

# Tax Reform for Health Care Market in Canada

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## 1 Introduction

### 1.1 Problems

The universal health care system in Canada ensures every citizen have free access to most of its services. This single-payer system is funded through taxes from Canadian citizens and permanent citizens. Arthur M. Okun argued in his book *Equality and Efficiency* that the policymakers need to confront with "the big trade-off" between reducing inequality and impairing economic efficiency. Although Canada's socialized health care system improves the equality for the society, it is not always the most efficient one. For instance, the overcrowded hospitals make many patients wait very long period for the necessary treatments after referral by a family doctor. Some people unfortunately passed away during the delays. Also, the current system lacks motivation for medical technology innovation.

### 1.2 Reform

In 2015, the life expectancy has exceeded 82 in Canada. On the other hand, the number of hospitals and medical school graduates are in stagnation. Qualified doctors and health care services are in high demand. In order to stimulate supply, government should increase fiscal expenditure on public health care system, such as financing medical school education and investing in medical technology.

### 1.3 Benefits

Medical education is costly as it requires both longer time and more facilities compared with other fields. Medical schools in Canada, mostly are public financed, will be able to train more future doctors with more fundings. Also, innovative technology (e.x artificial intelligence) would increase accuracy and speed of diagnoses and treatments. Thus, in the long-run, the policy of increasing health care expenditure should result in higher utilities for Canadians households and greater growth for the nation.

### 1.4 Funding Options

The current tax rate is based on family type. The amount a household pays is dependent on the number of children and parents. This mechanism fails to recognize that people's consumption of health care services differ by their jobs, ages, living habits, gender, etc. Taxes levy based on specific jobs is infeasible, as there lacks studies to show each job's causal relationship with individual's health. Living habits would lead to differences. Possible funding would come from extra consumption tax when people buy cigarettes and alcohol. Most importantly, the policymakers should consider imposing progressive income taxes based on family type. In essence, upper class households with large family size should pay relatively higher, while single young people starting their careers should receive a tax discount.

## 2 Analysis

### 2.1 Model Environment

The economic model for analysis is Neoclassical Model. The model relates supply and demand to an individual's rationality and his ability to maximize utility. The key ingredients are prices,

outputs, and income distributions in markets through supply and demand. Since the policymakers aim for better efficiency in health care market, the model would be appropriate to simulate the benefits and cost of purposed reform.

## 2.2 Kaldor facts

Nicholas Kaldor founded several facts of U.S and U.K about the relationship between factor intensity, output and payments. Using the macroeconomics data from 1950 to 2014, Canada displays the following Kaldor's facts (See figure 1 and 2):

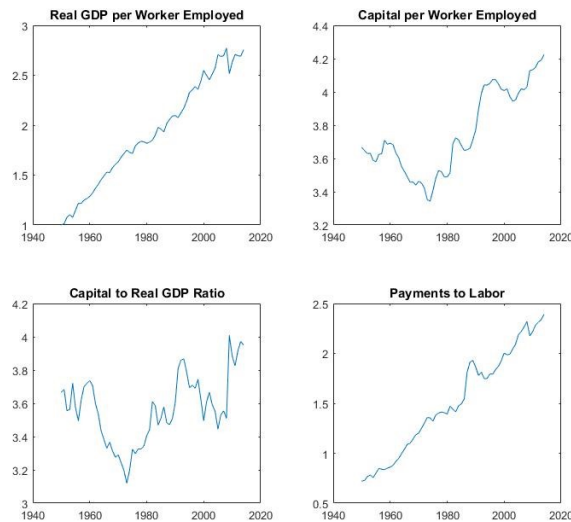


Figure 1: Kaldor facts of Canada, 1950-2014

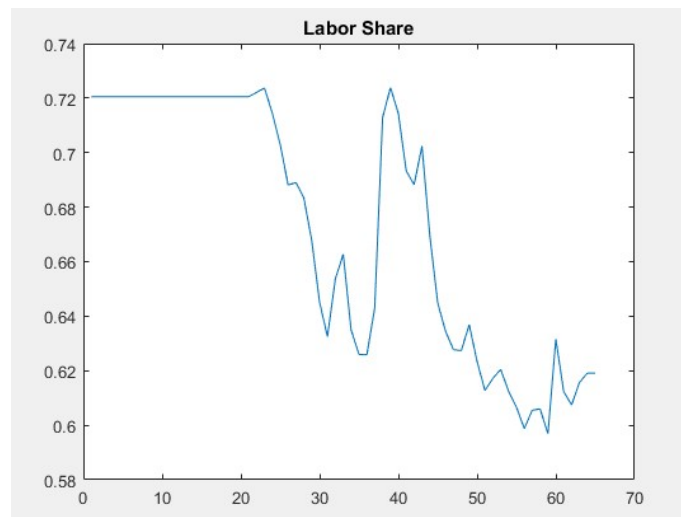


Figure 2: Labor Share of Canada, 1950-2014

1. Output per worker increases almost linearly, except for the financial crisis period in 2008.
2. Capital per worker employed starts to grow after 1970s.
3. Payment to labor are increasing constantly over time.
4. Capital to output ratio fluctuates, but it is roughly constant over time.
5. Labor share is roughly constant (0.61) since 2000.

Since Neoclassic Model was designed to produce these facts, it would be appropriate baseline model to study health care tax reform in Canada.

### 2.3 Growth Accounting

The graphs 3 and 4 visualizes different sources of factors contribute to the economic growth in Canada from 1950 to 2014. Solow Residual, measured by TFP, had been the primary driven factor to economic growth from 1950 to 2014. Nevertheless, TFP dropped dramatically around 2008 and has been slowly recovering in recent years. As a result, expenditure on health care education and innovation will drive the increase of TFP to generate economic growth.

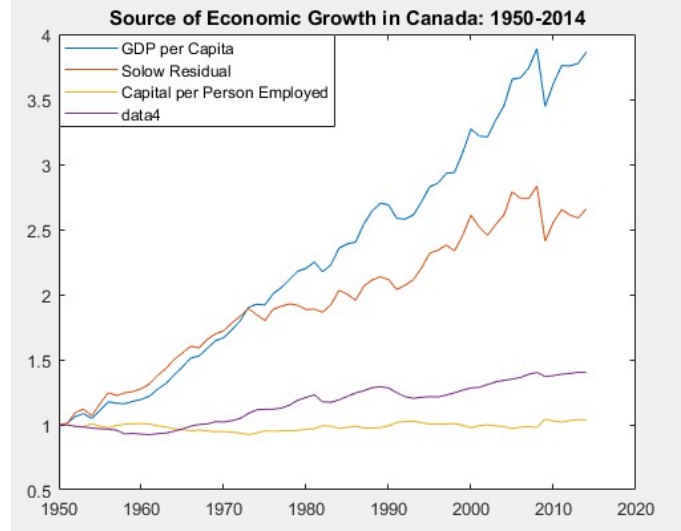


Figure 3: Source of Economic Growth in Canada, 1950-2014

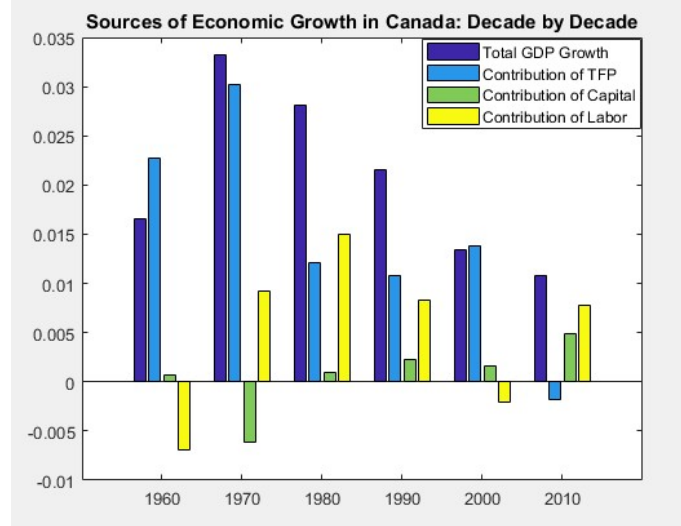


Figure 4: Source of Economic Growth in Canada, decade by decade, 1950-2014

### 2.4 Model Equilibrium

The tax distorted competitive equilibrium model is a set including vectors of allocations: (a) households  $\{c_t, l_t, a_t\}$  (b) banks  $\{x_t, k_t\}$  (c) firms  $\{c_t, x_t, k_t, l_t\}$ , a vector of prices  $\{r_t, w_t, i_t\}$  and a vectors of Fiscal policy  $\{\tau_{at}, \tau_{ct}, \tau_{kt}, \tau_{lt}, T_t, G_t\}$ ,  $t=0, 1, \dots, T$  such that:

- (i) Households maximize utility subject to their budget constraints, given prices and fiscal policy
- (ii) Banks maximize profits subject to their technology constraints, given prices and fiscal policy

- (iii) Firms maximize profits subject to their technology constraints, given prices and fiscal policy
- (iv) Governments' budget constraints are satisfied.
- (v) Markets Clear

The equilibrium is characterized by the following equations:

$$\begin{aligned}
w_t &= F_\ell(k_t, \ell_t) \\
r_t &= F_k(k_t, \ell_t) \\
i_t &= r_{t+1}(1 - \tau_{kt}) - \delta \\
k_{t+1} &= (1 - \delta)k_t + x_t \\
F(k_t, \ell_t) &= c_t + x_t + G_t \\
\frac{u_c(c_t, 1 - \ell_t)}{u_\ell(c_t, 1 - \ell_t)} &= \frac{(1 - \tau_{ct})}{(1 - \tau_{\ell t})w_t} \\
\frac{u_c(c_t, 1 - \ell_t)}{u_c(c_{t+1}, 1 - \ell_{t+1})} &= \beta(1 + i_t(1 + \tau_{at})) \\
a_{T+1} &= 0
\end{aligned}$$

## 2.5 Calibration

In the model, the measure of labor should calculate the percentage of people employed over labor who are eligible for working. Thus, I refer to the age distribution data and disabilities percentage. My labor measure rate is 0.55. The other calibrated parameters for the model are:

Calibrated parameters	Quantity
TFP growth rate (gamma)	0.0353
Depreciation rate (delta)	0.0418
Love of Leisure (theta)	0.0665
Discount Rate (beta)	0.9685
Capital Share (alpha)	0.3273
Total Population (steady state)	1
Total Factor Productivity (steady state)	1

Table 1: Calibrated parameters and Quantities

## 3 Benefits

### 3.1 Qualitative

The health care tax reform will bring in more government revenue. Given the budget constraints, they should spend them on improving the public health care system. For example, artificial intelligence software and robotics have bright potentials for innovating the current medical technology. These technology will help doctors make better inference from patients' diagnosis data. Also, public medical school need extra funding in order to educate doctors who are able to apply these technologies. In the model, I set the TFP as  $Z^{1.2}$  to reflect the exponential growth of productivity increase when  $Z$  increases.

### 3.2 Quantitative

At current steady state, GDP is 5.17% larger than before. However, the net government revenue is negative, which calls for tax increase to fund the program.

Matlab simulation result:

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PRICES

Interest Rate =0.032541  
Rental Rate =0.209  
Wage Rate =0.83674

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Quantities

HH Consumption =0.98457  
HH Savings =1.4303  
Investment =0.01543  
Capital Stock =1.3852  
HH Labor =0.74792  
GDP =1.0517  
Net Government Revenue =-0.59507

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Utility

-0.28315

## 4 Costs

### 4.1 Baseline Tax Rate

The current tax bill of representative families in Canada is show in Figure 5

Family Type	Average Cash Income (\$)	Average Total Tax Bill (\$)	Tax Rate	Health Care Insurance (\$)
Unattached Individuals	42,914	18,030	42.0%	4,257
2 Parents, 0 Children	105,656	49,316	46.7%	11,642
2 Parents, 1 Child	124,493	49,964	40.1%	11,795
2 Parents, 2 Children	122,101	48,685	39.9%	11,494
1 Parent, 1 Child	56,386	18,845	33.4%	4,449
1 Parent, 2 Children	56,349	15,333	27.2%	3,620

Source: The Fraser Institute's Canadian Tax Simulator, 2016.

Figure 5: Average income and average total tax bill of representative families in Canada, 2016

The system is primarily based on family type. For two parents households, they have incentives to raise the second child as it reduces the rate. The problem is the high rate for "unattached individuals", which are primarily unmarried young people. Young people have higher mobility as they have fewer social burdens. Also, presumably they need less health care services than the seniors. If a country cannot retain the talents, the productivity growth will be impaired. Thus, the tax reform should consider people's reactions towards tax changes as well.

### 4.2 Qualitative

Matlab program serves as the simulation of households and government when the tax rates differ. In Figure 6, the government revenue increases when the rates go from 0 to 0.4 (approximate value). Beyond that critical point, the revenue starts to decrease. In the model, people will be reluctant to earn more income and possess more capital if this won't make them better off.

### 4.3 Quantitative

The desired revenue goal is around 10%. I find that a combination of 36% labor income tax and 4% consumption tax would be optimal for funding the policy. Labor income tax is more favored

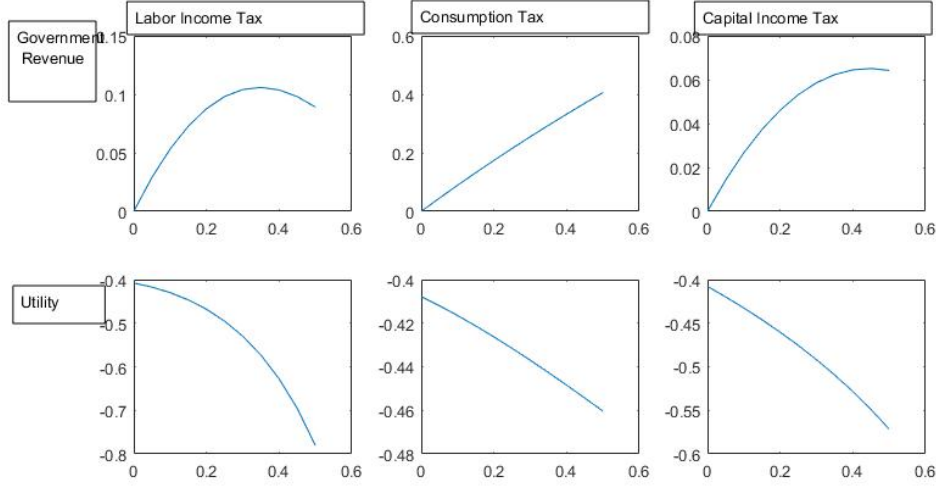


Figure 6: Government revenue and utility changes at different levels of labor income tax, consumption tax and capital income tax

as the current rate is not high compared with other peer countries. The experiments of taxes are shown in Figure 7:

Tax Scheme	Tax Value	Utility	Revenue/GDP
Labor	40.00%	-0.64237	8.07%
Consumption	25.00%	-0.54675	11.00%
Banks' Capital Income	30.00%	-0.57421	-6.58%
Labor & Consumption	L tax =36%; C tax=4%	-0.63294	10.81%

Figure 7: Optimal Tax Rates

#### 4.4 Interpretation and Robustness

The assumptions in this model is Canada is a closed economy. So people are not allowed to emigrant even though the tax rates are extremely high. Also, the purposed 36% of labor tax assumes that the government is able to impose the 3% more, compared with the current policy. In the reality, the tax reform act will fact constraints from political system, labor unions, etc. Also, the analysis focus on Canada as a nation instead of considering the disparities in different provinces. In the calibrated model, since only working-eligible labor is considered, the Laffer curve might be amplified. For the retired people or children, their stipends and consumption are more inelastic and the higher tax rates will not change their consumption behaviors much.

## 5 Discussion

### 5.1 Limitations

One limitation is that the long-term impact of investment in health care is difficult to estimate. Also, the model doesn't consider the influence of immigrants. Compared with Canadians, this new group of population growth may have completely different productivity, capital, utility functions and health habits.

### 5.2 Conclusion

Imposing 36% labor income tax and 4% consumption tax would be optimal for the 10% revenue goal. The revenue can improve the health care market efficiency by financing public medical schools' doctors trainings and research in innovative technology.

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