Empirical Analysis of Prescription Drug Expenditures in Canada

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Abstract:

This paper examines the relationship between public expenditures on prescription drugs and private spending on prescription drugs in Canada over the period 1985 to 2012 using province-specific and year-specific data from the Canadian Institute for Health Information and Statistics Canada. Over this period, prescription drug usage and expenditures were rising; moreover many new public drug coverage plans were implemented. This paper aims to find out whether public spending on prescription drugs is affected by private spending on these drugs, and whether the introduction of catastrophic drug plans could intensify public government burden. There also includes other socioeconomic and demographic explanatory variables, such as gross domestic product, employment rate and senior proportion, and provincial and year fixed effects. The estimation is on the basis of two-way fixed effects models, one is in level form, the other one is in share form. Because the data are in macro panel format, tests for nonspherical disturbances (heteroskedasticity, autocorrelation, contemporaneous correlation) and panel-corrected standard errors (PCSE) are applied. I find that private spending on prescription drugs is a substitute for public prescription drug expenditures. The introduction of the Public Prescription Drug Insurance Plan in Quebec increases public spending of prescription drugs. None of the socioeconomic and demographic variables included in my model significantly affect public prescription drug spending.

Key words*: prescription drug expenditures, catastrophic drug plans, nonspherical disturbances, panel-corrected standard errors*

1. Introduction

Drugs are an important component of health care services in Canada. Drug expenditures are estimated to be about 15.8% of total health care expenditures in Canada in 2014, while hospital expenditures are 29.5% and expenditures on physicians amount to 15.5% of total health care expenditures (CIHI 2014). But unlike hospital and physician care, for which public subsidies cover most expenditures, prescription drug expenditures must be covered by the individual. Most employed individuals, estimated as 60% by Carter (2011), have private insurance provided by employers as a benefit to employees. Public subsidies for drugs are typically only available to seniors and those with very low incomes. However, some provinces provide public subsidies for prescription drugs to the non-elderly and more well-to-do residents; for example, the Trillium Drug Program in Ontario in 1995, the Public Prescription Drug Insurance Plan in Quebec in 1997, the Assurance Plan in Newfoundland and Labrador in 2007, and the Family Pharmacare Program in Nova Scotia in 2008.

The Trillium Drug Program provides people with prescription drug subsidies based on their household income. People who are not covered under the Ontario Drug Benefit Program, or who are uninsured or underinsured by a private health insurance can apply for it.[1] Under the Public Prescription Drug Insurance Plan in Quebec, people are required to be insured by a private plan if this option is available to them. If they do not have access to a private plan, they must obtain coverage under the

[1] http://www.health.gov.on.ca/en/public/programs/drugs/programs/odb/opdp_trillium.aspx

public prescription drug insurance plan administered by the RAMQ (Ministère du Revenu du Québec 2003).[2] The Assurance Plan in Newfoundland and Labrador provides prescription drug coverage to individuals or families where eligible drugs costs exceed 5%, 7.5% or 10% of different levels of net family income.[3] The Family Pharmacare Program in Nova Scotia is also an income-based provincial drug insurance plan. All Nova Scotians could be eligible for it as long as they can prove that they have no drug coverage or the costs of prescription drugs are a burden to them.[4] Summaries of catastrophic drug plans of all provinces can be found in Phillips (2009).

Actually, the plan introduced in Quebec in 1997 includes two major changes to prescription drug insurance. The first one, which differentiates Quebec's prescription drug insurance plan from those in all the other provinces, is that private prescription drug insurance is compulsory for qualified people only in Quebec; i.e., people are required to be covered under a private plan by reason of their employment, profession or occupation (Ministère du Revenu du Québec 2003). However, in all other provinces, private prescription drug insurance is still voluntary. Second, the public prescription drug insurance plan in Quebec extends the public coverage of prescription drugs to those who do not have private insurance. This plan represents a shift in the public coverage criteria from being age-based to being largely income-centered. Income-centered drug subsidies form what is known as a catastrophic drug

[2] http://www.revenuquebec.ca/fr/default.aspx
[3] http://www.health.gov.nl.ca/health/prescription/nlpdp_plan_overview.html#4
[4] http://novascotia.ca/dhw/pharmacare/family-pharmacare.asp

plan (Grootendorst and Racine 2006). Similar plans which are featured as income-based drug subsidies were also introduced in other provinces; however, only in the above four provinces, i.e., Ontario, Quebec, Newfoundland and Labrador and Nova Scotia, were changes made over the 1985 to 2012, the period of my data set. I use four policy dummies to pick up the effects of the introduction of these catastrophic drug plans in my research, thereby capturing the potential impact of them on real per capita public prescription drug expenditures, which has been done in only a few papers.

The combination of private and public sources of financing prescription drugs entailed some 85% of total expenditures on drugs in 2012: 36% paid by the public-sector and 49% paid by the private sector; the remaining 15% came from the expenditures on non-prescribed drugs, including over-the-counter drugs and personal health supplies (CIHI 2014). This paper analyzes the relationship between these two sources of financing; in other words, I examine whether private drug spending is complementary to or a substitute for public drug spending. This research question has rarely been treated; in most articles related to health care expenditures (as described below), the research question focuses on the determinants of a particular kind of health care spending. I use annual data on provincial real per capita public and private expenditures on prescription drugs over the period 1985 to 2012 to explore the potential relationship between them.

Two main specifications are used to analyze the relationship of interest. In one model, the data on public and private spending on prescription drugs are in real per capita levels, whereas in the other model, the data are in share form, with the

dependent variable being the share of public prescription drug expenditures in total public health care expenditures, and the independent variable is the private sector share of expenditures on prescription drugs. I also add some socioeconomic and demographic variables as explanatory variables, including real per capita gross domestic product (GDP), the provincial employment rate, and the proportion of people aged 65 and over in the population. Firstly, GDP could be related to public spending on prescription drugs in the sense that the demand for health spending is partially a function of income, which can be measured by GDP. Second, employment rate is related to taxation, which is an important component of government revenue. Finally, since all seniors are covered under public drug plans, the larger the population of seniors, the higher public spending on prescription drugs is expected to be. Additionally, I add provincial and year fixed effects.

I use an ordinary least squares (OLS) technique to estimate the two-way fixed effects models. However, one big problem with panel data is nonspherical disturbances, which should be detected before regressions. In my model, diagnostic tests for heteroskedasticity, autocorrelation and contemporaneous correlation are conducted, and the regressions are corrected accordingly by using panel-corrected standard errors (PCSE).

My empirical results reveal that only the real per capita private spending on prescription drugs affects public spending on prescription drugs. An increase in real per capita private spending on prescription drugs is associated with a decrease in public spending on prescription drugs. Policy changes also affect spending. Real per

capita public prescription drug spending increases with the introduction of the catastrophic drug plan in Quebec.

The first section below briefly surveys the literature related to health care expenditures, not only in Canada but also in OECD countries. The second section provides an overview of the time series used in this study, formulates two specifications of the econometric model and describes the tests involved. The next section discusses the empirical results. Finally there is a brief concluding section.

2. Literature review

There is a body of literature by Canadian and international academics examining the determinants of health care expenditures, thereby offering suggestions regarding which variables to include in the empirical analysis of health care expenditures. One Canadian researcher, Livio Di Matteo, has conducted many studies on the determinants of Canadian health care expenditures. For example, Di Matteo and Di Matteo (1998) used a pooled time series cross-section model and provincial data over the period 1965-1991 to examine the determinants of real per capita provincial government health expenditures; they found, that the real per capita provincial government health expenditures were positively related to income, the proportion of seniors and federal transfer revenue, whereas the introduction of the Established Programs Financing (EPF) system in 1977, through which the federal government provided assistance to provinces, had a negative effect in Newfoundland and Quebec. Later Di Matteo and Di Matteo (2001) conducted a similar analysis for real per capita provincial public homecare expenditures over the period 1975-1996,

and found the same significant determinants as those of real per capita provincial government health expenditures listed above. In addition, the proportion of health care spending in provincial GDP and the onset of the Canada Health and Social Transfer (CHST) in 1996, both had positive effects on real per capita provincial public homecare expenditures. Later Di Matteo and Grootendorst (2002) examined the socioeconomic and demographic determinants of real per capita government drug expenditures over the period 1975-2000. This time, besides a vector of common demographic and economic variables, they also added policy variables, which aimed to capture the effects of the implementation of some catastrophic drug plans and provincial drug co-payment plans on public spending on drugs. They also included year indicator variables, which could represent the impact of pertinent federal policies, including the limitation of compulsory patented-drug licensing, the extension of the patent term in 1987 and the elimination of compulsory licensing in 1993. Their results showed that the effects of per capita income and federal cash transfers varied across provinces; the effects of age variables were important; the introduction of co-payment plans depressed per capita drug expenditures, whereas the catastrophic drug plans did not increase expenditures by very much.

Common to the above studies is that the empirical specifications were all in linear forms, and their goals were all to find the multivariate determinants of health expenditures in general. Di Matteo (2003 and 2014) expanded the functional form to allow for non-linear relationships, and tried to look at the effect of one particular variable (income and physician supply as described below) on health spending. He

used an OLS as a parametric technique and locally weighted scatterplot smoothing (LOWESS) as a nonparametric technique, which permitted a nonlinear specification to deal with outliers, and focused his analysis exclusively on income. With the OLS estimation, he found that overall health expenditures were either elastic or inelastic, while LOWESS suggested that income elasticities were negatively related to income levels. In addition, after comparing estimations with state-level data for the United States, province-level data in Canada and country-level data in OECD countries, he concluded that international income elasticities were generally larger than national ones. In his 2014 study, using LOWESS, Di Matteo focused on the impact of one particular variable, physician supply, and tried to find the effect of an increase in the number of physicians per 10,000 population on real per capita health expenditures. The contribution of physician numbers to the increase in overall real per capita provincial government health spending varied across different health categories and provinces, but overall its effect was relatively modest. Therefore, in the provinces where physician numbers were a more important driver of expenditures, the provincial governments could use physician numbers as an expenditure cost-control policy.

Concerning cost-control policies and taking into account the fact that the real per capita Canadian provincial government health spending had kept rising, Di Matteo (2010 and 2013) addressed the problem of the fiscal sustainability of public health expenditures, which involved looking at the growth of expenditures in relation to resources. In 2010, using Canadian provincial data over the period 1965-2008, he

found that for Canada's provinces as a whole, real per capita provincial government health spending grew at an average annual rate exceeding the rates for GDP, transfers and provincial revenues. This situation, begged for government policy responses as provincial health spending could not grow faster than the resource base forever. Furthermore, in 2013, he found when the growth rates for government health expenditures in different provinces/territories were broken up both by category and time period, the sustainability situation varied significantly across different categories of health expenditures and time periods, with the least sustainable area being prescription drugs. What is more, government health expenditure growth also varied across regions, which implied that some provinces were more sustainable than others.

Di Matteo (2004 and 2005) examined several different specifications when trying to estimate models to explain expenditures on health care. In 2004, besides a simple specification which related expenditures to real per capita GDP, federal cash transfers, provincial dummies and the proportion of the population over age 65, he also created another model which included the distribution of the population over several age groups, per capita physician numbers, private share of total health expenditures, health expenditures' share of total provincial government expenditures and a time-trend variable. With this more complex model, he found that the estimated coefficient on real per capita federal cash transfers was significant in the traditional model, but not significant in the new model; in the simple model, the estimated coefficient on the proportion of the population aged 65 or more was positive and significant, whereas in the complex model, the proportion of the population between

the ages of 18 and 64 had a greater effect than the proportion aged 65 to 74, which was negatively related to real per capita health expenditures; and the key source of age-related expenditures growth was the proportion of the population aged 75 or more. Finally, Di Matteo concluded that the most important determinant of health expenditures was the time variable, standing for the effects of technological extension, policy shifts, and changes in preferences and expectations. Continuing his analysis with this new model, in 2005 he applied this form to both US state level and Canada province level data and found the overall impact of time and age on per capita health expenditures were similar across these two countries.

Di Matteo (2000 and 2009) looked at the balance between public and private health spending. In 2000, he used the public share of total health care expenditures to denote the market decentralization in health care, thereby examining the determinants of the public-private mix in health care by using OLS over the period 1975-1996. He found that real per capita GDP, the federal health transfer, the individual income share of the top quintile, as well as the proportion of seniors in the population all affected public health expenditures. In 2009, he continued the analysis of the determinants of the public–private health expenditure split with several additional independent variables: the relative price of health, provincial dummies, the immigration rate, the death rate, a time trend and provincial political party variables. All of the estimated coefficients of the additional variables were found to be statistically significant, while the effects of the remaining variables were similar to those obtained from his analysis in 2000. However, most of the coefficients were quite inelastic, which meant that their

impact was quite small.

One gap in the literature on health-care spending is the effect of private health care spending on public health spending. This gap also appears in the analysis of health care expenditures in OECD countries, for example the work of Hansen and King (1996), McCoskey and Selden (1998), and Dreger and Reimers (2005). Since private sector spending on health care keeps rising, and there is concern about the fiscal sustainability of public health expenditures, it is of interest and helpful to look at the impact of private health spending on public spending.

Because fiscal sustainability was found to be the most problematic with prescription drugs, I focus on this area. And since the private funding is the primary source of financing for these drugs, I examine if there exists a significant effect of private spending on public spending in this area.

Several prescription drug plans were modified over the period of study: 1985 to 2012. Changes were implemented in Quebec, Ontario, Newfoundland and Labrador, and Nova Scotia. The impact of these plans on public spending on prescription drugs is of interest, especially the plan in Quebec which is the only explicit public-private insurance partnership in Canada (Hurley and Guindon 2008).

3. Data Description

I obtain province-specific data on health expenditures for the period 1985-2014 from Series B and G in the National Health Expenditure Trends databases maintained by the Canadian Institute for Health Information (CIHI).[5] I use data from Statistics

[5] https://www.cihi.ca/en/spending-and-health-workforce/spending/health-spending-data/national-health-expenditure-database

Canada's Canadian Socioeconomic Information Management System (CANSIM) to construct socioeconomic and demographic variables, including provincial/territorial gross domestic product, senior and total population, the employment rate and consumer price index.[6] Expenditures data for 2013 and 2014 are forecasted data (estimates), which are not included in my regressions. Employment rates for the territories are missing. Real per capita data are obtained by dividing provincial/territorial data in current dollars by population and deflating by the regional consumer price index (2002=100). In this section, I provide an overview of the health expenditures data in Canada over the period of 1985-2014.

3.1 Total health expenditures per capita in Canada in constant (2002) dollars

Figure 1 shows that when adjusted for inflation, total health expenditures per capita in Canada rose to $4,857 in 2012, were estimated to be $4,873 in 2013 and $4,828 in 2014, which implied a statistically significant change after 2012, from the result of a t test of which the null hypothesis is that the average value of data since 2012 is the same as the average value of data before.[7] Total health expenditures per capita varied among the provinces. Table 1 column 1 shows that from 1985 to 2012, the average annual total health expenditures per person in Northwest Territories including Nunavut and Yukon were much higher than those in the other provinces, at $6,448 and $4,397, respectively. Quebec and Prince Edward Island had the lowest average expenditures per capita, at $3,184 and $3,330, respectively. The higher health

[6] Table 384-0038 Gross domestic product; Table 051-0001 Estimates of population; Table 282-0002 Labour Force Survey estimates; Table 326-0021 Consumer Price Index. Statistics Canada

[7] Since Canada could be divided to four regions: Western Canada, Central Canada, Atlantic Canada, and Northern Canada, I choose several representative provinces from each region and delineate corresponding data of them in the figures. In Western Canada, Alberta is selected; in Central Canada, both Ontario and Quebec are selected; in Atlantic Canada, Nova Scotia and Newfoundland and Labrador are selected; in Northern Canada, Northwest Territories including Nunavut is selected.

expenditures in the territories are speculated to be explained by their larger geographical areas and low population densities (CIHI 2014).

Total health expenditures per capita in Canada in constant (2002) dollars increased slightly but significantly by an annual average rate of 1% before 1996. During subsequent years, total spending on health per capita in constant dollars increased by an average rate of 3%. As figure 1 illustrates, there was a growth phase in almost all provinces and territories after 1996, which could be attributed to the major investments made in health care by governments, including spending on physicians, drugs, hospitals and advanced diagnostics (CIHI, 2014 p.22). However, the average annual growth rate ranged from the highest at 5% in Newfoundland and Labrador to the lowest at 3% in Ontario over the period of 1997-2012.

Combining health expenditure growth with economic growth, figure 2 shows that total health expenditures in Canada amounted to 11% of GDP in 2012. It was forecasted to stay at 11% for 2013 and 2014. Table 1 column 2 shows that at provincial levels, the highest average share of health expenditures in GDP was 13% in Prince Edward Island, while the lowest was 7% in Alberta over the period of 1985-2012. In almost every province, there were increases in the total health expenditure-to-GDP ratio after the 2007-2008 recession, which was due to the decreased GDP during the global financial crisis.

Dividing total health expenditures into major categories, hospitals made up the largest component of health care spending (30%), having risen to $1,743 per capita across the country in 2012. Drugs represented the second-largest share (16%) at $958

in 2012, while physicians made up the third-largest share (15%) at $872.82 in 2012. What is of interest in this paper is the real per capita prescription drug expenditures, accounting for the largest portion of spending on drugs, which amounted to $668 in 2012 per person in Canada and was estimated to be around $662 in 2013, decreasing to $648 in 2014 in figure 3. In all provinces, upward trends in prescription drug spending could be seen over the earlier part of the period, stabilizing after 2010. The highest average real per capita prescription drug expenditure was $429 in Ontario, while the lowest level was $303 in Northwest Territories including Nunavut from 1985 to 2012.

3.2 Public-sector health expenditures per capita in Canada in constant (2002) dollars

In Canada, both the public and private sector finance the health system. Public-sector funding includes payments by governments at the federal, provincial/territorial and municipal levels and by workers' compensation boards and other social security schemes (CIHI, 2014 p.30). Private-sector funding consists primarily of health expenditures by households and private insurance companies.

Figure 4 shows that in 2012, at the pan-Canadian level, public-sector health expenditures per capita in constant (2002) dollars were $3,431, a small but statistically significant increase, about 0.31% from 2011, having been expected to increase to $3,441 in 2013 and decrease to $3,404 in 2014. Looking at provincial levels, after omitting the forecasted data, table 1 column 3 illustrates the top two highest levels of average annual public health spending lay in the Northwest Territories including Nunavut at $5,775 and the Yukon at $3,605. The two lowest

level were $2,318 in Quebec and $2,373 in Prince Edward Island. Public spending in the rest of the provinces did not different significantly. As a result, the gap between public spending in Northwest Territories including Nunavut and that in the rest of the provinces has become larger and larger.

As in the total health expenditures situation, a growth trend could be detected in almost all provinces and territories after 1996. The highest average annual growth rate was 5% in Newfoundland and Labrador and the lowest was 3% in Ontario over the period 1997-2012.

Taking into account the percentage share of public spending in total expenditures, figure 5 shows that the average percentage share in Canada over the period 1985-2012 was 71%, and the shares were similar across provinces/territories, ranging from 90% in the Northwest Territories including Nunavut to 69% in Ontario.

In Canada, hospitals and physicians are financed mainly by the public sector, according to the provisions in the Canada Health Act, while drugs and other professionals are financed primarily by the private sector. The dependent variable in model two in this paper is the share of public prescription drug expenditures in total public health expenditures. As figure 6 illustrates, over the period 1985-2012, the average share of public prescription drug spending in total public health expenditures was 7% in Canada, ranging from 8% in Quebec to 3% in the Northwest Territories including Nunavut. While the percentage shares fluctuated slightly in all provinces/territories, in Quebec the percentage share nearly doubled from 6% in 1996 to 11% in 2012. The reason might be related to the new pubic prescription drug

insurance plan in Quebec in 1997 that requires all residents of Quebec to be covered by drug insurance, whether by private group insurance or by the public plan, the effect of which is examined in the regressions in this paper.

3.3 Private-sector health expenditures per capita in Canada in constant (2002) dollars

Drug expenditures, followed by dental care services, usually account for the two largest portions of total private-sector spending, while prescription drugs account for the largest portion of spending on drugs. As figure 7 shows, private-sector health expenditures per capita in Canada in constant (2002) dollars was $1,426 in 2012, with the expectation of $1,432 in 2013 and $1,425 in 2014. Using real data over the period of 1985-2012, Table 1 column 4 shows that Ontario and Nova Scotia had the highest private health spending per capita, at $1,128 and $995 respectively. On the other hand, the Northwest Territories including Nunavut, and Newfoundland and Labrador had the lowest levels, at $673 and $785. In contrast to public-sector health spending, here differences in private health expenditures between different provinces/territories were not that huge and the growths were relatively more stable, with the exception of the Yukon, where the average annual growth rate from 1985 to 2012 was 7%, whereas in Ontario it was 3%.

Another variable in model two is the private share of expenditures on prescription drugs. As shown in figure 8, there were two phases in the growth of the private share of expenditures on prescription drugs over time. Since 1992, growth in different areas have remained relatively stable, with the highest average percentage share at 68% in Prince Edward Island and lowest at 33% in the Northwest Territories

including Nunavut. However, before 1992 in some provinces/territories, the changes were large, such as found in the Yukon, where the percentage share decreased from 71% to 26%. While in most areas the shares of private spending on prescription drugs decreased over the period of 1985-1992, in Saskatchewan, Nova Scotia and New Brunswick the proportions increased, by 22%, 11% and 9% respectively. In Quebec after 1997, there was a little decline in this proportion at first, which then became stable again. Table 1 column 5 shows the average annual share of private spending in total spending on prescription drugs over the period 1985-2012. There was a big difference between the largest share at 70% in Prince Edward Island and the lowest share at 34% in the Northwest Territories including Nunavut. Table 2 shows the trends in the private shares of expenditures on prescription drugs across provinces before 1993. Table 3 shows the average annual shares of private spending on prescription drugs in different provinces over the period 1993-2012.

4. Empirical Methodology

There are two empirical specifications employed in this paper:

$$Publicspend_{it} = \alpha + \beta_1 Privatespend_{i(t-1)} + \beta_2 Socio_{it} + \beta_3 Policies_{it} + \beta_4 F_i + \beta_5 F_t + \varepsilon_{it} \quad (1)$$

$$Publicshare_{it} = \alpha + \beta_1 Privateshare_{i(t-1)} + \beta_2 Socio_{it} + \beta_3 Policies_{it} + \beta_4 F_i + \beta_5 F_t + \varepsilon_{it}$$

$$i = 1, \dots, 10; t = 1, \dots, 28, \quad (2)$$

where i represents the province and t the time period from 1985 to 2012. Due to the unavailability of the employment rate for the three Canadian territories, they are excluded from the analysis.

There are two dependent variables. The first is real per capita provincial public spending on prescription drugs (*Publicspend*) in model 1 and the second is public prescription drug spending as a proportion of total public health spending (*Publicshare*) in model 2. The first model allows us to see the direct impact of, among other things, catastrophic drug plans on the level of public prescription drug spending (per capita); it also presents a straightforward way to discern the relationship between public and private spending. In the second model, the impact of changes in drug policies on the distribution of public health care spending can be captured; we can see if, for instance, the new policies affect the share of public health care spending going to prescription drugs.

To take account of the potential relationship between private prescription drug spending and public drug expenditures and the proportion of public prescription drug expenditures in total public health expenditures, I include real per capita provincial private spending on prescription drugs (*Privatespend*) in model 1, and the share of private spending on prescription drugs (*Privateshare*) in model 2. However, it is possible that the private expenditures on prescription drugs are endogenous in these models: private and public expenditures may be determined simultaneously, and hence the assumption that the explanatory variable is uncorrelated with the errors in the equation is violated. To deal with this endogeneity problem, I use one-year lagged values of *Privatespend* and *Privateshare* in each of the two models.

Three main socioeconomic and demographic variables are included in the equation: real per capita provincial gross domestic product (*GDP*), the provincial

employment rate (*Employrate*), and the proportion of the provincial population aged 65 and over (*Seniors*). Real GDP is considered by many researchers as a determinant of health expenditures (Di Matteo 1998, 2001, 2002, 2003, 2004 and 2005; Hansen and King 1996; McCoskey and Selden 1998; Dreger and Reimers 2005; Day and Tousignant 2005). I expect that the demand for health spending is partially a function of income; per capita GDP is often used as the measure of income. The employment rate is considered to be related to private prescription drug insurance because private insurance is often offered by employers. The employment rate is also related to government revenue through taxation: the higher the employment rate, the more income taxes collected by the government, which may increase public spending on health care. The proportion of the population that is aged 65 or older is added to the regression because these individuals are covered by provincial public prescription drug plans. It is also the case that older people tend to demand more prescription drugs relative to younger people, ceteris paribus.

Four policy dummy variables are included in the regressions, to pick up the four main changes to public prescription drug coverage that occurred over the period of my study (as described earlier): the introduction of the Trillium Drug Program in Ontario in 1995 (*Ont1995*); the Public Prescription Drug Insurance Plan in Quebec in 1997 (*Que1997*); the Assurance Plan in Newfoundland and Labrador in 2007 (*NL2007*); and the Family Pharmacare Program in Nova Scotia in 2008 (*NS2008*).

Vectors of provincial and year fixed effects are also added. The provincial fixed effects capture any time invariant regional effects not captured by the other variables.

Ontario is the reference group. Through the use of year fixed effects, I can capture the impact of other undetected technological changes or decisions by provincial drug plans over time. The year of 1985 is the reference year. Therefore, I am estimating two-way fixed effects models. Table 4 summarizes the definitions of the variables and table 5 summarizes the descriptive statistics.

4.1 Residual diagnostic tests

For the panel regression model, an ordinary least squares regression technique (OLS) is appropriate if we assume that there is no heteroskedasticity, no correlations between the errors across cross-sectional units (contemporaneous correlations) or across time (autocorrelation). However, in macro panels as in my case, there may be several types of nonspherical disturbances, including heteroskedasticity, autocorrelation and contemporaneous correlation. Disturbances are heteroscedastic when they have different variances (Greene 2012 p.257). In a panel format, it means that there is a different variance for each cross-sectional unit. Autocorrelation indicates that there is correlation across the observations in the cross-sections in a panel (Greene 2012 p.388). Contemporaneous correlation means that there is correlation between the realizations of two time series variables in the same time period.[8] Any one of the three problems can render hypotheses tests about the coefficients invalid.

[8] http://www.oxfordreference.com/view/10.1093/acref/9780199237043.001.0001/acref-9780199237043-e-3524.

We have two possible strategies for dealing with these problems. The first is to use the OLS estimation with the panel-corrected standard errors (PCSE) provided by Beck and Katz (1995). The other option is to use a more efficient estimator, such as the feasible generalized least squares (FGLS) estimator. However, Beck and Katz (1995) showed that the OLS estimators with PCSE often yield more accurate hypothesis test results. I therefore employ the OLS regression procedure with the PCSE.

Several residual diagnostic tests are needed for testing the existence of heteroskedasticity, contemporaneous correlations and serial correlation. However in E-views 9.0, only the test for cross-section dependence exists, and there are not built in tests for heteroskedasticity and autocorrelation in a panel format. For the cross-section dependence test, Breusch-Pagan Lagrange Multiplier (LM) test is used to test the null hypothesis of no contemporaneous correlations. Table 6 shows the residual cross-section dependence test results for these two models. With a few noted exceptions, the level of significance used for hypothesis tests is at the 5% level. In both cases, we can reject the null hypothesis under the Breusch-Pagan LM test of no cross-section dependence, concluding that there are contemporaneous correlations in these two models.

To determine whether the residuals from the regression are province-wide homoskedastic (equal variances across provinces), I test the equality of the variances of the residual series for each province using three approaches – the Bartlett, Levene and the Brown-Forsythe tests computed by E-views. Table 7 presents these test

results. All three of these test statistics provide strong evidence of the presence of province-wise heteroskedasticity, decisively rejecting the null hypothesis of equal variances.

Because of the unavailability of built-in tests for serial correlation with panel data, I conduct the serial correlation Lagrange multiplier (LM) test for each province separately. Table 8 shows the results of these tests for the residuals from the regressions of models 1 and 2 for each province. The serial correlation LM tests with two lags strongly reject the null hypothesis of no serial correlation for all residual series, though some test statistics are significant only at the 10% level.

So far all three problems have been detected. I therefore use the OLS approach with the PCSE method (which deals with heteroscedasticity and contemporaneous correlations) and I include a first-order autocorrelation AR(1) correction to deal with the autocorrelation. With these corrections, the hypothesis test results are valid.

5. The OLS Results

Table 9 shows the least squares regression results in Stata 13.1 for model 1 and 2 by using panel-corrected standard errors (PCSE) and assuming that there is an AR (1) within panels, and the coefficient of the AR (1) process is common to all the panels. Overall, the R-squared is equal to 0.82 for model 1 and 0.86 for model 2.

For both models 1 and 2, the estimated coefficients of the lags of real per capita private spending on prescription drugs and private share of prescription drug expenditures are statistically significant. However, none of the socioeconomic and

demographic variables can significantly impact real per capita public spending on prescription drugs and the share of public prescription drug spending in total public health spending. Therefore two additional regressions are conducted in order to allow the estimated coefficients on real per capita private prescription drug spending and on the private share of prescription drug spending to differ across provinces. These regression results are shown in table 10.

In model 1, the estimated coefficients on the lags of the real per capita private spending on prescription drugs are significant in British Columbia, New Brunswick, Nova Scotia, Prince Edward Island and Quebec. The lags of private spending are all negatively related to public spending, which suggests that the real per capita private spending on prescription drugs substitutes for public spending. And according to the magnitudes of the coefficients, in the face of an identical change in real per capita private spending on prescription drugs in last year, the change of public spending in British Columbia is the largest.

For model 2, the estimated coefficients on the private share of prescription drug expenditures are statistically significant for all but three provinces: Alberta, Newfoundland and Labrador and Prince Edward Island. The coefficients are all negative, while the highest absolute value appears in Quebec. This is reasonable because a larger private share of prescription drug expenditures is associated with a smaller public share of prescription drug spending, thereby resulting in a smaller proportion of public prescription drug spending in total public health spending.

None of the estimated coefficients on GDP, employment rate or senior proportion are statistically significant for these two models. Whereas much of the existing literature finds that GDP exerts a significant impact on health-care spending in general, the fact that I have included private spending on prescription drugs and am focused on public expenditures in that area only, may help to explain the differences between my findings and those in the literature.

For the policy dummy variables, the introduction of catastrophic drug plans seems to affect real per person public prescription drug spending significantly only in Quebec in model 1. Since the policy in Quebec extended catastrophic drug subsidies to the non-elderly and the non-indigent, it is reasonable that real per capita prescription drug spending increases with the implementation of the Public Prescription Drug Insurance in Quebec in 1997. After the introduction of this policy, there has been an addition of about $37 in expenditures on prescription drugs per person compared to the level before the introduction of this plan. Given that the annual average prescription drug spending per person in Quebec over the period 1985 to 2012 was about $200, the additional impact of the prescription drug policy amounts to 19%. This result is in contrast to Di Matteo and Grootendorst (2002) who found that the introduction of catastrophic drug plans in general did not increase provincial government drug expenditures by very much. Of course, the fact that the Quebec program was more extensive than that which was introduced in other provinces, helps to account for this difference in results.

For model 2, besides the Public Prescription Drug Insurance in Quebec, the introduction of the Trillium Drug Program in Ontario in 1995 also has significant effect on the proportion of public prescription drug spending in total public health spending. Both of these new catastrophic drug plans increase the shares of public prescription drug spending in total public health spending in Ontario and Quebec. In Quebec, after the introduction of the Public Prescription Drug Insurance Plan in 1997, the share of public prescription drug spending in total public health spending is roughly 0.03 higher than before. The insignificant estimated coefficients on the policy dummies *NL2007* and *NS2008* may arise because the period after the introduction of these plans is not long enough for detecting their effects.

With the exception of Newfoundland and Labrador, Nova Scotia, Quebec and Saskatchewan, the estimated coefficients on all the other provincial fixed effects are significant. And since Ontario is the reference province, the provincial fixed effects in model 1 suggest that, other things being equal, the real per person public spending on prescription drugs is lower in other provinces than in Ontario. The lowest estimated coefficient happens in Prince Edward Island, which confirms the fact that it has the lowest annual average level of per capita public prescription drug spending. For model 2, only the estimated coefficients on provincial fixed effects in Nova Scotia and Quebec are not significant. All the other coefficients are negative, which indicates that the shares of public prescription drug spending in total public health spending are lower in these provinces compared to the share in Ontario.

All the estimated coefficients on the year fixed effects are statistically significant and positive. And we can see increasing trends in the estimated coefficients in both models, which is consistent with the observation that real per capita public prescription drug spending is increasing over the period of study in all provinces.

6. Conclusions

This paper has estimated and focused on two main relationships: the relationship between real per capita public expenditures on prescription drugs and private expenditures on prescription drugs; and, the relationship between the share of public prescription drug spending in total public health spending and the share of private expenditures in total expenditures on prescription drugs. In both cases, I control for many socioeconomic and demographic variables. I test and correct for the nonspherical disturbance by computing panel-corrected standard errors (PCSE) and assuming a first-order autocorrelation AR(1) within panels when I conduct the OLS regressions.

From the regression results of the first model, public spending of prescription drugs is negatively related to the lag of private spending of prescription drugs and unrelated to GDP, the employment rate, and the senior proportion. The negative relationship between public and the lag of private spending on prescription drugs suggests that they are substitutable. So if people have higher private spending on prescription drugs in last year, they have lower expectation of public prescription drug expenditures in this year.

Only the estimated coefficient on the policy dummy variable for Quebec is significant and positively related with public prescription drug spending. So the extension of that province's drug plan to new groups resulted in an increase in public prescription drug expenditures, by about 19%. This result suggests that extending coverage of prescription drugs is costly. However, my analysis does not take into account any positive effects that access to prescription drugs may have on other areas of health care spending – for instance, Emergency Department visits. Diabetics, for instance, who cannot afford their medication are more likely to end up in the hospital than if they were covered by a provincial plan.

The significant provincial fixed effects in Alberta, British Columbia, Manitoba, New Brunswick and Prince Edward Island suggest that there are differences in the real per capita public prescription drug expenditures in those provinces compared to Ontario. The estimated coefficients for all the year fixed effects imply that the rate of increase of public prescription drug expenditures varies over years.

From the regression result of the second model, the share of public prescription drug spending is negatively related to the lag of private share of prescription drug expenditures and again unrelated to all the socioeconomic and demographic variables. Besides Quebec, the estimated coefficient on Ontario policy dummy is also significant. More provincial fixed effects and all year fixed effects matter.

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Table 1: Health Expenditures by Provinces (see notes below table)					
	1	**2**	**3**	**4**	**5**
Canada	$3,470	10%	$2,247	$993	55%
N.L.	$3,341	11%	$2,583	$758	63%
N.S.	$3,377	12%	$2,383	$995	59%
Que.	$3,184	10%	$2,318	$886	53%
Man.	$3,728	12%	$2,794	$935	55%
Alb.	$3,588	7%	$2,624	$963	58%
Y.T.	$4,397	9%	$3,608	$792	38%
P.E.I.	$3,330	13%	$2,373	$957	70%
N.B.	$3,385	12%	$2,416	$969	64%
Ont.	$3,596	9%	$2,467	$1,128	56%
Sask.	$3,495	10%	$2,670	$825	50%
B.C.	$3,485	10%	$2,518	$967	51%
N.W.T.	$6,448	11%	$5,775	$673	34%

NOTE: Column 1 describes the average annual total health expenditures per person in constant (2002) dollars, 1985-2012.
Data Source: Total Health Expenditure, by Province/Territory and Canada, 1975 to 2014—Current Dollars. Table B.1.1 Series B in National Health Expenditure Trends Database, 1975 to 2014 from CIHI. Https://www.cihi.ca/en/spending-and-health-workforce/spending/health-spending-data/national-health-expenditure-database.

Column 2 describes the average shares of health expenditures in GDP, 1985-2012.
Data Source: Table 384-0038 Gross domestic product, expenditure-based, provincial and territorial, annual (dollars unless otherwise noted). Statistics Canada. Http://www5.statcan.gc.ca/cansim/pick-choisir?lang=eng&p2=33&id=3840038.

Column 3 describes the average annual public health spending in constant (2002) dollars, 1985-2012.
Data Source: Public-sector Health Expenditure, by Province/Territory and Canada, 1975 to 2014—Current Dollars. Table B.3.1 Series B in National Health Expenditure Trends Database, 1975 to 2014 from CIHI.

Column 4 describes the average annual private health spending in constant (2002) dollars, 1985-2012.
Data Source: Private Sector Health Expenditure, by Province/Territory and Canada, 1975 to 2014—Current Dollars. Table B.2.1 Series B in National Health Expenditure Trends Database, 1975 to 2014 from CIHI.

Column 5 describes the average annual share of private spending in total spending on prescription drugs, 1985-2012.
Data Source: Expenditure on Drugs by Type, by Source of Finance, and as a Share of Public, Private and Total Health Expenditures, 1985–2014. Series G in National Health Expenditure Trends Database, 1975 to 2014 from CIHI.

Table 2: Shares of private expenditure on prescription drugs before 1993													
	Can	N.L	P.E.I	N.S.	N.B.	Que.	Ont.	Man.	Sask	Alb.	B.C.	Y.T.	N.W.T
85	56%	80%	89%	45%	52%	57%	58%	60%	27%	64%	47%	71%	39%
86	56%	68%	81%	52%	52%	61%	58%	62%	28%	62%	40%	65%	39%
87	55%	66%	69%	51%	54%	57%	56%	55%	36%	59%	45%	52%	39%
88	54%	66%	70%	50%	54%	57%	55%	54%	42%	59%	46%	38%	40%
89	54%	66%	71%	49%	55%	56%	55%	57%	44%	53%	47%	33%	40%
90	53%	63%	71%	52%	56%	55%	54%	58%	44%	53%	46%	30%	37%
91	52%	61%	68%	54%	57%	53%	53%	57%	45%	54%	44%	30%	39%
92	52%	61%	68%	55%	61%	54%	53%	54%	49%	53%	44%	26%	35%

Data Source: Expenditure on Drugs by Type, by Source of Finance, and as a Share of Public, Private and Total Health Expenditures, 1985–2014. Series G in National Health Expenditure Trends Database, 1975 to 2014 from CIHI.

Table 3: Average annual shares of private expenditure on prescription drugs, 1993-2012			
Canada	55%		
N.L.	62%	P.E.I.	68%
N.S.	62%	N.B.	67%
Que.	52%	Ont.	56%
Man.	54%	Sask.	54%
Alb.	55%	B.C.	53%
Y.T.	36%	N.W.T.	33%

Data Source: Expenditure on Drugs by Type, by Source of Finance, and as a Share of Public, Private and Total Health Expenditures, 1985–2014. Series G in National Health Expenditure Trends Database, 1975 to 2014 from CIHI.

Table 4: Regression Variable Definitions

Variable	Definition
Publicspend	Real per capita provincial public spending on prescription drug(2002 dollars)
Publicshare	The proportion of public spending on prescription drug in total public health expenditures
Privatespend	Real per capita provincial private spending on prescription drug(2002 dollars)
Privateshare	The proportion of private spending on prescription drug in total prescription drug expenditures
Socios:	
GDP	Real per capita provincial gross domestic product(2002 dollars)
Employrate	Provincial employment rate
Senior	Proportion of provincial population aged 65 and over
Policy changes:	
Ont1995	1 after introduction of the trillium drugs program in Ontario
Que1997	1 after introduction of the basic prescription drug insurance plan in Quebec
NL2007	1 after introduction of the assurance plan in Newfoundland and Labrador
NS2008	1 after introduction of the family pharmacare program in Nova Scotia
Fixed effects:	
Fi	Province fixed effects
Ft	Year fixed effects

Table 5: Descriptive statistics

	Publicspend	Publicshare	Privatespend	Privateshare	GDP	Employrate	Seniors
Mean	162.24	0.06	225.12	0.58	33136	0.59	0.13
Median	140.34	0.06	206.69	0.57	31634	0.60	0.13
Maximum	370.23	0.12	542.67	0.89	67497	0.72	0.17
Minimum	29.60	0.02	42.19	0.27	17220	0.43	0.08
Std. Dev.	76.25	0.02	109.95	0.08	9367	0.06	0.02
Observations	280	280	280	280	280	280	280
Cross sections	10	10	10	10	10	10	10

Table 6: Residual Cross-Section Dependence Tests

Null hypothesis: No cross-section dependence (correlation)

(obs=270)

Test	Statistic	d.f.	Prob.
Model 1: Breusch-Pagan LM	209.27	45	0.00
Model 2: Breusch-Pagan LM	92.99	45	0.00

Table 7: Test for Equality of Variances between Series (province-wise heteroscedasticity)

A: Model 1 (obs=270)

Method	df	Value	Probability
Bartlett	9	48.48	0.00
Levene	(9, 260)	6.50	0.00
Brown-Forsythe	(9, 260)	3.74	0.00

B: Model 2 (obs=270)

Method	df	Value	Probability
Bartlett	9	58.61	0.00
Levene	(9, 260)	4.67	0.00
Brown-Forsythe	(9, 260)	4.18	0.00

Table 8: Breusch-Godfrey Serial Correlation LM Test

Province	Model 1 Obs*R-squared	Prob. Chi-Square(2)	Model 2 Obs*R-squared	Prob. Chi-Square(2)
Alb.	13.49	0.00	8.99	0.01
B.C.	20.19	0.00	20.95	0.00
Man.	16.55	0.00	13.22	0.00
N.B.	13.04	0.00	16.07	0.00
N.L.	18.22	0.00	20.33	0.00
N.S.	10.96	0.00	5.61	0.06
Ont.	14.26	0.00	14.23	0.00
P.E.I.	8.17	0.02	4.73	0.09
Que.	9.86	0.01	12.43	0.00
Sask.	12.04	0.00	6.96	0.03

NOTE: For every province, observations included is 27.

Table 9: Least Squares Regression with Panel-corrected Standard Errors and AR(1)

	Model 1 Publicspend	Model 2 Publicshare
Privatespend(Privateshare)	-0.0803**	-0.0625***
	(-2.73)	(-10.40)
Socios:		
GDP	-1.09e-4	-1.63e-7
	(-0.36)	(-1.62)
Employrate	4.103	-0.0189
	(0.05)	(-0.68)
Seniors	42.92	-0.0779
	(0.16)	(-1.09)
Policy changes:		
Ont1995	8.309	0.00831***
	(1.23)	(4.15)
Que1997	37.14***	0.0276***
	(3.47)	(6.85)
NL2007	3.151	-0.00249
	(0.55)	(-0.95)
NS2008	0.0135	-1.32e-4
	(0.00)	(-0.05)
Province fixed effects:		
Alb.	-28.60*	-0.0113***
	(-1.99)	(-3.58)
B.C.	-44.94***	-0.0155***
	(-3.86)	(-6.31)
Man.	-25.70**	-0.0147***
	(-2.91)	(-7.13)
N.B.	-31.96**	-0.00760*
	(-2.64)	(-2.20)
N.L.	-29.45	-0.0116*
	(-1.93)	(-2.32)
N.S.	-13.83	-9.27e-4
	(-1.11)	(-0.26)
P.E.I.	-57.86***	-0.0125***
	(-5.11)	(-3.89)
Que.	0.609	-0.00464
	(0.05)	(-1.26)
Sask.	-1.731	-0.00649*
	(-0.13)	(-2.32)
Year fixed effects:		
Year1987	4.100***	9.13e-4***
	(5.27)	(3.90)

Year1988	9.073***	0.00220***
	(5.76)	(4.28)
Year1989	17.56***	0.00501***
	(8.61)	(7.55)
Year1990	24.98***	0.00679***
	(11.38)	(9.63)
Year1991	29.49***	0.00857***
	(13.06)	(12.73)
Year1992	34.92***	0.00981***
	(12.68)	(11.89)
Year1993	33.80***	0.0108***
	(11.02)	(11.92)
Year1994	34.48***	0.0131***
	(10.75)	(14.31)
Year1995	40.36***	0.0167***
	(11.80)	(17.63)
Year1996	38.59***	0.0163***
	(10.29)	(15.81)
Year1997	39.88***	0.0155***
	(9.99)	(13.56)
Year1998	53.07***	0.0189***
	(12.24)	(15.11)
Year1999	68.81***	0.0220***
	(14.55)	(16.01)
Year2000	86.96***	0.0261***
	(16.79)	(16.90)
Year2001	107.1***	0.0291***
	(19.27)	(18.11)
Year2002	123.6***	0.0322***
	(20.34)	(18.57)
Year2003	138.8***	0.0349***
	(21.12)	(18.63)
Year2004	152.1***	0.0375***
	(21.23)	(18.52)
Year2005	163.5***	0.0380***
	(21.28)	(17.50)
Year2006	174.8***	0.0384***
	(20.81)	(16.12)
Year2007	183.8***	0.0389***
	(20.43)	(15.78)
Year2008	190.2***	0.0378***
	(19.98)	(14.30)
Year2009	204.9***	0.0372***
	(21.90)	(14.87)

Year2010	211.8***	0.0364***
	(20.89)	(13.51)
Year2011	214.8***	0.0375***
	(18.58)	(12.72)
Year2012	206.9***	0.0359***
	(17.11)	(11.15)
Constant	103.7*	0.109***
	(2.11)	(6.57)
Observations	270	270

t statistics in parentheses

* p < 0.05, ** p < 0.01, *** p < 0.001

Table 10: Different coefficients on Privatespend and Privateshare across provinces

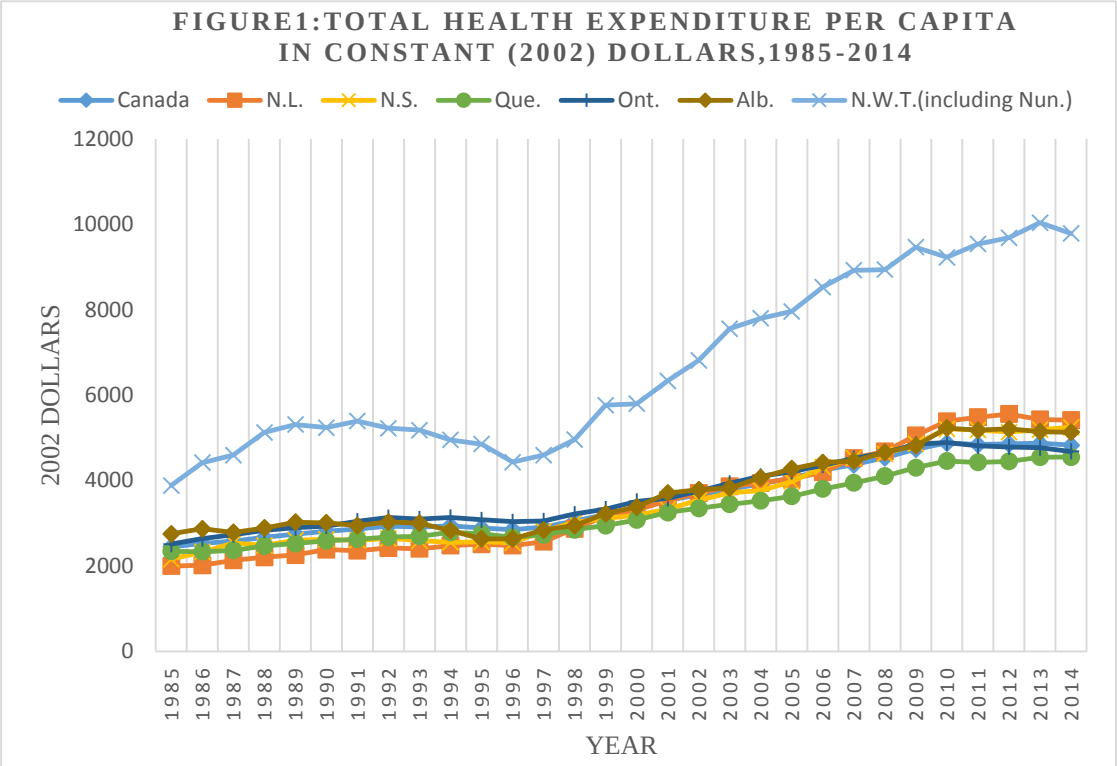
	Model 1 Publicspend	Model 2 Publicshare
Alb. Privatespend	-0.0532	-0.0430
(Privateshare)	(-0.68)	(-1.49)
B.C. Privatespend	-0.310***	-0.0780***
	(-6.51)	(-5.01)
Man. Privatespend	-0.00612	-0.0525**
	(-0.09)	(-2.75)
N.B. Privatespend	-0.0918**	-0.116***
	(-3.22)	(-9.18)
N.L. Privatespend	-0.0357	-0.00374
	(-0.75)	(-0.26)
N.S. Privatespend	-0.111*	-0.102***
	(-2.57)	(-5.60)
Ont. Privatespend	-0.0606	-0.0601*
	(-1.05)	(-1.97)
P.E.I. Privatespend	-0.111**	-0.00960
	(-3.02)	(-0.76)
Que. Privatespend	0.229***	-0.248***
	(3.82)	(-6.39)
Sask. Privatespend	-0.132	-0.0785***
	(-1.44)	(-6.46)
Socios:		
GDP	-2.80e-8	-1.81e-7
	(-0.00)	(-1.86)
Employrate	-39.23	-0.00469
	(-0.46)	(-0.17)
Seniors	-430.7	-0.100
	(-1.25)	(-1.58)
Policy changes:		
Ont1995	8.629	0.00783***
	(1.22)	(4.09)
Que1997	22.79**	0.0241***
	(2.59)	(8.57)
NL2007	1.969	-0.00386
	(0.32)	(-1.61)
NS2008	7.689	5.06e-4
	(0.95)	(0.20)
Province fixed effects:		
Alb.	-42.17*	-0.0225
	(-2.49)	(-0.97)

B.C.	2.077	-0.00636
	(0.15)	(-0.34)
Man.	-29.91*	-0.0193
	(-2.22)	(-1.10)
N.B.	-23.98	0.0283
	(-1.39)	(1.54)
N.L.	-45.67	-0.0459*
	(-1.72)	(-2.46)
N.S.	-1.060	0.0243
	(-0.06)	(1.22)
P.E.I.	-39.68*	-0.0481**
	(-2.40)	(-2.61)
Que.	-55.24***	0.0984***
	(-3.82)	(3.68)
Sask.	17.50	0.00246
	(0.84)	(0.14)
Year fixed effects:		
Year1987	4.702***	0.00293***
	(3.51)	(8.40)
Year1988	11.41***	0.00466***
	(4.75)	(6.77)
Year1989	20.93***	0.00739***
	(6.51)	(8.68)
Year1990	29.24***	0.00916***
	(7.92)	(9.91)
Year1991	34.15***	0.0113***
	(8.88)	(13.51)
Year1992	39.58***	0.0128***
	(9.50)	(14.13)
Year1993	38.69***	0.0142***
	(8.41)	(14.36)
Year1994	39.58***	0.0171***
	(7.56)	(17.09)
Year1995	46.00***	0.0207***
	(7.96)	(18.97)
Year1996	44.14***	0.0204***
	(7.10)	(18.09)
Year1997	47.29***	0.0206***
	(6.96)	(17.13)
Year1998	60.87***	0.0240***
	(7.89)	(18.64)
Year1999	77.85***	0.0264***
	(9.18)	(18.55)

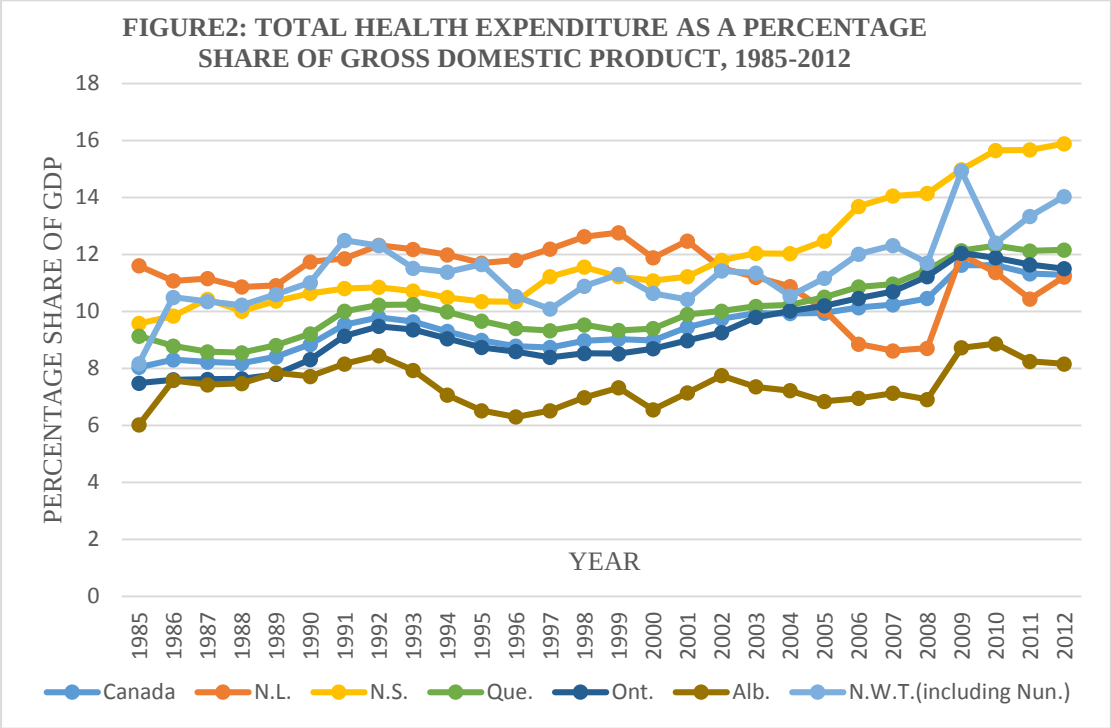
Year2000	95.94***	0.0304***
	(10.54)	(18.77)
Year2001	116.3***	0.0332***
	(11.95)	(19.65)
Year2002	133.7***	0.0359***
	(12.59)	(19.25)
Year2003	149.0***	0.0389***
	(13.08)	(19.06)
Year2004	162.9***	0.0412***
	(13.22)	(18.84)
Year2005	174.8***	0.0418***
	(13.31)	(18.06)
Year2006	187.0***	0.0423***
	(13.20)	(16.98)
Year2007	197.2***	0.0428***
	(12.75)	(16.79)
Year2008	202.8***	0.0415***
	(12.60)	(15.48)
Year2009	218.5***	0.0411***
	(13.64)	(16.57)
Year2010	225.9***	0.0404***
	(13.11)	(15.42)
Year2011	229.9***	0.0425***
	(11.79)	(15.24)
Year2012	225.2***	0.0408***
	(10.91)	(13.50)
Constant	173.8*	0.0996***
	(2.50)	(4.60)
Observations	270	270

t statistics in parentheses

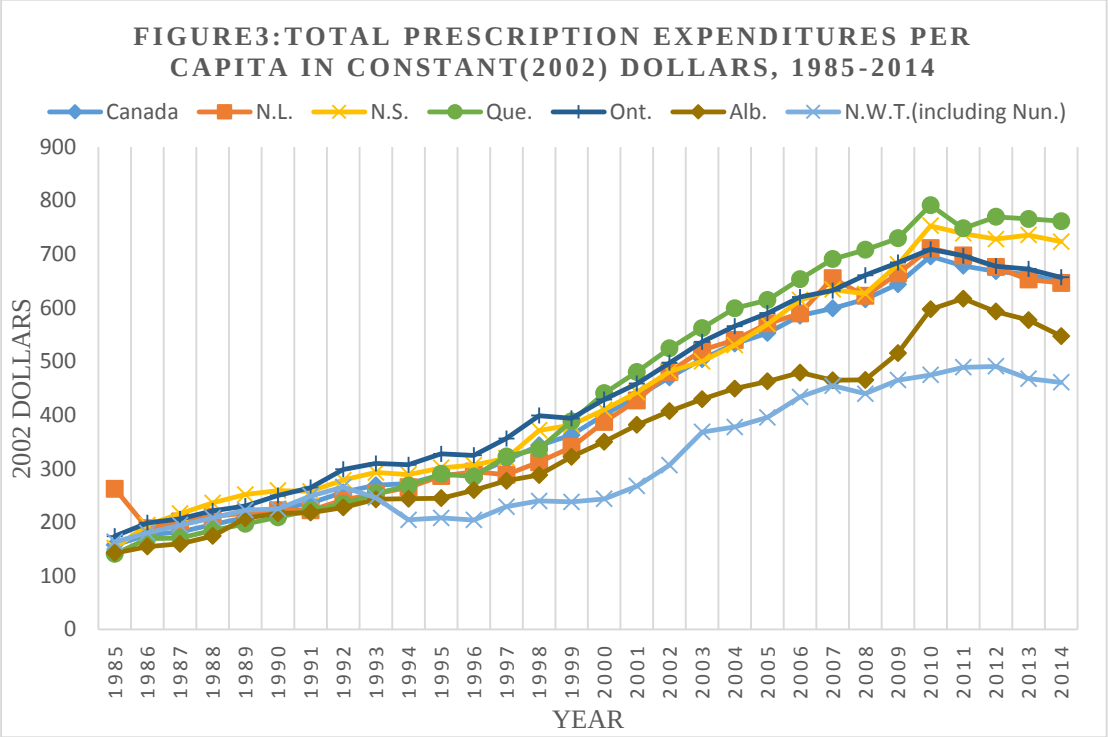
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$



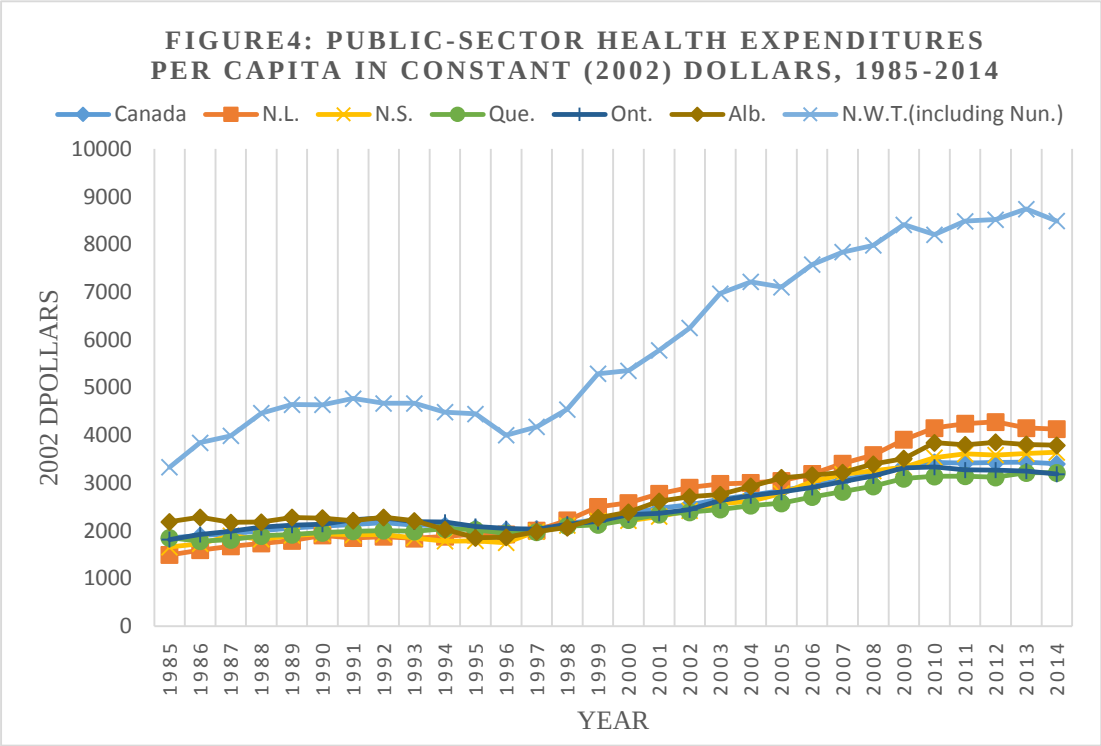
Data Source: Total Health Expenditure, by Province/Territory and Canada, 1975 to 2014—Current Dollars. Table B.1.1 Series B in National Health Expenditure Trends Database, 1975 to 2014 from CIHI. Https://www.cihi.ca/en/spending-and-health-workforce/spending/health-spending-data/national-health-expenditure-database



Data Source: Total Health Expenditure, by Province/Territory and Canada, 1975 to 2014—Current Dollars. Table B.1.1 Series B in National Health Expenditure Trends Database, 1975 to 2014 from CIHI. Table 384-0038 Gross domestic product, expenditure-based, provincial and territorial, annual (dollars unless otherwise noted). Statistics Canada. Http://www5.statcan.gc.ca/cansim/pick-choisir?lang=eng&p2=33&id=3840038.

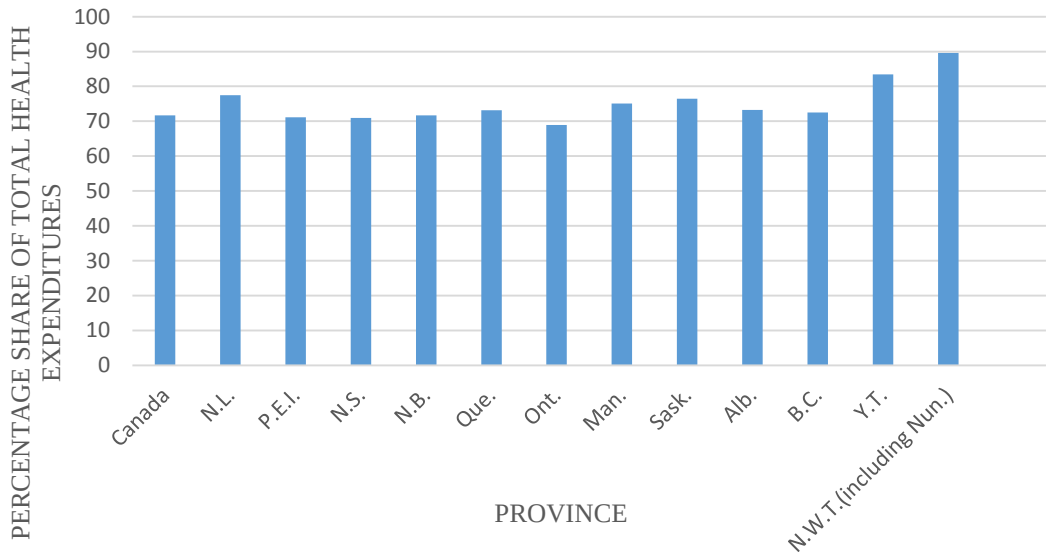


Data Source: Expenditure on Drugs by Type, by Source of Finance, and as a Share of Public, Private and Total Health Expenditures, 1985–2014. Series G in National Health Expenditure Trends Database, 1975 to 2014 from CIHI.

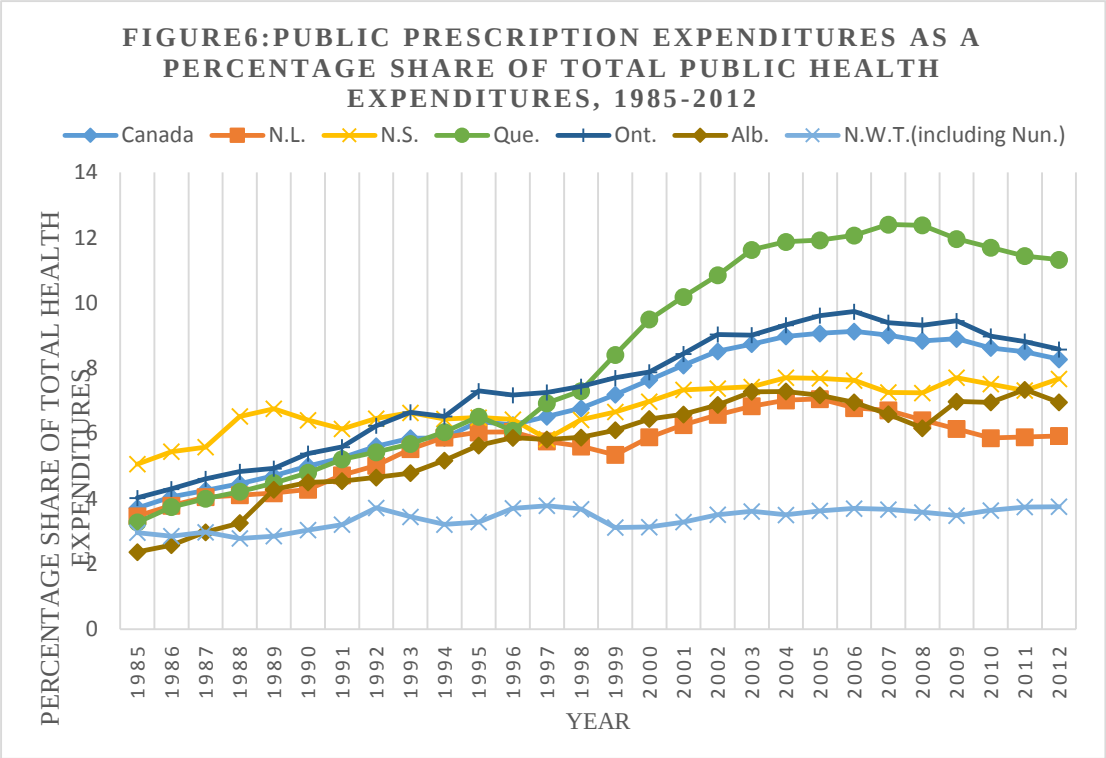


Data Source: Public-sector Health Expenditure, by Province/Territory and Canada, 1975 to 2014—Current Dollars. Table B.3.1 Series B in National Health Expenditure Trends Database, 1975 to 2014 from CIHI.

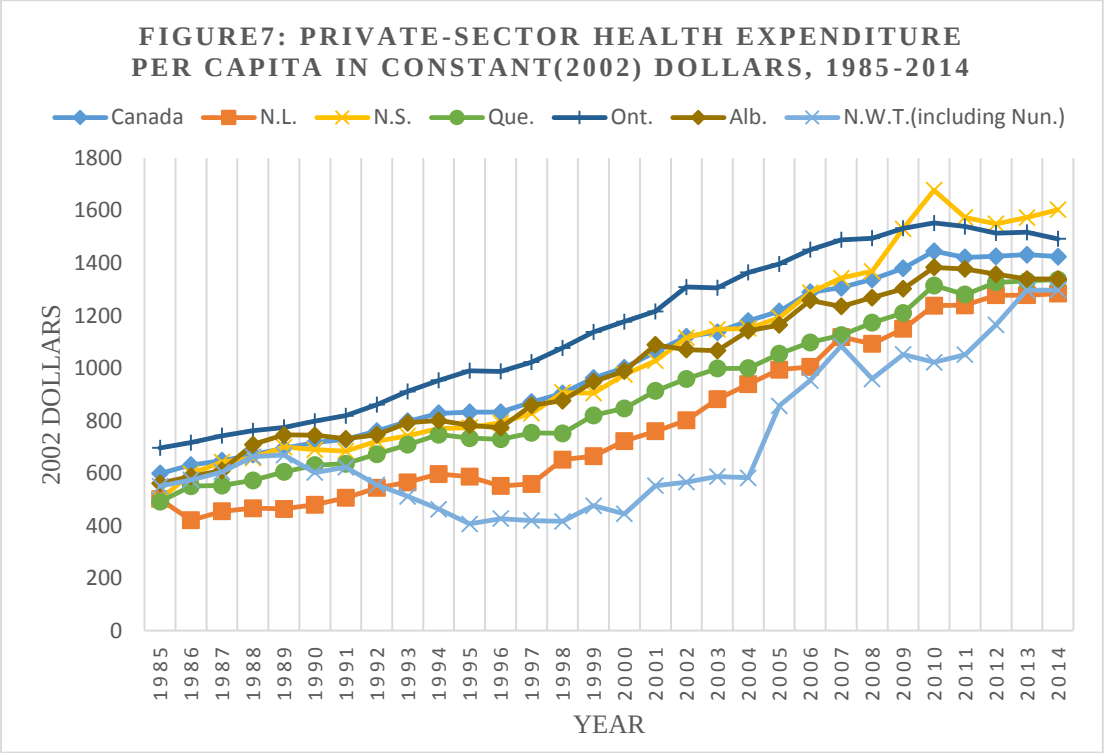
FIGURE5: AVERAGE OF PERCENTAGE SHARE OF PUBLIC-SECTOR EXPENDITURES IN TOTAL HEALTH EXPENDITURES IN DIFFERNET PROVINCES/TERRITORIES



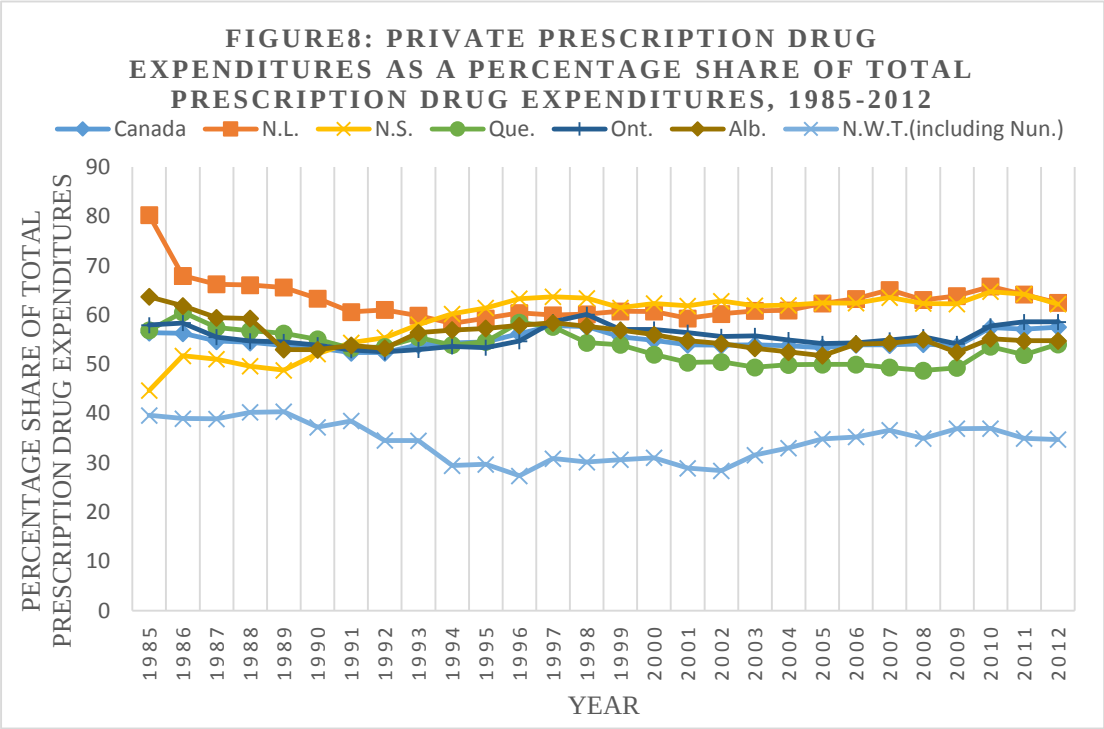
Data Source: Public-sector Health Expenditure, by Province/Territory and Canada, 1975 to 2014—Current Dollars. Table B.3.1 Series B in National Health Expenditure Trends Database, 1975 to 2014 from CIHI. Total Health Expenditure, by Province/Territory and Canada, 1975 to 2014—Current Dollars. Table B.1.1 Series B in National Health Expenditure Trends Database, 1975 to 2014 from CIHI.



Data Source: Expenditure on Drugs by Type, by Source of Finance, and as a Share of Public, Private and Total Health Expenditures, 1985–2014. Series G in National Health Expenditure Trends Database, 1975 to 2014 from CIHI. Public-sector Health Expenditure, by Province/Territory and Canada, 1975 to 2014—Current Dollars. Table B.3.1 Series B in National Health Expenditure Trends Database, 1975 to 2014 from CIHI.



Data Source: Private Sector Health Expenditure, by Province/Territory and Canada, 1975 to 2014—Current Dollars. Table B.2.1 Series B in National Health Expenditure Trends Database, 1975 to 2014 from CIHI.



Data Source: Expenditure on Drugs by Type, by Source of Finance, and as a Share of Public, Private and Total Health Expenditures, 1985–2014. Series G in National Health Expenditure Trends Database, 1975 to 2014 from CIHI.