consumption and gross investments excluding transfers for all levels of government combined as a percentage of GDP[4]. Additionally, the government balances its budget at every period and is not allowed to carry a national debt. Budgetary surpluses are given back to households in the form of transfer payments, ψ, while deficits are funded through lump-sum tax payments.

3.6 Entrepreneurs' Problem

Entrepreneurs maximize their profits, π^E, given their production technology and their current wealth, a. They do so by choosing the optimal amount of capital and labour to bring into their project. Entrepreneurs supply their own endowment of labour into their venture and

[4] This number was computed using data from the Statistics Canada, Table 36-10-0104-01.

may also hire additional efficient labour units in exchange for the current market wage, w[5]. Entrepreneurs supply their own stock of assets as capital and may also borrow additional capital from a financial intermediary at a rental rate $\tilde{r}$. Note that $\tilde{r} = r + \phi$, where r is the market risk-free rate and ϕ is a premium levied by the lending institution. The premium ϕ is meant to capture the fact that entrepreneurial investments are inherently risky, and as such, banks will typically ask to be compensated for this risk.

Additionally, entrepreneurs may also choose to keep some of their assets as savings, in which case, they earn the risk-free rate r on those savings. This is bound to happen for very wealthy agents or for those with low entrepreneurial ability due to the decreasing return-to-scale production technology imposed on the entrepreneurs.

Furthermore, entrepreneurs face a borrowing constraint. One may not borrow more than $(1+d)$ times his current stock of assets, a[6]. Entrepreneurs repay their debt at the end of the period and may not default on their payments. The leverage constraint implies that even high-ability agents may choose to be workers if their stock of wealth is low. Indeed, agents in this situation may find it more attractive to earn a wage than operating a small-scale business.

Overall, entrepreneurs solve the following problem:

$$\pi^E(a, \epsilon, \theta) = \max_{k,n} \{f(k, n, \theta) + (1 - \delta)k - (1 + \tilde{r})(k - a) - w \max[n - \epsilon, 0] - T(I_e)\} \tag{9}$$

$$I_e = f(k, n, \theta) - \delta k - \tilde{r}(k - a) - w \max[n - \epsilon, 0] \tag{10}$$

$$k \leq (1 + d)a \tag{11}$$

$$\tilde{r} = \begin{cases} r & \text{if } k \leq a \\ r + \phi & \text{if } k > a \end{cases} \tag{12}$$

where I_e is income net of capital depreciation spending, paid wages, and interest expenses

[5]Note that entrepreneurs do not pay themselves a wage

[6]The stock of assets, a, effectively acts as collateral for the lending institution

on capital (or plus interest income on savings). Beyond I_e, entrepreneurs have no other source of taxable income. $T(I_e)$ corresponds to taxes paid according to the income tax system described in Section 3.5. Equation (11) imposes the leverage constraint on entrepreneurs, which may only borrow up to d times their current wealth. We impose $d = 0.5$ following Evans and Jovanovic (1989) and Kitao (2008)

3.7 Financial Intermediaries

The financial sector consists of banks operating in a competitive market[7]. Households deposit their savings into banks and receive interest at a rate of r. The banks can then lend to corporate and entrepreneurial firms. As described above, entrepreneurial firms have to pay a premium, ϕ, on top of the usual rental rate of capital since entrepreneurial ventures are inherently risky. Following Kitao (2008), it is assumed that the premium cost, ϕ, is a pure cost and it does not appear as income for any agents in the economy.

3.8 Dynamic Program

Households are heterogeneous along four state variables: wealth, $a \in \mathbb{A}$, labour productivity, $\epsilon \in \mathbb{E}$, entrepreneurial ability, $\theta \in \Theta$, and occupation, $i \in \mathbb{I}$. Therefore, the household's state space, $\mathbb{S}$, is defined over $\mathbb{S} = \mathbb{E} \times \Theta \times \mathbb{I} \times \mathbb{A}$. At every period, households choose how much to consume, c, and save for the next period, a', and their occupation in the next period (either worker or entrepreneur) in order to maximize the present value of the discounted utility presented in equation (1). Equation (13) formulates this problem in recursive form by defining the following value function, $V(.)$, for a household in state $s \in \mathbb{S}$:

$$V(a, \theta, \epsilon, i) = \max_{c, a', i'} \{u(c) + \beta E[V'(a', \theta', \epsilon', i')]\} \tag{13}$$

where the expectation operator, $E[.]$, is taken with respect to the stochastic processes

[7] As such, banks make no profit.

of ϵ and θ. The value function is subject to the budget constraint of the households, which depends on the current occupation of the agent:

- **Worker's budget constraint:**

$$(1+\tau_c)c + a' = \epsilon w + (1+r)a - \tau_a a - T(I_w) + \psi \tag{14}$$

$$I_w = \epsilon w + ra \tag{15}$$

- **Entrepreneur's budget constraint:**

$$(1+\tau_c)c + a' = \pi^E(a,\epsilon,\theta) - \tau_a a + \psi \tag{16}$$

Both types of agents are subject to the additional constraints that consumption is either positive or zero ($c \geq 0$) and current and future wealth must be within a defined interval ($a \in [\underline{a}, \bar{a}]$). This dynamic programming problem is solved using the Value Function Iteration algorithm. Further details on this topic are provided in Appendix I

3.9 Steady State Competitive Equilibrium

A Steady State Competitive Equilibrium consists of prices (r,w), allocations of workers and entrepreneurs, allocations of consumption and savings, the government tax system, a value function, financial intermediaries, and the distribution of agents over the state space $\mathbb{S}$ given by $\Phi(s)$, such that:

1. Given prices, government transfers and taxes, the allocations solve the maximization problem for households in each state $s \in \mathbb{S}$.

2. The prices satisfy the corporate sector profit-maximization problem. As such, $r = F_k(K,N) - \delta$, and $w = F_N(K,N)$, where K and N are the total capital and effective labour employed in the corporate sector.

3. The government balances its budget:

$$G + \psi = \int [\tau_c c(s) + T(I_e(s)) + T(I_w(s)) + \tau_a a(s)] d\Phi(s) \tag{17}$$

4. Capital and labour markets clear:

$$\int k(s) d\Phi(s) + K = \int a(s) d\Phi(s) \tag{18}$$

$$\int n(s) d\Phi(s) + N = \int l(s) d\Phi(s) \tag{19}$$

Note that given labour is supplied inelastically, and that every households dispose of one unit of labour, we have $\int l(s)d\Phi(s) = 1 * \int \epsilon dF(\epsilon)$, where $F(\epsilon)$ is the CDF for the labour productivity process.

5. The distribution Φ is time-invariant. That is, the law of motion of agents over the state space $\mathbb{S}$ respects:

$$\Phi = Q(\Phi) \tag{20}$$

where Q is a transition operator on the distribution of agents: $\Phi_{t+1} = Q(\Phi_t)$.

4 Calibration

In this section, we go over the calibration of parameters and the distribution of wealth for the baseline model. Parameters are calibrated to match various features of the Canadian economy[8]. There are two sets of calibrated parameters presented in the tables below: Externally assigned parameters, and internally calibrated parameters. The former parameters are assigned following standard values coming from the literature, while the latter parameters are jointly calibrated in order to match certain targets such as the distribution of wealth in the economy, the ratio of wealth and GDP, total tax revenues, etc.

Tables 1 and 2 list the values that were imposed on externally assigned parameter, and internally calibrated parameter, respectively. The tables also provide descriptions of the parameters and the source for the values.

Table 1: Externally assigned parameters

Parameter	Description	Value	Source
Preferences			
σ	Relative risk aversion	2.0	Covas (2006)
Production			
α	Capital share	0.36	Covas (2006)
δ	Depreciation rate of capital	0.06	Kitao (2008)
ϕ	Premium on entrepreneurs' borrowing	0.05	Diaz-Gimenez et al. (2012)
d	Entrepreneurs' leverage constraint	0.5	Evans and Jovanovic (1989)
Endowment			
ρ	Autoregressive coefficient on labour productivity process.	0.90	Covas (2006)
σ_v^2	Variance of the labour prod. process	0.16	Covas (2006)
Government			
γ_1	Income tax progressivity	0.193	Holter et al. (2019)
$\frac{G}{Y}$	Government Spending as a share of GDP	0.24	Stats Can and author calc.

[8]Efforts were made to make the model as good a representation of the Canadian economy as possible. However, where Canadian data was lacking, US data was used in substitute (e.g. distribution of entrepreneurial ability)

Table 2: Internally calibrated parameters

Parameter	Description	Value	Target (Source)
Preferences			
β	Intertemporal discount factor	0.98	Wealth/GDP = 2.89 (Stats Can)
Production			
v	Entrepreneur income share	0.88	Share of total income to entrepreneur =0.27 Kitao (2008)
Government			
γ_0	Income tax scale factor	0.92	Share of income tax / Total revenue = 0.65, Total tax revenue / GDP = 0.34 (Stats Can)
τ_a	Assets tax rate	0.0125	Asset tax revenue/ Total revenue = 0.10 (Stats Can)
τ_c	Consumption tax rate	0.13	Cons. tax revenue / Total revenue = 0.22 (Stats Can)

4.1 Preferences

The coefficient of relative risk aversion, σ, is set to 2.0 following the calibration of Covas (2006) and Kitao (2008). Furthermore, the discount factor on the utility of future consumption is calibrated to 0.98 in order to achieve a target ratio of total assets over GDP of 2.89[9]. This ratio was calculated with capital stock data from Statistics Canada[10].

4.2 Endowment

Following Covas (2005), we set the autoregressive coefficient on labour productivity shock to 0.90, and the variance to 0.16. This calibration imposes a high persistence on the productivity shock and a wide dispersion of income that matches the income inequality found in the data. The endowment of entrepreneurial ability is discussed in more details in Section 4.5.

[9]Since public capital is not considered in the model, total capital is defined as the sum of equipment and structure, inventories, land, and residential capital

[10]See Table 36-10-0097-01

4.3 Production

We use standard figures from the literature for the corporate production technology. That is, the capital share of income, α, is set to 0.36 and depreciation of capital is set to 0.06 following Kitao (2008). The same author also proposes a value of 0.88 for v, the non-corporate production parameter, which is used in this paper as well. This parameter controls how much rent entrepreneurs retained on their investment.

4.4 Government and Taxes

The share of government spending (minus transfers) is set to 24% of GDP based on data from Statistics Canada and our calculations. A similar value was also used in Dorich et al. (2013). All three tax rates described in Section 3.5 are internally calibrated to match certain targets. The tax rate on consumption, τ_c, is set to 0.13 so that revenues from consumption taxes account for 23% of total tax revenues. Similarly, the asset taxation[11] rate is set to 1.25% and account for 11.5% of tax revenues. Thirdly, the scale parameter of the income tax function, γ_0, is calibrated to 0.92 so that income tax account for 65.5% of tax revenues.[12] Furthermore, tax rates were also jointly calibrated so that total tax revenues were equivalent to 34% of the annual Canadian GDP[13]. Overall, this calibration leads to positive transfers to households which account for 9.5% of total GDP.

4.5 Entrepreneurial Ability Process

The calibration of the entrepreneurial ability process follows mainly the work of Kitao (2008) and Quadrini (2000). This stochastic process is critical as it is the main determinant of wealth accumulation and inequality in the model (which is further described in Section 4.6). Given the lack of data on entrepreneurship in Canada, most of the calibration for this part

[11]Note that only net positive asset holdings are taxed.

[12]The share of total revenues for each form of taxation was calculated using data from Table 36-10-0450-01 of Statistic Canada.

[13]This ratio was calculated using data from Statistic Canada, Table 36-10-0450-01

relies on US data. Table 3 outlines the moments that are targeted in the calibration of the entrepreneurial process.

Table 3: Entrepreneurial process targets

Moments	Targets	Model
Fraction of entrepreneur	12%	11.6%
Share of entrepreneurs' income	27%	26.3%
exit rate (overall)	20%	20.1%
exit rate (new entrants)	40%	38.7%
Share of capital used by entrepreneurs	35%	34.0%
Share of assets owned by entrepreneur	40%	41.8%

These targets impose several features on how entrepreneurs behave in the model. We target a 12% share of entrepreneurs within the model, which is consistent with the share of households who reported ownership of business assets (Gentry and Hubbard (2004)). We also impose that the probability of exit of new entrants is twice larger than for entrepreneurs who have been established for 2 periods or more. This is meant to capture the learning process of entrepreneurship as agents tend to acquire business skill with time. Overall, the calibrated Markov process for entrepreneurial ability, θ is given by:

$$\theta \text{ grid } = [0.0, 0.465, 1.550, 2.6350] \tag{21}$$

$$P_\theta = \begin{bmatrix} 0.780 & 0.220 & 0 & 0 \\ 0.430 & 0.420 & 0.150 & 0 \\ 0 & 0.430 & 0.420 & 0.150 \\ 0 & 0 & 0.220 & 0.780 \end{bmatrix} \tag{22}$$

$$\text{stationary distribution } = [0.5540.2830.0990.0664] \tag{23}$$

5 Results

5.1 Baseline Distribution of Wealth

First, we present some features of the baseline economy (i.e. the model with no tax on high wealth). More specifically, we focus on the distribution of wealth. The baseline model generates wide wealth inequalities that match the data from the Canadian Survey of Financial Security (SFS) relatively well. A comparison of the empirical and the baseline model distribution is presented in Table 4. The empirical distribution is based on the SFS 2016.

Table 4: Empirical and model distribution of wealth

Wealth Quantile	SFS	Model
Top 0.1%	3.1	2.97
Top 0.5%	9.2	10.5
Top 1%	13.7	16.5
Top 5%	33.0	34.6
Top 10%	47.6	50.4
Top 20%	67.2	68.2
Bottom 40%	2.3	1.5
Bottom 20%	-0.14	-0.20

Figure 1 displays the simulated distribution of wealth in the baseline model[14]. From the top panel, we can see that the model generates a highly right-skewed distribution of wealth with most of the population having near-zero net wealth and the highest level of wealth being held by a handful of agents. Additionally, the bottom panel represents wealth inequality in the forms of a Lorenz Curve, where the black curve is a 45-degree line (i.e. an economy with uniform distribution of wealth) and the blue curve shows the cumulative wealth distribution of wealth at every point along the cumulative population distribution. The model generates a distribution of wealth where the bottom 60% dispose of little net wealth and where wealth grows at an exponential speed beyond that point. Overall, the model generates a wealth Gini coefficient of 0.72, which is close to the empirical 2018 coefficient of 0.726 computed by

[14]Note that all figures can be found in Appendix II

Davies and Di Matteo (2021).

5.1.1 Who is in the top 1%?

It is important to understand what are the types of agents that compose the top 1% of the wealth as these will be the agent taxed in our policy experiment. Starting with occupation, the baseline model yields that the top 1% is evenly split between workers and entrepreneurs (48.9% and 51.1% respectively). As such, entrepreneurs are over-represented in the top of the wealth distribution since they make up 12% of the overall population. Table 5 gives a breakdown of the composition of the top 1% by occupation, entrepreneurial ability, and labour productivity. Panel a) of the table shows the distribution of entrepreneurs within the top 1%, while panel b) focuses on workers.

Starting with entrepreneurs, the best predictor of being a member of the 1% club is having a very high entrepreneurial ability, θ_4. This makes sense as these are the most productive agents in the economy and therefore enjoy higher profits which allows them to accumulate wealth faster. Having high labour productivity also seems helpful for entrepreneurs (albeit not nearly to the same degree as entrepreneurial ability) since those agents supply their own labour endowment into their business allowing them to save on paid wages.

As for workers, they are mostly agents with low entrepreneurial ability, θ_1, and high to average labour productivity. How did these workers make it into the 1%? Hypothetically, there are two ways for workers to become wealthy: First, one could have a long streak of high labour productivity, ϵ_5, allowing those "lucky" agents to save enough to eventually join the top 1%. The second, and much more likely scenario, is that an entrepreneur makes it into the top of the distribution thanks to high entrepreneurial ability, but gradually loses his ability. An agent in this situation would eventually stop running a business and would find it more profitable to simply supply his labour for a wage and earn interest on his savings.

To get a sense of which of these hypotheses is the most probable, we can look at wealth mobility generated by the model. Such a measure of mobility is the the steady state exit rate

Table 5: Distribution of agents within the top 1% of the wealth distribution

a) Entrepreneurs

	θ_1	θ_2	θ_3	θ_4	Marginal ϵ
ϵ_1	0	2.29	4.56	9.04	15.88
ϵ_2	0	3.02	6.03	12.00	21.05
ϵ_3	0	3.42	6.85	13.67	23.94
ϵ_4	0	3.11	6.27	12.54	21.92
ϵ_5	0	2.41	4.91	9.88	17.20
Marginal θ	0	14.24	28.63	57.13	

b) Workers

	θ_1	θ_2	θ_3	θ_4	Marginal ϵ
ϵ_1	10.27	4.91	1.01	0	16.19
ϵ_2	13.50	6.46	1.33	0	21.29
ϵ_3	15.21	7.29	1.51	0	24.00
ϵ_4	13.77	6.60	1.37	0	21.74
ϵ_5	10.63	5.10	1.06	0	16.79
Marginal θ	63.37	30.36	6.27	0	

from the 1% between two consecutive periods. In this regard, the model generates that 4.98% of the 1-percenters exit the top of the distribution every period and are replaced by agents coming from the bottom 99%. Of those who leave, about 78% are workers. Meanwhile, all of those who enter the top 1% are entrepreneurs before entering, which confirms our second hypothesis.

Overall, we can expect that agents in the top 1% with low entrepreneurial ability and those who choose to be workers are the most likely to be negatively impacted by the wealth tax since those agents have lower returns on their capital compared to the high-ability entrepreneurs. These agents will be even more likely to drop out of the top 1% as the wealth tax will make it increasingly difficult to save enough to remain at the top of the wealth distribution.

Finally, it is also interesting to look at the distribution of labour income within the top 1%. By labour income, we mean wages earned by workers and "rents" earned by entrepreneurs[15],

[15]Here, "rents" refers to gross revenues from operating a business, minus wages, interest and depreciation

while capital income corresponds to earnings from interest on savings. The model generates that 95% of total income in the top 1% comes from labour. This indicates that most of the income among the wealthiest agents is earned from productive activity rather than simple interest on assets owned.

5.2 Wealth Tax Economy

We now move to studying the impact of the wealth tax on the steady state equilibrium. We compute the equilibrium for several levels of tax rate, $\tau_w \in (0, 1, 2, 3, 5, 10, 15, 20, 30, 40)$, on wealth in the top 1%. This will allow us to identify the welfare-maximizing level for this type of wealth tax. This tax is only levied on households in the top 1% of the wealth distribution. Furthermore, this tax is applied on wealth above the wealth level threshold to be part of the 1% (I denote this threshold by $\underline{a}_{1\%}$)[16]. As such, the budget constraint for working and entrepreneurial households respectively become:

$$(1+\tau_c)c + a' = \epsilon w + (1+r)a - \tau_a a - \tau_w \max(a - \underline{a}_{1\%}, 0) - T(I_w) + \psi \tag{24}$$

$$(1+\tau_c)c + a' = \pi^E(a, \epsilon, \theta) - \tau_a a - \tau_w \max(a - \underline{a}_{1\%}, 0) + \psi \tag{25}$$

Figure 2 displays the effects of the wealth tax for several variables in the model (the horizontal axis corresponds to the various tax rates for which the steady state equilibria are computed). A first key result is that taxing high wealth always yields a lower level of steady state savings as the tax makes it less attractive to keep very high levels of assets. This increased scarcity in the supply of assets also leads to a higher price of capital (the interest rate). This makes it costlier for the corporate and entrepreneurial sectors to rent capital for their activities. Furthermore, labour becomes more abundant relative to capital which

paid, and excluding interest earned on savings. This corresponds to what the entrepreneurs directly earn for operating a business.

[16]For instance, if the threshold to be part of the 1% was \$1 million in wealth, then the tax would not apply to the first \$1 million worth of assets of the agent

pushes wages down (the former factor is supplied inelastically).

In the aggregate, the lower amount of capital in the economy leads to a decrease in output at all levels of wealth taxation. However, notice that this tax tends to boost entrepreneurial output. Entrepreneurs reach their peak level of production when high wealth is taxed at 5%, after which entrepreneurial production starts declining. Indeed, entrepreneurs benefit from the lower wage given that the entrepreneurial sector tends to be relatively more labour intensive than the corporate sector. This is particularly advantageous for entrepreneurs who are financially constrained, as they face a leverage constraint and have to pay the premium ϕ on their borrowings but are always allowed to hire as many workers as is optimal at the current market wage. As such, most entrepreneurs are able to operate more profitable businesses and therefore enjoy higher net incomes. As for the share of agents who choose to be entrepreneurs, the relationship with the wealth tax is positive, although it is quite weak as the share increases by merely 0.45 percentage points between the steady state of $\tau_w = 40\%$ and the no tax equilibrium. As such, the effect of the tax on entrepreneurship is small.

We now move on to look at the effect of the tax on government revenues and fiscal policy. Firstly, the wealth tax has a clear negative impact on revenues steaming from the taxation of consumption and workers' income in the long run. Lower wages reduce workers' total income, and hence lead to weaker consumption, which in turn means smaller tax revenues from these two sources. Revenues from taxing total assets also fall given that savings are negatively impacted by the tax. However, more tax revenues are collected from entrepreneurs as these agents generate more net revenues when a wealth tax is implemented. As for the wealth tax, the relationship between revenues collected directly from taxing high levels of wealth and the tax rate is reminiscent of the Laffer Curve. In fact, the relationship is at first positive and peak revenue collection is achieved at $\tau_w = 10\%$. Wealth tax revenues start declining thereafter as the tax reduces the incentive to save beyond $\underline{a}_{1\%}$ and therefore reduces wealth tax revenues. The relationship between total tax collection and τ_w is similar with the peak revenue achieved at $\tau_w = 3\%$. The relationship between transfers to households and the rate of wealth taxation essentially follows the same relationship as the total taxes', as the increases in government revenues are redistributed to households and falls in revenues are compensated by lower transfers.

Another question of interest in this essay was whether wealth taxation would lead to a reduction in wealth inequality. The last panel of Figure 3 provides an answer to this question. We can see that the relationship between our main measure of inequality, the wealth Gini coefficient, and the rate of wealth taxation is a negative one. As, such, taxing the wealth of the richest households and redistributing the revenues to all agents does appear to reduce inequality. This is an unsurprising result. However, what is more surprising is the scale of the effect. Indeed, even with a very high rate of taxation, the reduction in wealth Gini is quite modest at -0.04. A possible explanation for the failure of the wealth tax in significantly reducing inequality is that imposing a high tax rate makes the rich poorer, but it also makes the poor poorer given the depressionary effect of the tax on total output and lower income for most agents except for entrepreneurs who enjoy higher income levels.

Finally, we can ask ourselves whether it is overall beneficial for society to implement wealth taxation (i.e. does this policy improve the welfare of society?). To do this, we look at whether taxing wealth leads to an improvement in welfare when considering ex-ante expectation of outcomes, which is akin to Rawls' notion of measuring well-being "behind a veil of ignorance". Figure 2 shows the effect on societal welfare at various wealth tax rates. The main takeaway is that taxing wealth at a rate of 1% or lower may lead to a higher steady state welfare level, while taxing at a higher rate makes society as a whole worse off. Indeed, taxing wealth at 1% allows the government to raise its total revenue from tax collection. The supplementary revenues are then redistributed to all agents, which allows households at the bottom of the wealth distribution to increase their consumption. On the other hand, we can see that any increase in wealth tax beyond $\tau_w = 1\%$ leads to a fall in welfare. In those scenarios, taxing wealth leads to a large enough fall in output and income so that most agents are worse off. Despite the increase in transfers coming from the tax, it is insufficient to compensate most agents for their loss of income and leads to a decrease in consumption.

5.3 Transitional Dynamics

Figure 3 presents the transition between the initial steady state of no wealth taxation and the economy with a 1% tax on the stock of assets in the top 1% of the wealth distribution. The latter steady state has been shown to be welfare improving (see Section 5.2). Note that we assume that the policy change come as a surprise to agents, and as such, behaviours are unchanged prior to the tax being implemented.

For policy analysis purposes, it is critical to assess how the various variables of interest evolve over time[17]. The horizontal axis of the charts corresponds to the number of periods. Period zero is the initial steady state, while the new wealth tax is implemented at the beginning of period 1.

5.3.1 Initial Impact

The tax has an immediate impact on the wealthiest agents' consumption savings decisions. As it becomes less advantageous to keep a high level of assets, these agents reduce their savings in favour of consumption. Thanks to a higher level of consumption and the implementation of the wealth tax, the government is able to increase its tax revenues by about 0.47% in the first period. These new revenues are then redistributed equally to all households in the form of transfers. This benefits most households that are able to expand their consumption. Overall, the increased level of consumption for most agents leads to a clear increase in societal welfare in the first period.

Meanwhile, on the production side, the wealth tax has a disparate effect on the corporate and entrepreneurial production sectors. Starting with entrepreneurs, we can see that

[17]This is especially important given that it takes infinitely long to reach the new steady state as it is approached asymptotically. We allow the transition to take place over 125 periods. However, for most variables the new steady state level is essentially reached after 50 to 75 periods.

the tax leads to a decrease in entrepreneurial capital and output in the first few periods. The explanation for this effect is that the wealth tax happens to affect disproportionately entrepreneurs who are over-represented in the top 1% of the wealth distribution. These entrepreneurs choose to reduce their investment in capital in order to finance more consumption and to pay the tax[18], which leads to lower entrepreneurial output. As for the corporate sector, it follows the opposite path by increasing slightly their level of capital, employment, and output in order to respond to the higher demand for consumption goods generated by the transfers to households.

5.3.2 Long-term effects

Despite some overall positive impacts in the first few periods of the transition, Figure 3 shows that the lower level of savings inevitably takes a toll on the productive capacity of the economy. The scarcity of capital relative to total labour inevitably leads to an increase in the price of capital (the interest rate) and a fall in wages. Lower wages are financially painful for most households as the majority of agents are employed as workers. The fall in worker's income has a depressionary effect on consumption, and hence it leads to lower tax collection from worker's income and consumption. Furthermore, the decrease in savings among the wealthiest households eventually leads to lower revenues from taxing high levels of wealth and for the already existing tax on assets. As such, we see a slow decline in total tax revenues starting from the second period onward. This leads the government to reduce its transfers to households, which further depresses consumption.

However, entrepreneurs seem to benefit from the tax in the long run and are able to increase their net income, which helps the government to partly compensate for the fall in other sources of tax revenue. What is causing this income gain to entrepreneurs? Here, the entrepreneurs end up benefiting from the long-term fall in wages. Therefore, entrepreneurs decide to substitute capital for labour in order to reduce their cost of production. They

[18]Note that entrepreneurs can simply do this by "eating" their capital.

also see a slight uptick in capital in the long run, although the final level of entrepreneurial capital is still much lower than the initial steady state level. As for the corporate firms, their output drops steadily from the second period onward due to a lower capital level, and labour being absorbed by the entrepreneurial firms. Despite the increase in productivity from the non-corporate sector, the impact of the wealth tax on output is clearly negative over the transition with the level of total production contracting 0.19% from the initial steady state to the final.

5.4 Policy Experiment: Funding Higher Government Spending

In this section, we run a policy experiment where we use a wealth tax and a consumption tax to fund a permanent increase in government spending. This experiment is of interest as we could imagine such an increase in G could be due to to an increase in debt servicing costs. This is a situation that the Government of Canada will most likely face due to the large deficits incurred during the COVID-19 pandemic. As such, this experiment provides insights as to which form of taxation would be optimal to pay for some of the COVID-related spending.

Our simulation takes the following form. Given the absence of government debt in our model, we assume an exogenous rise in government spending, G, in period 0. The level of G is then kept fixed at this new level for the whole transition. This is meant to capture the increase in debt servicing costs which should not lead to an increase in utility for any agents. To balance the budget, the government can either change its consumption tax rate, τ_c, or its wealth tax rate, τ_w. We assume that transfers are kept constant at the baseline level throughout the transition.

Furthermore, we need to address the size of the shock to G. At this point, it is unclear, what will be the costs associated with the COVID deficit. Many factors that could influence the rise in the cost of servicing the debt have yet to unfold (e.g. recurrent "wave" of the virus throughout 2021-2022, and the speed at which the interest rate will rise.) Due to this reason, we assume that the rise in G matches the maximum total tax revenue amount that can be collected in the final steady state using an increase in the wealth tax. As seen in Section 5.2, this is a rather small amount, which corresponds to a 0.35% increase in G from its baseline level.

Figure 4 displays the transitional dynamics for two scenarios. The blue lines correspond to the effect of using wealth taxes to close the budget, while the orange line is the scenario in which the consumption tax rate is used. Starting with the simulation using a consumption tax, we can see that using τ_c is much less distortionary for the economy than using a wealth tax. Indeed, an increase in the consumption tax of this magnitude has virtually no effect on the aggregate level of savings. Therefore, both factor prices are essentially unaffected and all aggregate variables (except consumption) remain constant throughout the transition. In effect, all this tax does is to switch a small share of consumption from the agents to the government. This leads to a decrease in welfare for all agents. However, the decrease in welfare is higher for agents at the bottom of the income distribution as the lost consumption represents a higher share of their total consumption.

The story is more interesting when looking at the effect of using τ_w to balance the government budget. In the first period, the government imposes a modest wealth tax of 0.6% on the top 1% of the wealth distribution. This is enough to fund the increase in G upon impact. However, the wealthiest agents choose to reduce their savings because of the tax. This means that the government has to increase τ_w in the following period in order to balance its budget. Having rational expectations, agents foresee this reaction from the government and therefore further reduces their savings to avoid higher tax rates in the future. This results in an increased scarcity of capital in the economy, higher interest rates and lower wages. Similarly to Section 5.3, we get a decrease in total output but an increase in entrepreneurial output and income. Again, the increase in tax revenues from entrepreneurial income is insufficient to compensate for the fall in revenues from taxing consumption and worker's income. This means that that the government has to keep increasing its wealth tax rate until it reaches its final steady state of $\tau_w = 3\%$

Finally, looking at the effect on welfare in both of these experiments is instrumental in determining which form of taxation is better for society over time. In the first few periods, the wealth tax is less detrimental to overall welfare. Indeed, in those periods the wealth tax only affects small share of the population which see its welfare decline. Meanwhile, the consumption tax is detrimental to the overall population, and more particularly for lower-income agents. However, this effect quickly reverses during the transition as the negative impacts of the wealth tax unfold. As the total output is depressed due to lower capital accumulation, so does consumption for most agents, which to leads to lower welfare. In the medium and long-run, the model yields that taxing wealth is more harmful to the economy's welfare than using a consumption tax.

There are many other considerations for this comparison that are not captured by our modelling approach. First, Canada already disposes of a consumption tax. As such, it would arguably be easy (although possibly unpopular) for the government to increase its consumption tax rate. Meanwhile, the country does currently make use of a national wealth tax. Implementing such a new fiscal measure would take some time and could be costly (e.g. keeping registries of wealth, enforcing compliance). On the other hand, our scenario does not take into consideration that it was mostly the poorest Canadians that were the most negatively impacted by the COVID-19 shock. As such, increasing the consumption tax would disproportionately add to the fiscal burden of those who have already been hit by the crisis.

5.5 Extension: Endogenous Wealth Tax Evasion

In this section, we extend on the model previously presented by allowing for a form of endogenous wealth tax evasion. This is an interesting addition as one of the main criticism leveraged against policies of wealth taxation is that they encourage the richest and most productive members of society to hide their wealth (most often in foreign countries), which impedes the government's ability to collect tax revenues. We first present how the baseline model is modified in order to allow for wealth tax evasion. Secondly, we look at comparative statics of different wealth tax rates and attempt to identify the welfare-maximizing tax rate when we allow for wealth tax evasion[19].

5.5.1 How wealth tax evasion takes place

The modelling approach is heavily inspired by Rotberg and Steinberg (2021). In the baseline model, we introduced the variable a, which stood for the agents' stock of savings. This variable is now replaced by two new state variables: a_r, which is the "reported" wealth (i.e. the wealth that is reported to the government and that may be taxed), and a_h, which is the "hidden" wealth (i.e. the wealth that is kept in a foreign tax shelter and that may not be taxed.)

When saving into a shelter, agents face two direct costs. First, agents must pay a fixed cost, μ, if $a'_h > 0$, and a variable cost, ξ, that is proportional to assets moved in and out of the tax shelter. Therefore, the cost of maintaining a tax shelter is $\mathbb{1}_{(a'_h>0)} \cdot \mu + \xi|a'_h - a_h|$. Note that the fixed cost, μ, essentially controls which agents will be able to hide assets in a shelter (i.e. the extensive margin of evasion). Meanwhile, the variable cost, ξ, controls how much agents will choose to hide in the shelter (i.e. the intensive margin). Overall, these costs are meant to capture the actual monetary costs of concealing wealth offshore, but also penalties for misreporting or being caught by tax collection agencies.

There is an additional indirect cost that is specific to entrepreneurs. First, note that hidden wealth may not be used by the entrepreneurs as capital in their projects. Following Rotberg and Steinberg (2021), we impose that only a certain share, χ, of hidden wealth may be used as collateral for the entrepreneurs' borrowing. This creates an opportunity cost for the entrepreneurs: hiding more assets into the shelter in the current period reduces

[19] It would have been interesting to look at the transitional dynamics for the model with wealth tax evasion as well. However, due to the increased computational cost of introducing wealth tax evasion in the model, this has proven difficult to be done. As such, we leave this task for future research.

collateral, and therefore capital income in the following period.

A few additional notes are in order. First, we assume that a_h is kept outside of the economy and does not find its way back into the domestic capital market (this is a departure from Rotberg and Steinberg (2021)[20]). As such, the asset market-clearing condition is unchanged from the baseline model. Furthermore, hidden assets earn a foreign an interest rate of r^*. Given the relatively small size of the Canadian economy, we impose that whatever happens in Canada has no impact on the r^* which is exogenously fixed.

The budget constraints for the workers and the entrepreneurs respectively take the form:

$$(1+\tau_c)c + a_r' + a_h' = \epsilon w + (1+r)a - \tau_a a - T(I) + \psi + (1+r^*)a_h - (\mathbb{1}_{(a_h'>0)} \cdot \mu + \xi |a_h' - a_h|) \tag{26}$$

$$(1+\tau_c)c + a_r' + a_h' = \pi^E(a,\epsilon,\theta) - \tau_a a + \psi + (1+r^*)a_h - (\mathbb{1}_{(a_h'>0)} \cdot \mu + \xi |a_h' - a_h|) \tag{27}$$

The coefficients related to tax evasion are calibrated to match the following targets. First, the share of agents who partake in tax evasion is targeted to be 0.05% (Guyton et al. (2020)). Hidden wealth accounts for 4% of total wealth (Zucman (2015)). Finally, we target that households conceal about a third of their wealth regardless of their position in the wealth distribution (Alstadsaeter et al. (2019)). Other parameters follow the same calibration as presented in Section 4.

5.5.2 Comparative Statics

We now move on to study the impact of the wealth tax on the steady state equilibrium when accounting for wealth tax evasion. Again, our main objective is to identify the welfare-maximizing rate of wealth taxation (if it exists). Similarly to Section 5.2, we assume the level of government spending, G, is kept fixed to the level of the initial steady state. Furthermore, we fix the foreign interest rate to be equal to the domestic interest rate when computing the

[20] Rotberg and Steinberg (2021) build their model for the US and assume that hidden wealth finds its way back into the US economy given that hidden money is typically used to purchase US assets. This is unlikely to be the case for Canada.

initial steady state. However, when computing the steady state for the economy with wealth taxation, we fix r^* to the value of the foreign interest computed for the initial steady state.

Figures 5 displays the comparative statics of varying the wealth tax rates when accounting for wealth tax evasion. The first main takeaway is that implementing a wealth tax is no longer welfare improving at any level of wealth taxation. Indeed, the tax leads to a sharp fall in welfare at all levels of τ_w.

This welfare effect can be explained by changes in the amount of hidden wealth. Figure 5 shows that implementing a wealth tax leads to an increase in evasion in the long-run. For instance, the model yields an increase of 62% in the level of hidden assets when implementing a 1% wealth tax. The same chart shows a positive correlation between the rate of wealth taxation and the level of hidden wealth. The peak level of hidden assets is achieved at a wealth tax rate of 30%, after which, the level of evasion reaches a plateau. The rise in domestic interest rate rises relative to the foreign return on capital and the rise in entrepreneurial income provide a counterbalancing force to keep assets domestically. Nonetheless, it is insufficient to prevent capital outflows.

In many respects, the effect on aggregate variables is quite similar in the models with and without wealth tax evasion. Implementing a wealth tax leads to a fall in savings. Furthermore, with wealth evasion, the decrease in total assets is sharper than in the no-evasion model as the tax also leads to assets leaving the domestic economy. Again, the increased scarcity of capital relative to labour leads to a rise in the domestic interest rate and a fall in the wage rate. This is particularly painful for the competitive corporate sector of production since it is capital intensive, and therefore sees a bigger decrease in production when we account for wealth evasion. Overall, total output declines at all level of wealth taxation, which suggests that such a tax would damage the economy's ability to produce consumption goods.

Let us turn to tax revenues. Similarly, to the economy without tax evasion, taxing capital leads to a fall in tax revenues from labour income taxation and asset taxation since the tax has for effect to reduce assets accumulation and to reduce wages. The tax improves revenue collection from entrepreneurial income. However, a key difference in this extension is that tax revenues of this type improve until $\tau_w = 10\%$, and drops sharply subsequently. The increase in entrepreneurial income is again driven by the fall in wages and the subsequent rise in entrepreneurial output. This difference may be explained by the dynamics in hidden wealth, which eventually reduces the incentives for high-performing entrepreneurs to invest domestically. This leads to a fall in entrepreneurial output and income. Overall, these effects lead to a decrease in total tax collection at all levels of τ_w. Due to the fall in revenues, the government finds itself obliged to reduce transfers to households, which is detrimental to the welfare of all agents in the economy but more specifically those at the bottom of the income and wealth distribution since transfers occupy a bigger share of their total income.

6 Conclusion

In this essay, we looked at whether taxing the wealth of the richest member of society would be a good policy for the Government of Canada in order to raise new tax revenues and increase the welfare of Canadians. Using a dynamic general equilibrium model calibrated for the Canadian economy, we found that a wealth tax on the top 1% of wealthiest agents followed by redistribution of tax proceeds may lead to welfare gains provided that the proportional tax rate is less than 1%. We found that any wealth tax more aggressive than described would be counterproductive to the economy's ability to produce goods and would eventually make most agents worse off. We find little evidence that such a tax would reduce the amount of agents who choose to become entrepreneurs. On the other hand, we also find that the potential welfare gains from wealth taxation are nullified when we account for the possibility of wealth tax evasion.

Furthermore, the analysis of the transitional dynamics shows that gains in welfare and tax revenues are stronger immediately after the implementation of the tax since this policy leads to a sharp initial increase in consumption. However, the effects on consumption become negative over the following periods as the tax leads to lower asset accumulation, and thus, lower total output. We find that much of the fall in output comes from the corporate sector while the entrepreneurial sector sees a rise in output thanks to a fall in wages which makes hiring more labour cheaper. Following, the analysis of two scenarios, we found that consumption taxes are markedly less distortionary for the economy and less damaging for the welfare of the population compared to taxing wealth.

Many further extensions that could be made to this model in order to make this simulation more realistic. However, this would come at the cost of increased computational hurdles. For instance, we could turn our model into a full-blown life-cycle model. This would allow us to better capture the process behind wealth accumulation. An even better extension would be to introduce government debt into the model. The COVID-19 crisis has led the Canadian government to borrow an unprecedented amount of money to finance the various COVID-19 relief programs. Allowing the government to carry a certain amount of debt instead of always balancing its budget would make it feasible to run a simulation where the government use new tax receipts to make payment on the national debt (as opposed to increasing transfers or government spending as we did in this study.) Both of these extensions would provide better recommendations for policy-making.

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7 Appendix I: Computational Algorithm

This section describes the algorithm used to solve for the initial and final steady state of the baseline model, as well as how the transition between both of these steady state was computed. First, we solve the model over a discrete state space using the Value Function Iteration algorithm. We define a grid with 400 points of possible asset value, a. The labour productivity and entrepreneurial processes are discretized as shown in Section 3.3.

7.1 Steady State Computation

1. Guess an initial value function, governmental transfers to households, and a capital-labour ratio for the corporate sector. Compute the rental rate, r, and wage, w, with the guess of the capital-labour ratio.

2. Solve the entrepreneurs' optimization problem presented in equations (9)-(12). Given the non-linearities of the problem, the problem is also solved on a grid of 300 capital points and 300 labour points.

3. Compute consumption at all points in the state space by using the budget constraints of the workers and the entrepreneurs. Compute the utility from consumption. In the case of negative consumption, set the utility to negative infinity (or a very large negative number) so that these points are never chosen by the agents.

4. Solve the consumer maximization presented in equation (13) by using the guess for the value function from Step 1 and the utility computed in Step 3. Obtain an updated guess of the value function. Repeat this step until satisfactory convergence is achieved[21].

5. Obtain policy function for savings, consumption and occupation. Use these policy functions to derive a transition matrix. Iterate on the transition matrix until the invariant distribution is obtained.

[21] A detailed explanation of the VFI procedure and example MATLAB code are available on Fabrice Collard's website: http://fabcol.free.fr/notes.html

6. Use the invariant distribution to compute aggregate variables. Obtain a new corporate capital-labour ratio. Check if the new ratio is sufficiently close to the initial guess. If it is, go to the next step, if not, update the guess for the capital-labour ratio and go back to step 2.

7. Check if the government budget constraint is balanced. If not, adjust transfers to households and go back to Step 2.

7.2 Transition Path Computation

1. Compute an initial and a final steady state as explained in Section 7.1. Take a guess, T, of the length of the transition. Take a guess for the path of the corporate capital-labour ratio and a guess for the path of transfers to households. Compute the path of factor prices.

2. Use the value function of the final steady state for the period T. Solve the households' problem for $T-1$. Continue as such by backward induction until the value function for period 1 is obtained. Compute policy functions and the law of motions from one period to another.

3. Use the stationary distribution of the initial steady state for period 1 and compute forward the distribution of agents at all periods with the law of motions obtained in Step 2.

4. Compute the path of aggregate variables with the distribution of agents obtained in Step 3. Compute a new path of corporate capital-labour ratios and check if the path is unchanged. If not, update the capital-labour ratios, compute updated factor prices, and go back to step 2. Also, check if the government budget constraint is balanced. If not, adjust transfers and go back to step 2.

8 Appendix II: Figures

Figure 1: Distribution of wealth in the baseline model

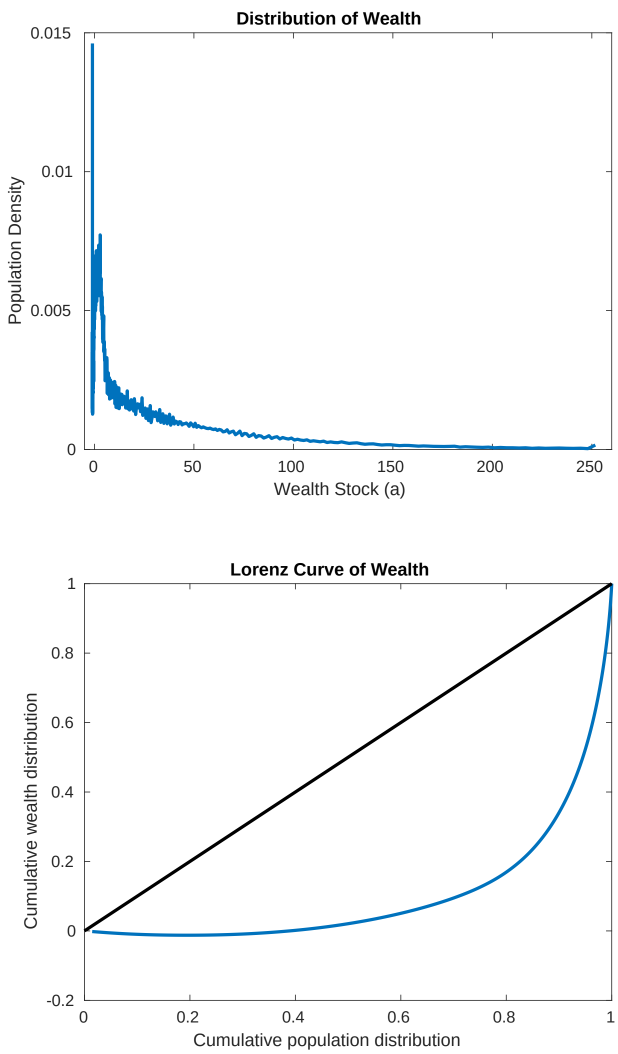

Figure 2: Comparative Statics along the rate of wealth taxation

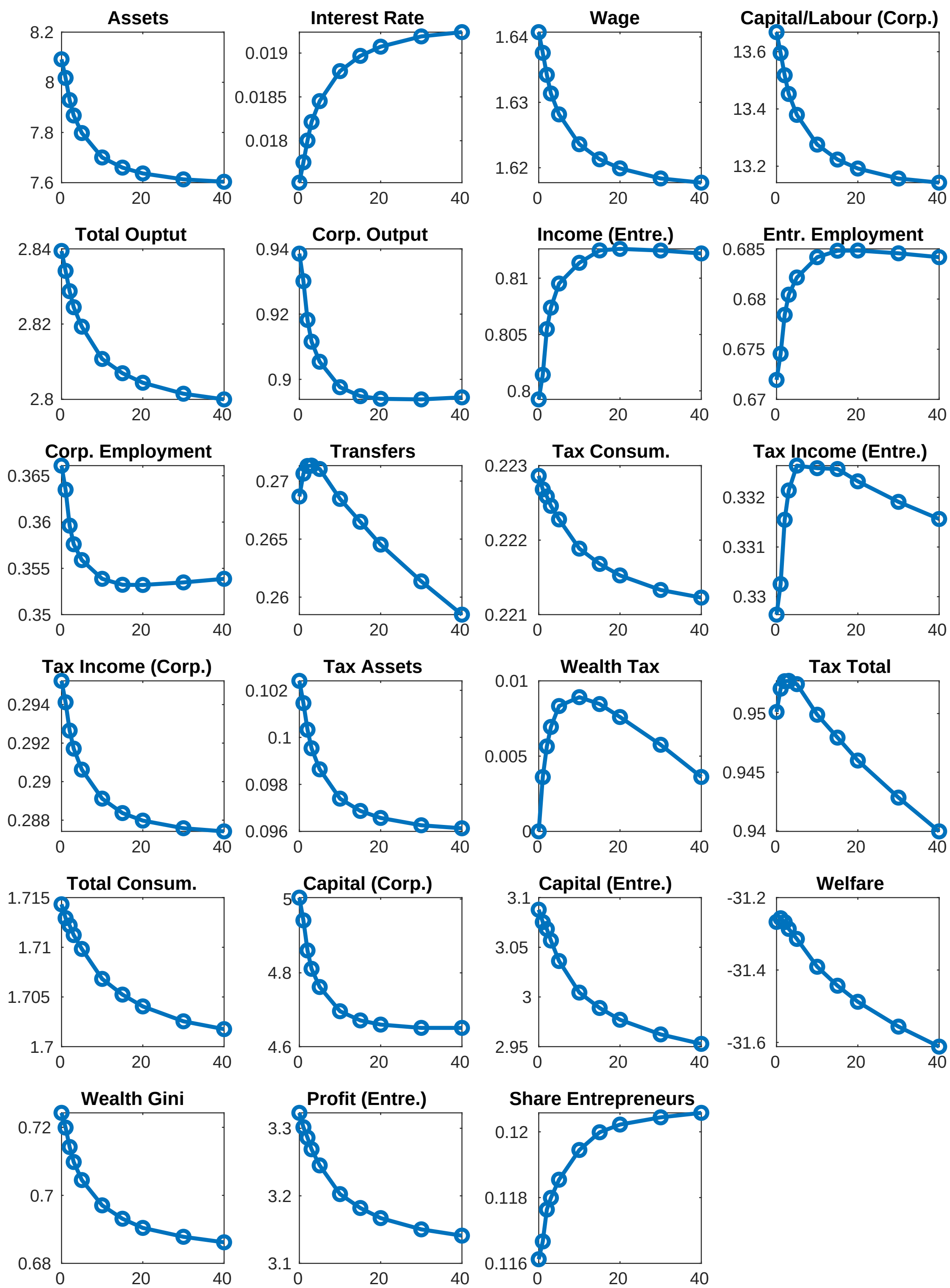

Figure 3: Transition from baseline to 1% wealth tax

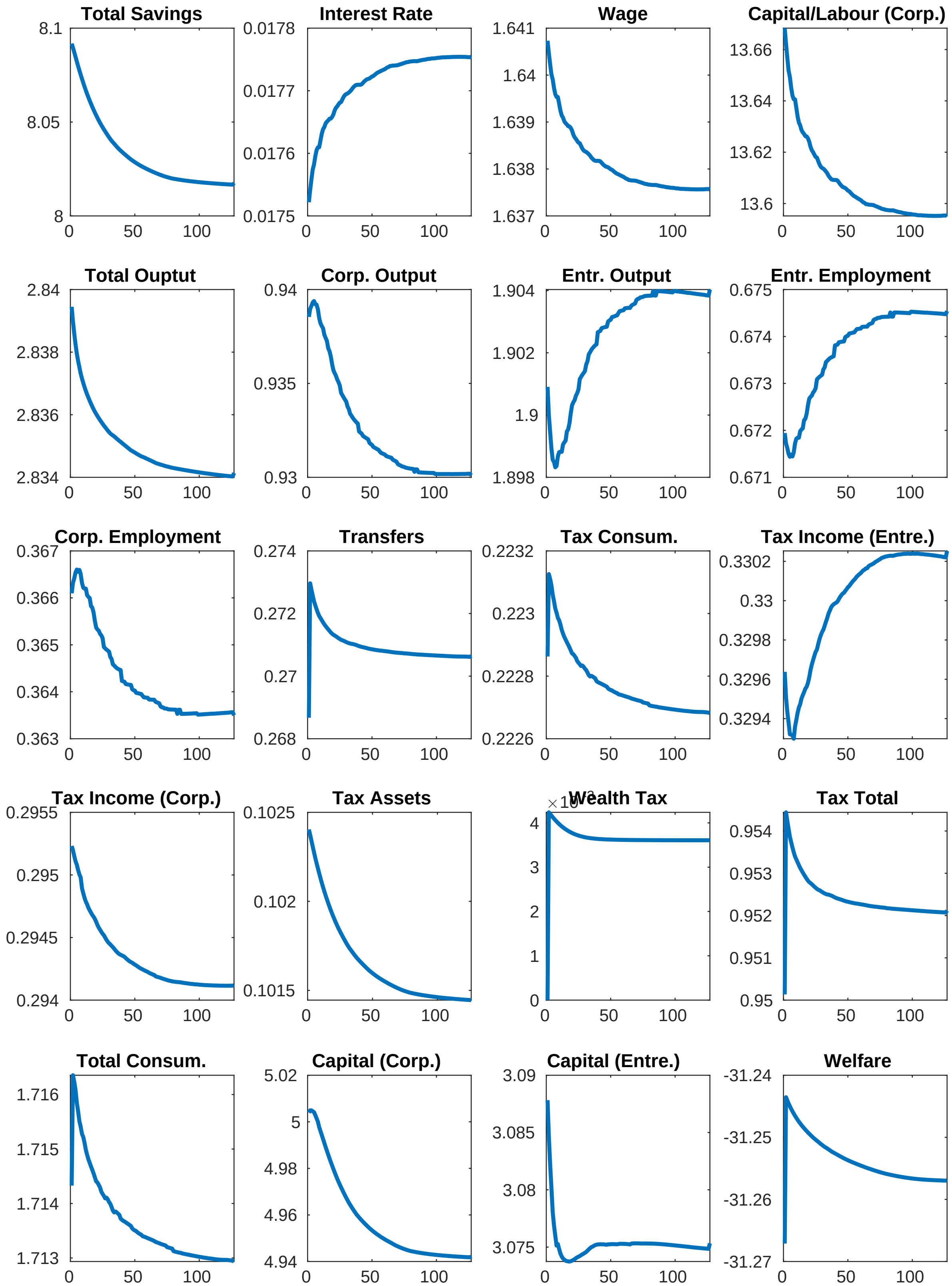

Figure 4: Transition for the policy experiments

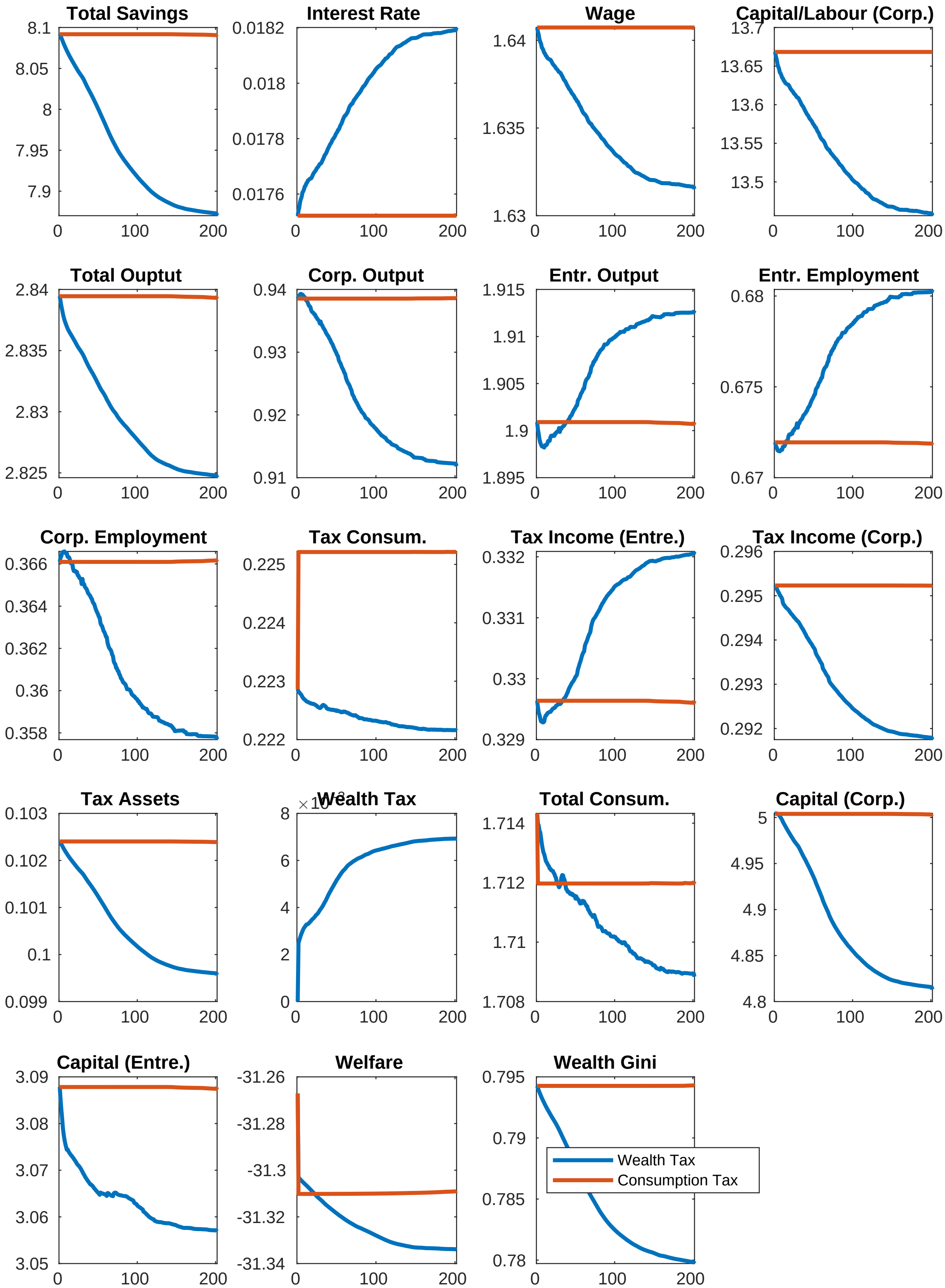

Figure 5: Comparative statics along the rate of wealth taxation (with tax evasion)