

Out-of-Pocket Prescription Drug Expenditures and Public Prescription Drug Programs: Provincial Evidence from Canada^{*}

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Abstract: Between 1970 and 1986 all Canadian provinces introduced some version of a prescription drug benefit plan for those age 65 or over and since 1986, all the provinces have increased copayments or deductibles on these plans to some degree. In earlier work, we have used the public-use Family Expenditure Survey to examine the changes in household out-of-pocket prescription drug expenditure associated with the introduction of these plans and with the cutbacks. We particularly examined the relative effects on households of different economic circumstances, which we measure by level of total consumption or outlay (excluding expenditures on automobiles and recreational vehicles). The current research uses the Family Expenditure Survey master file which has the additional information of province of residence (rather than region of residence) and includes 1978 and 1982 prescription drug expenditure. Our findings with this more detailed sample are consistent with our earlier research: it appears as if the onset of provincial senior prescription drug plans is associated with a larger dollar reduction in the out-of-pocket prescription drug expenditure among high-total-outlay households than among low-total-outlay households such that the change in prescription drug budget share is about the same. A new finding is that the estimated associated reduction in prescription drug budget share is greater in households with high prescription drug budget shares. However, among high-prescription-use households, the prescription drug budget share reductions in low-total-outlay households are only slightly larger than those in high-total-outlay households. In this research we also examine changes in prescription drug expenditure in the nonsenior population when programs for the nonsenior population are introduced: the evidence is not as clearcut as in the senior case, although the quantile regression evidence is very similar.

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1. Introduction

Between 1970 and 1986 every Canadian province introduced a program to offset the expense of prescription drugs for at least low-income seniors. In Alan, Crossley, Grootendorst and Veall (2001, henceforward ACGV1) we study the relationship between these program introductions and the out-of-pocket expenditures of senior-headed households, using the public-use version of successive waves of the Statistics Canada Family Expenditure Survey. Using total outlay on consumption (from which we exclude purchases of cars and recreational vehicles) as our measure of spending power or standard of living¹, we focus on the difference between the changes in out-of-pocket expenditures by high-total-outlay and low-total-outlay households. We find that the dollar reduction in prescription drug expenditure associated with the onset of a provincial drug program appears to be much larger for high-total-outlay households than for low-total-outlay households, so much so that the reduction in budget share devoted to prescription drugs appears to be about the same.

A shortcoming of the analysis in ACGV1 is that the public-use version of the Family Expenditure survey only contains regional data. While the provinces of British Columbia, Ontario and Quebec are regions, the Prairies region and the Atlantic region each have more than one province. Moreover the public-use data did not contain prescription drug expenditures for 1978 and 1982. The purpose of this report is to (a) replicate the previous analysis on the Family Expenditure Survey master file that includes provincial identifiers and prescription drug expenditure data for 1978 and 1982, (b) using that same sample, focus on households with

¹Particularly for senior households who may have substantial wealth but low incomes, our view is that total spending is a better indicator of standard of living and economic circumstance than income. We exclude expenditures on automobiles and recreational vehicles because these are large and infrequent and hence differences in such spending across households would distort the true differences in their standards of living.

particularly large consumption of prescription drugs and (c) to begin a similar analysis for nonseniors.

As a very brief summary of our results, we find that our results on the public-use sample are fully supported by our results on the master file: that is the introduction of prescription drug plans for the senior population is associated with a much larger dollar reduction in out-of-pocket prescription drug expenditure by high-income households than by low-income households. There is also evidence of a compression in the distribution of out-of-pocket prescription drug expenditure: that is, as might be expected, the reduction was greater for households that were large users of prescription drugs. Finally, turning to the results for the nonsenior population, the introduction of government drug plans for this age group is not associated with a consistent change in the distribution of out-of-pocket drug expenditures.

Section 2 briefly discusses the data. Section 3 concentrates on the results for households in which both head and spouse are seniors. Nonsenior households (that is households in which neither the head is less than 65 years of age) are the focus of Section 4. Section 5 concludes.

2. Data

The Canadian Family Expenditure (or FAMEX) data are a series of cross sectional household surveys conducted by Statistics Canada at irregular multi-year intervals from 1969 to 1996. Because our emphasis is on the introduction of prescription drug programs that occurred during this period, we do not use its successor survey, the Survey of Household Spending. FAMEX data is intended to be representative of all persons living in private households.² The

²This excludes, for example, individuals residing in hospitals, penal institutions or indigenous reserves.

survey is a stratified multi-stage sample, and lower population regions such as the Atlantic provinces are over-sampled. For comparability across years, we limit the sample in all years to urban respondents as the surveys were so limited in 1974, 1984 and 1990. In most years in which both urban and rural populations were surveyed, this urban population comprised between 50 and 60% of the total.³ The reporting unit was changed slightly (from a “spending unit” to a “household” in 1990). To maximize comparability through time we drop multiple family households, which are typically about 5% of the sample. Face-to-face interviews are conducted in January, February and March to collect expenditure (including prescription drug expenditure) and income information for the previous calendar year (for example, the 1996 data were collected in the first quarter of 1997). Extensive efforts are made to ensure the quality of the responses. Respondents are asked to consult bills and receipts and income is carefully reconciled with expenditure and the net change in assets and liabilities during the reference year. When necessary, multiple visits to a household are made.

Table 1 (taken from ACGV1) uses the public-use FAMEX data to summarize some of the important national trends for seniors (households with head of age 65 or over and spouse, if present, also of age 65 or over) and households headed by nonseniors.⁴ As we do throughout this report, we convert all dollar values into 1992 dollars using the Consumer Price Index. (Figure 1 is also taken from the public-use sample and gives an idea of the heterogeneity of the prescription drug expenditure share as it varies with total outlay.)

Table 1 shows that for both senior and nonsenior households, average out-of-pocket

³Due to a change in the definition of “urban”, the urban respondents comprise a larger fraction of the population in 1996. The year 1996 is not central to our most important through- time comparisons.

⁴The Canadian income tax system provides favourable treatment for large medical expenses. These provisions change over time but currently involve a reduction in federal/provincial income tax payments by about 25% of medical expenses in excess of the lower of \$1,600 and 3% of income. Our figures for medical

household prescription drug expenditures were less than \$250 in 1969. For both seniors and nonseniors, prescription drug expenditures fell to less than \$100 by 1984 and then rose more recently, more sharply for seniors than for others but still to less than 1969 levels. Note that by 1996, prescription drug costs were only about a fifth of all out-of-pocket medical expenditures (including eyeglasses, hearing aids and dentistry) for nonsenior households and about a quarter for seniors.

Table 1 reveals that senior households spend more on prescription drugs than nonsenior households *absolutely*; this is also true as a proportion of total outlay. For example, in 1996 the budget share of out-of-pocket spending on prescription drugs was 1.4% for senior households and 0.5% for nonsenior households.

3. Senior Households

Between 1970 and 1986, all Canadian provinces introduced subsidy programs for prescription drug use by those age 65 and over and have continued to adjust these programs to the present time. Table 2 is taken from ACGV1 and summarizes these programs very briefly.⁵

We begin our analysis by estimating the relationship between the budget share of out-of-pocket prescription drugs and income (or total outlay). We do so in a multivariate framework. This is an attempt to isolate the relationship between such expenditures and income from other determinants of demand such as household size and other demographics. Because a general *nonparametric* model for prescription drug share for household h

expenditures do not adjust for this income tax relief.

⁵ For further information, see Grootendorst (2001). Note that before 1970, British Columbia (B.C.) had a program available for low income seniors and in other provinces, some seniors may have acquired prescription drugs through social assistance programs.

$$\omega_h = f(\ln x_h, z_h) + \varepsilon_h \quad (1)$$

would have too many dimensions and be infeasible to estimate and interpret, we instead posit a *semiparametric* model

$$\omega_h = g(\ln x_h) + z_h\beta + \varepsilon_h, \quad (2)$$

that is, we allow the h th household's expenditure share (ω_h)⁶ to be a flexible function of the log of its total income ($\ln x_h$) but restrict the household attributes (z_h) to affect the share in the linearly additive way assumed for standard linear regression analysis. (Standard assumptions are also made about the random error ε_h .) This “hybrid” approach keeps the dimensionality of the model down but still allows a detailed analysis of the relationship of prescription drug expenditure share to income.

There are at least two methods to estimate models such as (2) discussed in the literature. Blundell and Duncan (1998) discuss a method due to Robinson (1988) which is fully efficient. In ACGV1 we found it gave very similar results to the “differencing” method discussed by Yatchew (1998) which we have used here. This method is not fully efficient in a statistical sense but is much more rapid computationally.

Table 3 and all subsequent tables and figures are based on the FAMEX master file sample. It gives the coefficients (the estimates of β in (2)) corresponding to various household attributes.⁷ The first column corresponds to the older population in 1969 (before almost all the public plans for seniors were available), the second column reports results for 1986 (when the

⁶In the analysis for ACGV1 we estimate equations such as (2) by weighting by total expenditure (in addition to the stratification weights provided by Statistics Canada). We also estimate without total expenditure weights, finding it makes little difference. We will follow the latter procedure here.

⁷Note that the R^2 values reported are low in part because they correspond only to the parametric part of the model and do not reflect the “explanatory power” of the outlay variable. However as Figure 1 makes clear, prescription drug spending is very heterogeneous across senior households, one of many reasons we pursue the quantile regression analysis discussed later.

programs were perhaps at the peak of their generosity⁸) and the third column presents estimates for 1996.⁹

The coefficients are multiplied by one hundred, so that they should be read as percentage points. Thus in 1969 the budget share of prescription drugs was more than one percentage point higher for senior households with married heads as opposed to unmarried heads, and this gap was statistically significant (where throughout this paper “statistically significant” means “the null hypothesis that the quantity in question is zero can be rejected at the 5 per cent level of significance”). In 1986 there was no significant gap, while in 1996 the gap was significant again, with the budget share of married households about .6 of a percentage point higher than for unmarried households.

There are no statistically significant effects of gender or household size. The latter may reflect the fact that among the senior population most of the variation in household size is between one and two person households and this variation is largely captured by the married dummy variable. There are provincial effects, and they vary across years.

Figure 2 plots, for each of the three years noted above, estimates of $g(\ln x_h)$, the relationship of the out-of-pocket budget share of prescription drugs to total outlay. (Of course the nonparametric portion cannot be condensed to a vector of coefficients and is best represented graphically.) It can be seen that, conditional upon the variables in Table 3, the relationship has a

⁸The beginning of retrenchment was perhaps marked by the introduction of copayments by British Columbia in 1987. Subsequent cutbacks by other provinces are described in Table 2.

⁹Quebec, New Brunswick and Nova Scotia have charged prescription drug plan premiums to seniors since the 1990s but we have omitted these from this analysis.

downward slope, indicating that expenditure share falls with income in each year. This suggests that a prescription drug subsidy may provide a greater benefit to low income senior households. Note, however, that much of the apparent downward slope is for the year 1969 for values of real outlay less than \$5000. But this part of the curve is not only flattened in subsequent years but also almost disappears, as federal income support measures introduced in the 1970s greatly reduced the number of very poor seniors. Hence that part of the 1969 curve is not very relevant for current policy. At real outlays greater than \$5,000 the curve is close to linear. It is also not very steep given that the horizontal scale is in logs, with a decline in about one percentage point as real outlay increases from \$5,000 to \$50,000.

Figure 2 also reveals that between 1969 and 1986, the period in which the prescription drug plans were introduced, the budget shares fall by almost the same amount across the whole range of total outlay. Then between 1986 and 1996 as prescription drug programs were being reduced, the budget shares increase by almost the same amount across the whole range of total outlay.¹⁰ This is consistent with the hypothesis that the prescription drug plans had very similar effects on the budget shares of low income and high income households.

Table 4 presents within-province comparisons of average prescription drug out-of-pocket expenditures before and after the introduction of drug plans as summarized in Table 2. The analyses for Prince Edward Island and New Brunswick are not included because of Statistics Canada confidentiality restrictions. The comparison in each case is between low-total-outlay and high-total-outlay households, that is between households in that province who would be in the

¹⁰The predicted budget shares in Figure 2 are constructed to have the same mean as the actual budget shares in each year by adding back the estimated (yearly) mean of $z_i\beta$.

lowest 25% households in Canada in total spending and households in the highest 25%. The methodology we use is so-called “difference-in-difference”, that is we give the reduction in out-of-pocket spending by the low-total-outlay group (the “difference”) and then the additional change by the high-total-outlay group (the “difference-in-difference”). Such estimates are calculated using an ordinary least squares regression with the household prescription drug expenditure variable on the left hand side and an intercept term, a high-total-outlay household dummy, an after-program time dummy and a third interaction variable equal to the product of the other two dummy variables. The coefficient of the after-subsidy variable is the mean change by the low-total-outlay group and the coefficient of the interaction variable is the additional effect on the high-total-outlay group. The Canada-wide estimate in Table 4 is created by pooling the provincial (excepting Prince Edward Island and New Brunswick) before and after data (even though the programs are not the same in the different provinces) and estimating a difference-in-difference regression in the above manner except with provincial intercept dummies added as well.

Just as it was the case for all five regions in ACGV1, for all eight provinces in Table 4 the dollar reduction in prescription drug expenditures before and after the introduction of a drug benefit program is greater for high income households. The difference, however, is statistically significant only in the cases of Ontario and British Columbia. However for the pooled Canada result, the estimate is that a drug benefit program for seniors reduces a low-total-outlay senior household’s out-of-pocket drug expenditure by about \$45 and by about an additional \$175 for high-total-outlay households. Both of these values are statistically significant. Moreover the comparable values from ACGV1 using the regional data without years 1978 and 1982 were \$80 and \$147 which in our view is remarkably close.

If instead we focus on budget share, the Canada estimates suggest that the introduction of a drug benefit program is associated with a reduction in budget share of about .01 (that is one percentage point) and that there is no statistically significant difference (and almost no difference at all) between low-total-outlay and high-total-outlay groups. Again the results are close to what was obtained in the regional analysis.

In Table 5 we follow ACGV1 and present results from various other regressions on the master file. For brevity, we only present the additional expenditure change by the high-total-outlay group as compared to the low-total-outlay group as estimated in an all-Canada regression. The first row of Table 5 just repeats the Canada “base case” result from Table 4. The second row is based on an identical regression except the dependent variable is the sum of prescription drug plus insurance expenditure.¹¹ The third row is from a regression where the dependent variable is the sum of prescription drug plus over-the-counter medication expenditure. It can be seen the results are similar to the “base case” result (and to ACGV1): again the dollar reductions are greater for high-total-outlay households than for low-total-outlay households and there is no statistically significant difference in the reduction of budget share.

In the fourth row of Table 5, we redid our base case on a per capita rather than a per household basis. While our absolute dollar differential effect was smaller, as would be expected

¹¹We pursue this analysis as one check of the robustness of our results. However there are shortcomings to the approach. First, while private health insurance premiums can be regarded as another method of private payment for prescription drugs, the insurance variable used includes premiums paid to private and public plans. This was in accordance with advice from Statistics Canada that despite the best efforts of interviewers, respondents cannot always distinguish between public and private health coverage and hence total premiums is the more reliable variable. Second, we cannot determine what proportion is associated with prescription drug coverage as such plans may also include dental care, eyeglasses, hearing aids, prosthetics, semiprivate and private hospital rooms as well as services provided by non-physician personnel such as physiotherapists. Industry information (Canadian Life and Health Insurance Association, 1994) suggests that between 87% and 95% of such plans have coverage for prescription drug coverage. Some respondents report extremely small health insurance expenditures; these may be travel medical insurance.

and was the case in ACGV1, it remained statistically significant and the budget share effect remained statistically insignificant. Also, before the introduction of the subsidies, some impoverished households would have received prescription drug assistance through programs designed for the indigent or through charitable endeavours. To check whether our results were unduly sensitive to our choice of the bottom quartile as one of the two comparison groups, we tried using the second quartile instead. The estimate of the mean national differential effect indicates that the households with total outlay in the top quartile reduced their prescription drug expenditure by almost \$80 more than did households with total outlay in the second quartile. While the estimate is not quite statistically significant at the 5 per cent level, it is almost numerically identical to the comparable estimate in ACGV1.

Finally we repeated our analysis for the retrenchment period when prescription drug subsidies were reduced in several provinces . This exercise is somewhat more problematic than studying the introduction of subsidies because the nature of the retrenchment was more heterogeneous across regions. The coefficient we report in Table 5 has a sign consistent with the other results in that table (that is the reduction of prescription drug subsidies is associated with a *larger* dollar increase in out-of-pocket dollar expenditure by high-total-outlay households) but it is not statistically significant.

In Table 6, we present results for quantile regressions for the 80th percentile of senior households with the largest out-of-pocket expenditure on prescription drugs, measured as a budget share. Our estimates are for Canada as a whole using the same “before-and-after” provincial observations used in our analysis of prescription drug plans above, although confidentiality considerations imposed by Statistics Canada restrict us to using only eight provinces. We repeat the analysis using the sum of prescription drug and over-the-counter drug

purchases and in each case we estimate the regressions with and without provincial dummies. Finally we compare the 80th percentile regressions for high out-of-pocket drug expenditure using all senior households with the same 80th percentile regressions using only those senior households in the lower half of the total spending distribution.

Our conclusion is that the introduction of provincial drug plans for the older population is associated with a reduction in the out-of-pocket budget share for drugs of about 2 percentage points for those in the 80th percentile of usage as measured by budget share. This is about twice as much the average Canada budget share reduction as estimated in Table 4. Table 6 shows the estimates are almost identical for the households with lower total spending. Repeating the analysis for the same periods of subsidy reduction discussed in the context of Table 5, the increase among these high users is roughly 1.5 percentage points and the estimates again are very similar to those for households with lower total spending.

4. Nonsenior Households

Table 7 describes the introduction and change of public drug benefit benefits for nonsenior households, not including benefit plans for households on social assistance. It can be seen that only five provinces introduced relevant target programs during the target period.

Our empirical research followed the same stages as that for seniors. Figure 3 uses the master file and hence outliers are not identified by year (as they are in Figure 1 which is based on the public-use sample). It is the basic scatter which emphasizes how much prescription drug use varies across households. Table 8 gives the coefficients of the linear part of the nonparametric estimates of equation (2) for this sample. The coefficients for some of the household attributes,

particularly age, are more significant than the comparable coefficients in the case of seniors, perhaps because the nonsenior household population is more heterogeneous.¹² The provincial dummy coefficients seem to be related only weakly to the introduction of provincial programs, with a drop in the Saskatchewan coefficient between 1969 and 1986 perhaps associated with the introduction of a nonsenior drug benefit program there, but for the other western provinces where programs were also introduced, only a small drop in the coefficient for British Columbia and the opposite change in the Manitoba and Alberta coefficients. Also note that all the provincial dummy coefficients rise between 1986 and 1996 which could possibly be associated with an introduction of a program in Ontario, the reference province for the dummy variable analysis, although subsequent discussion will question this hypothesis.

Figure 4 presents the nonparametric curves for 1969, 1986 and 1996 and the pattern is not clear as it was in the case of seniors. Of course this is not unexpected given a number of provinces have not introduced programs and for those that did, there were not the clear periods of program introduction and program cutback.

Table 9 provides a difference-in-difference analysis similar to Table 4. It can be seen that the results in this case are also not nearly as clearcut as they were in the case of senior households. In the case of Ontario the program has a high enough deductible that it may at least initially have had relatively little effect as compared to previous programs for those on social assistance. In the case of the four western provinces, there is evidence of an association between program introduction and reduced out-of-pocket prescription drug expenditures and budget shares for that portion of the population with low total outlay. The evidence is that for high-total-

¹²Footnote 7 regarding the low R^2 values applies here, with Figure 3 demonstrating how heterogeneous prescription drug spending is across nonsenior households.

outlay households, there was no comparable reduction (rather an increase) in Manitoba but a larger reduction in the other three western provinces (by a statistically significant amount in Saskatchewan and British Columbia¹³). Still the overall Canada regression, which uses the observations from all five provinces considered, does not find statistically significant reductions when these programs are introduced.

As we did in the senior case, we analyze some variants of the model in Table 10, for brevity only reporting the incremental change for the high-outlay group. The results, both reported and unreported, are consistent with those in Table 9. In particular, there is no evidence of a larger or smaller drop in absolute dollar out-of-pocket expenditures by high-outlay households. Finally in Table 11, we repeat the same quantile regression analysis we did for the senior population, again basing it on the 80th percentile of the dependent variable prescription drug budget share. Here there is a clear association between the introduction (the reduction) of prescription drug programs and a reduction (an increase) of the out-of-pocket budget share for drugs among high users. The changes are much smaller than in the senior case, and are only very slightly larger for the low-total-outlay households.

¹³In British Columbia two time spans are tried; 1969 to 1974 includes only the January, 1974 introduction of a “working poor” program while 1969 to 1978 also includes the plan for all nonsenior, non-social-assistance households introduced in January 1977. As might be expected only the second span has a differential effect on high-total-outlay households that is statistically significant at the 5 per cent level.

5. Discussion

In this paper we have reported evidence on the changes in out-of-pocket prescription drug expenditures by Canadian senior and nonsenior households over the period 1969 to 1996. Our focus has been on the relative changes by high-total-outlay and low-total-outlay households where we think of total outlay as a better indicator of economic circumstance than income. We find that in the case of seniors and the onset of senior drug benefit programs, the dollar reductions in out-of-pocket prescription drug expenditures by high-total-outlay households are greater than those of low-total-outlay households so that the reduction in prescription drug budget share is about the same. These results from the FAMEX master file which contains information on province of residence and 1978 and 1982 prescription drug use are very similar to the results we obtained in early research on the public-use sample which does not have this extra information.

We also estimate quantile regressions based on the 80th percentile of out-of-pocket prescription drug budget share. The evidence is clear that the introduction and cutback of prescription drug benefits programs are associated with larger than average expenditure changes in these households but, in terms of budget share, the evidence is that the budget share changes for households in the bottom two quartiles of total outlay were only slightly larger than those for all households.

We also follow similar methods to study drug benefit programs for the nonsenior population. Our results are much less clearcut, perhaps because during the period in question a significant fraction of the more affluent nonsenior population had an employer-provided prescription drug plan. There is no consistent statistically significant evidence that suggests the onset or cutback of these programs was associated with different changes in out-of-pocket

prescription drug dollar expenditure or budget share by those in different income groups.

However the 80th percentile quantile regressions did indicate statistically significant changes in the anticipated direction for those with high prescription drug out-of-pocket budget shares. Again the evidence is that the budget share changes were only slightly larger for those in the bottom two quartiles of total outlay.

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Table 1
Mean Real Out-of-Pocket Direct Medical Expenditures,
Nonsenior and Senior Households, Canada, 1969-1996

	Direct Medical Expenditures (excluding insurance)		Prescription Drugs	
	Nonseniors	Seniors	Nonseniors	Seniors
1969	\$862	\$639	\$203	\$225
1974	\$644	\$482	\$138	\$158
1984	\$565	\$394	\$94	\$55
1986	\$576	\$477	\$96	\$49
1990	\$631	\$571	\$108	\$92
1992	\$628	\$541	\$126	\$119
1996	\$638	\$693	\$132	\$178

This table is taken from Alan, Crossley, Grootendorst and Veall (2001) and is based on the Statistics Canada Family Expenditure Survey, public-use sample and hence excludes 1978 and 1982 where prescription drug expenditures are not included. Means are taken over all households. Sample sizes for 1969 are 5538 for nonseniors, 758 for seniors. Comparable values for other years are 1974 (5568, 978), 1984 (3763, 657), 1986 (4329, 789), 1990 (3638, 758), 1992 (4146, 808), 1996 (6821, 1574). Results reflect population weights to adjust for oversampling. All dollar values converted to 1992 dollars using CPI.

Table 2
Brief Summary of Introduction and Changes to Prescription Drug Subsidy Programs for Seniors by Province, Canada, 1969-1996

Province	Introduction	Brief Description
Newfoundland	Apr. 1980	Only low income seniors covered, copayment = dispensing fee (typical value, \$7.61 in 1992) + 10% of ingredient cost if > \$30.
Prince Edward Island	Jan. 1986	Full coverage until December 1986; then fixed copayment per prescription (e.g. \$11.85 in 1992).
Nova Scotia	Oct. 1974	Initially no copayment, full coverage until May 1990 for all seniors; June 1990: fixed copayment \$3 per prescription; since July 1991 copayment = 20% of cost (min. \$3) with various maximums (e.g. \$150 in 1992), sometimes income-contingent; since April 1995 income-contingent premiums up to \$215/yr. (opt-out provision since Sept. 1996).
New Brunswick	Jan. 1975	Initially no copayment; since Nov. 1983 fixed copayment per prescription (e.g. \$7.05 in 1992, \$9.05 in 1999) to annual maximum for all seniors, initially \$30, raised to \$45 (Jan. 1985); since Jan. 1988, maximum only allowed for lowest income seniors and raised to \$120 (\$250 in April 1996); since July 1992, premium for high income seniors (e.g. \$48/month in 1992).
Quebec	Aug. 1974	Initially no copayment, although first 2 years for low income seniors only, then for all seniors (Oct. 1977); May 1992: copayment (except for low income seniors) of \$2 per prescription to annual maximum of \$100; since August 1996: 25% copayment up to various income-contingent maximums.
Ontario	Sept. 1974	Initially no copayment, although first year for low income seniors only, then for all seniors; since July 1996: \$2 per prescription for low income seniors; others pay \$6.11 per prescription above \$100 deductible.
Manitoba	July 1973	copayment and deductible (e.g. 20% and \$106.60 in 1992); January 1993: copayment increased to 30%; beginning April 1996 zero copayment with income-contingent deductible (2%-3% of household income).
Saskatchewan	Sept. 1975	Initially fixed \$2 copayment which increased to \$3.95 by Jan. 1984; since July 1987: copayment = 20%, then 25% (March 1991), then 35% (May 1992) plus deductibles (initially family \$75/yr, single \$50/yr but since March 1993 semi-annual \$100 for low income senior, \$850 for high income senior); since March 1993 semi-annual out-of-pocket limit of 1.7% of adjusted household income for those with adjusted income under \$50,000.
Alberta	July 1970	copayment = 20%, min[30%,\$25] since June 1994, no premium since Jan. 1972
British Columbia	July 1972	First year, coverage for low income seniors only with \$2 copayment plus 50% of balance; July, 1973: program for all seniors, no cost-sharing; April 1987: copayment = 75% of dispensing fee to \$125 annual maximum; since April 1994: copayment = 100% of dispensing fee to \$200 annual maximum

Table 3			
Coefficients from semiparametric regression			
with prescription drug expenditure share variable as dependent variable and log of total expenditure as nonparametric variable : seniors			
	1969	1986	1996
Variable	Coefficients ($\times 10^2$)		
Female (=1 if female)	3.352 (1.13)	-1.395 (0.98)	-0.494 (0.29)
Married (= 1 if Married)	1.686 (4.89)	-1.368 (0.60)	0.633 (2.59)
Age (household head)	0.064 (2.34)	0.005 (0.33)	0.012 (.67)
Age*Female	-0.035 (0.87)	0.023 (1.17)	0.013 (0.55)
ln(Household size)	-1.263 (1.70)	0.711 (1.44)	0.146 (0.24)
ln(Household size) squared	0.299 (0.57)	-0.169 (0.47)	0.213 (0.44)
Newfoundland	0.444 (0.75)	1.372 (6.11)	1.626 (4.62)
Prince Edward Island	1.522 (2.60)	n.a.	1.309 (4.73)
Nova Scotia	2.091 (3.67)	0.148 (0.66)	1.106 (4.53)
New Brunswick	1.330 (2.77)	0.376 (1.71)	1.539 (6.20)
Quebec	0.857 (2.72)	0.057 (0.37)	0.621 (3.26)
Manitoba	0.393 (1.16)	1.211 (6.94)	1.587 (6.97)
Saskatchewan	0.665 (1.59)	0.31 (1.72)	3.096 (14.16)
Alberta	-0.330 (0.79)	1.014 (5.37)	1.071 (4.37)
British Columbia	-0.570 (1.82)	0.130 (0.09)	0.431 (2.52)
Constant	0.001 (0.01)	0.001 (0.01)	-0.000 (0.01)
Number of Observations	757	789	1593
R ²	0.09	0.14	0.15

Ontario is the reference case for the provincial dummy variables. For confidentiality reasons, Prince Edward Island is excluded from the 1986 sample. Absolute values of *t*-statistics in brackets where a value in excess of 1.96 indicates that the coefficient is significantly different from zero at the five per cent level. The number of observations is before the first differencing used in the estimation technique. R² values are for parametric part of model only (as estimated by OLS).

Table 4
Difference-in-difference Estimates of Effects on Real Out-of-Pocket Prescription Drug Expenditure by Seniors: High-Total-Outlay vs. Low-Total-Outlay Households, Before and After Introduction of Major Drug Benefit Programs

Province (and major introductions)	Before	After	Change by Low-Total-Outlay Group		Additional Change by High-Total-Outlay Group	
			in 1992 constant \$	in Budget Share	in 1992 constant \$	in Budget Share
Newfoundland (low income only), (April, 1980)	1978	1982	10.3 (0.07)	-0.0108 (0.47)	-311.2 (0.65)	0.0007 (0.03)
Nova Scotia (Oct. 1974)	1969	1978	-216.8 (2.23)	-0.0352 (2.11)	-81.7 (0.34)	0.0271 (1.52)
Quebec (August, 1974 and Oct., 1977)	1969	1978	-132.9 (2.97)	-0.0222 (3.15)	-114.8 (1.16)	0.0121 (1.53)
Ontario (September, 1974)	1969	1978	-40.8 (0.67)	-0.0082 (0.94)	-200.7 (2.56)	0.0025 (0.28)
Manitoba (July, 1973)	1969	1974	22.9 (0.61)	0.0018 (0.34)	-210.1 (1.69)	-0.0108 (1.38)
Saskatchewan (Sept, 1975)	1974	1978	-31.5 (0.63)	-0.0045 (0.65)	-100.0 (1.04)	-0.0014 (0.17)
Alberta (July, 1970 and Jan, 1972)	1969	1974	-53.9 (1.22)	-0.0070 (1.28)	-34.6 (0.60)	0.0035 (0.60)
British Columbia (July, 1972 and July, 1973)	1969	1974	-22.2 (1.68)	-0.0045 (2.01)	-205.8 (3.51)	-0.0039 (1.27)
Canada*			-46.3 (2.11)	-0.0094 (3.02)	-176.9 (4.31)	0.0008 (0.23)

Notes: New Brunswick and Prince Edward Island have not been included in either the provincial or Canada-wide analysis because of Statistics Canada confidentiality restrictions. The Canada-wide estimate is based on a pooled difference-in-difference regression with provincial intercept dummies using the above years (even though the programs and introduction years differ by province.) Absolute values of *t*-statistics based on heteroskedasticity-consistent standard errors in parentheses where a value in excess of 1.96 indicates that the coefficient is significantly different from zero at the five per cent level.

Table 5
Additional Expenditure Change by High-Total-Outlay Group as Compared to Low-Total-Outlay Group (Seniors):
National Average Effect of Introduction of Public Drug Benefit Plans

Case	in 1992 constant \$	in Budget Share
Base case (as in Table 3)	-176.89 (4.31)	0.0008 (0.23)
Prescription drug plus insurance expenditure	-231.19 (4.84)	-0.0008 (0.23)
Prescription drug plus over-the-counter medication expenditure	-194.22 (4.19)	0.0035 (0.91)
Per Capita	-104.63 (3.42)	0.0037 (1.12)
Low total outlay group = second quartile	-80.46 (1.80)	0.0056 (1.81)
Reduction of benefits	48.72 (0.92)	-0.0019 (0.75)

For reduction benefits, the years used in calculating the national effect are Quebec, Ontario, Manitoba and Alberta (1992 to 1996), Nova Scotia, Saskatchewan and British Columbia (1986 to 1996). Absolute values of *t*-statistics based on heteroskedasticity-consistent standard errors in parentheses. A value in excess of 1.96 indicates that the coefficient is significantly different from zero at the five per cent level.

Table 6		
Comparison of Quantile (80th percentile) Regression Results for All Seniors and Lower - Total-Outlay Seniors, Canada		
Case	All Senior-Headed Households	Senior Households in Lower Two Quartiles of Total Outlay
Coefficient of dummy for introduction of prescription drug benefit programs		
Prescription drugs, regression with provincial dummy variables	-0.0208 (12.94)	-0.0212 (8.184)
Prescription drugs, regression without provincial dummy variables	-0.0228 (10.82)	-0.0223 (4.55)
Prescription drug plus over-the-counter medication expenditure, regression with provincial dummy variables	-0.0220 (9.80)	-0.0242 (6.04)
Prescription drug plus over-the-counter medication expenditure, regression with provincial dummy variables	-0.0234 (10.13)	-0.0259 (6.26)
Coefficient of dummy for reduction of prescription drug benefit programs		
Prescription drugs, regression with provincial dummy variables	0.0128 (17.45)	0.0152 (9.98)
Prescription drugs, regression without provincial dummy variables	0.0138 (10.46)	0.0161 (4.97)
Prescription drug plus over-the-counter medication expenditure, regression with provincial dummy variables	0.0153 (11.89)	0.0188 (8.98)
Prescription drug plus over-the-counter medication expenditure, regression with provincial dummy variables	0.0152 (8.81)	0.0189 (7.82)
<p>Dependent variables are budget shares and results are for 80th percentile of those with largest out-of-pocket drug expenditures. Absolute values of t-statistics based on heteroskedasticity standard errors are in parentheses. A value in excess of 1.96 indicates that the coefficient is significantly different from zero at the five per cent level.</p>		

Table 7
Brief Summary of Introduction and Changes to Prescription Drug Subsidy Programs for Nonsenior Households Not on Social Assistance, by Province, Canada, 1969-1996

Province	Introduction	Brief Description
Ontario	April, 1995	Deductible falls with family size and ranges from \$300 (household of 3 or more, net income up to \$6,500) to \$4089 (single with household income of approx.\$100,000). Higher deductibles possible for households with income in excess of \$100,000. + \$1 × (family net income in excess of \$100,000); in April, 1996: minimum deductible lowered to \$150; in July, 1996, \$2 per prescription co-payment.
Manitoba	Jan. 1975	20% co-payment and deductible (e.g. \$50 at inception, increasing over time); January 1993: copayment increased to 40%; beginning April 1996 zero copayment with income-contingent deductible (2%-3% of household income).
Saskatchewan	Sept. 1975	Initially \$2 per prescription copayment which increased incrementally to \$3.95 by June 1984; July 1987: \$125 deductible, 20% copayment; March, 1991: \$125 deductible, 25% copayment; May, 1992: semi-annual deductible of \$190/family, 35% copayment to semi-annual out-of-pocket limit of \$375, then 10% copayment; March, 1993: \$850 semi-annual deductible, then 35% copayment to semi-annual out-of-pocket limit of 1.7% of adjusted household income for those with adjusted income under \$50,000.
Alberta	July, 1970	copayment = 20%; June 1994, copayment=min[30%,\$25]; premiums contingent on income and household size.
British Columbia	Jan. 1972; June, 1977	In Jan. 1972, program introduced for the working poor with co-payment of \$2 per prescription + 50% of remainder; in June 1977 that program was discontinued and replaced by a program for all nonsenior households not on social assistance: copayment=20%; deductible initially \$100 rising incrementally to \$500 by March 1993; April, 1994: co-payment lowered to zero for low-income households and raised to raised to 30% for high-income households, in both cases with \$600 deductible.

Table 8			
Coefficients from semiparametric regression			
with prescription drug expenditure share variable as dependent variable and log of total expenditure as nonparametric variable : nonseniors			
	1969	1986	1996
Variable	Coefficients ($\times 10^2$)		
Female (=1 if female)	-0.055 (0.30)	-0.060 (0.74)	0.240 (0.17)
Married (= 1 if Married)	0.409 (4.44)	0.110 (2.74)	0.278 (4.96)
Age (household head)	0.016 (10.25)	0.007 (7.09)	0.023 (11.35)
Age*Female	0.009 (2.38)	0.002 (1.17)	0.002 (0.56)
ln(Household size)	0.362 (2.74)	-0.051 (0.66)	0.036 (0.29)
ln(Household size) squared	-0.137 (2.44)	0.040 (1.00)	-0.059 (0.88)
Newfoundland	0.009 (0.10)	0.075 (1.41)	0.268 (3.01)
Prince Edward Island	0.442 (3.15)	n.a.	0.189 (1.92)
Nova Scotia	-0.036 (0.42)	0.117 (2.27)	0.353 (4.57)
New Brunswick	0.343 (3.49)	0.006 (0.11)	0.058 (0.71)
Quebec	0.211 (3.95)	0.057 (1.73)	0.241 (4.36)
Manitoba	0.025 (0.34)	0.130 (2.83)	0.293 (3.67)
Saskatchewan	0.143 (1.82)	-0.60 (1.49)	0.327 (4.89)
Alberta	0.039 (0.61)	0.167 (0.46)	0.186 (2.78)
British Columbia	0.144 (2.26)	0.068 (1.78)	0.108 (1.94)
Constant	0.000 (0.00)	-0.000 (0.00)	-0.000 (0.01)
Number of Observations	5537	4340	7033
R ²	0.05	0.03	0.05

Ontario is the reference case for the provincial dummy variables. For confidentiality reasons, Prince Edward Island is excluded from the 1986 sample. Absolute values of *t*-statistics in brackets. A value in excess of 1.96 indicates that the coefficient is significantly different from zero at the five per cent level. Number of observations are before the first differencing used in the technique. R² values are for parametric part of model only (as estimated by OLS).

Table 9
Difference-in-difference Estimates of Effects on Real Out-of-Pocket Prescription Drug Expenditure by Nonsenior Households: High-Total-Outlay vs. Low-Total-Outlay Households, Before and After Introduction of Major Drug Benefit Programs

Province (and major introductions)	“Before”	“After”	Change by Low-Total-Outlay Group		Additional Change by High-Total-Outlay Group	
			in 1992 constant \$	in Budget Share	1992 constant \$	in Budget Share
Ontario	1992	1996	-3.4 (0.15)	0.0009 (0.55)	2.8 (0.10)	-0.0010 (0.60)
Manitoba	1974	1978	-53.6 (2.80)	-0.0044 (3.36)	128.8 (2.56)	0.006 (3.59)
Saskatchewan	1974	1978	-86.7 (5.31)	-0.0063 (5.16)	-81.3 (1.98)	0.0025 (1.77)
Alberta	1969	1974	-25.4 (1.69)	-0.0015 (1.42)	-35.9 (1.04)	-0.0000 (0.00)
British Columbia	1969	1974	-97.2 (4.18)	-0.0068 (4.41)	-27.9 (0.63)	0.0040 (2.26)
	1969	1978	-92.4 (3.96)	-0.0066 (4.26)	-84.2 (2.00)	0.0024 (1.37)
Canada*			-24.9 (1.79)	-0.0013 (1.32)	-0.3 (0.02)	0.0007 (0.66)

*The Canada result is based on a difference-in-difference pooled regression using the same time periods as above (except for British Columbia only 1969 to 1978) with provincial intercept dummies. Absolute values of *t*-statistics based on heteroskedasticity-consistent standard errors in parentheses. A value in excess of 1.96 indicates that the coefficient is significantly different from zero at the five per cent level.

Table 10
Additional Expenditure Change by High-Total-Outlay Group as Compared to Low-Total-Outlay Group (Nonseniors):
Robustness Tests of National Average Effect of Introduction of Subsidies

Case	in 1992 constant \$	in Budget Share
Base case (as in Table 9)	-0.3 (0.02)	0.0007 (0.66)
Prescription drug plus insurance expenditure	-10.33 (0.28)	0.0001 (0.08)
Prescription drug plus over-the-counter medication expenditure	19.58 (0.91)	0.0002 (0.21)
Per Capita	-20.53 (1.77)	0.0003 (0.31)
Low-total-outlay group = second quartile	-6.47 (0.30)	0.0003 (0.38)
Reduction of benefits	-30.18 (0.62)	-0.0024 (1.60)
<p>Reduction of benefits is examined by pooling Manitoba (1992 to 1996), Saskatchewan (1992 to 1996) and British Columbia (1992 to 1996) in a difference-in-difference regression with provincial dummies. Absolute values of <i>t</i>-statistics based on heteroskedasticity-consistent standard errors in parentheses. A value in excess of 1.96 indicates that the coefficient is significantly different from zero at the five per cent level.</p>		

Table 11 Comparison of Quantile (80th percentile) Regression Results for All Nonsenior Households and Lower-Total-Outlay Nonsenior Households, Canadian Provinces Where Nonsenior Plan was Introduced		
Case	All Nonsenior Households	Nonsenior Households in Lower Two Quartiles of Total Outlay
Coefficient of dummy for introduction of prescription drug benefit programs		
Prescription drugs, regression with provincial dummy variables	-0.0026 (8.13)	-0.0029 (5.03)
Prescription drugs, regression without provincial dummy variables	-0.0032 (10.87)	-0.0037 (7.21)
Prescription drug plus over-the-counter medication expenditure, regression with provincial dummy variables	-0.0021 (5.62)	-0.0024 (3.44)
Prescription drug plus over-the-counter medication expenditure, regression with provincial dummy variables	-0.0026 (6.48)	-0.0026 (4.09)
Coefficient of dummy for reduction of prescription drug benefit programs		
Prescription drugs, regression with provincial dummy variables	0.0021 (4.35)	0.0026 (2.80)
Prescription drugs, regression without provincial dummy variables	0.0022 (4.03)	0.0024 (2.50)
Prescription drug plus over-the-counter medication expenditure, regression with provincial dummy variables	0.0042 (7.10)	0.0051 (4.39)
Prescription drug plus over-the-counter medication expenditure, regression with provincial dummy variables	0.0040 (7.60)	0.0048 (4.22)
Dependent variables are budget shares and results are for 80 th percentile of those households with largest out-of-pocket drug expenditures. Absolute values of t-statistics in parentheses. A value in excess of 1.96 indicates that the coefficient is significantly different from zero at the five per cent level.		

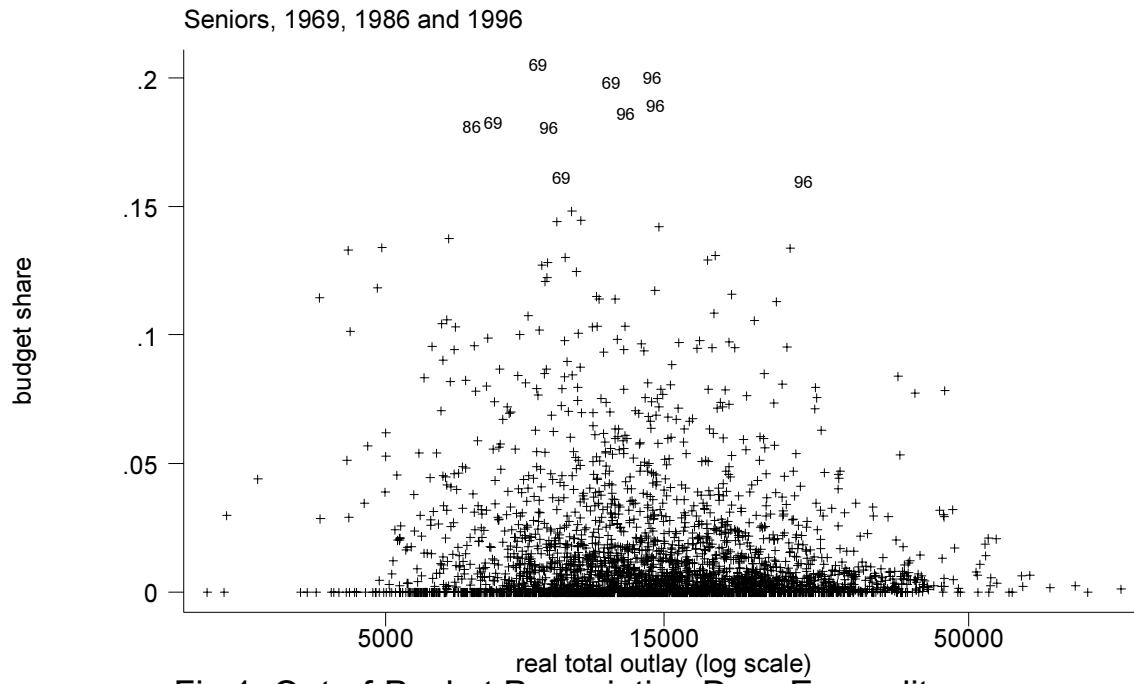


Fig 1: Out-of-Pocket Prescription Drug Expenditures

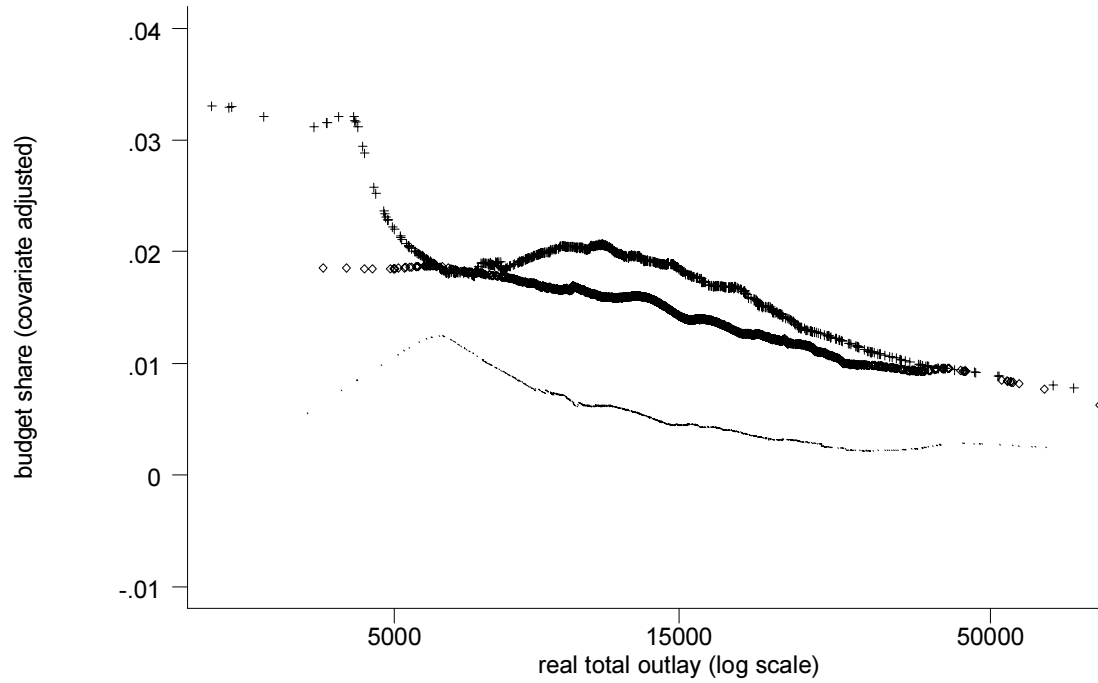


Fig 2: Engel Curves for Prescription Drugs, Seniors

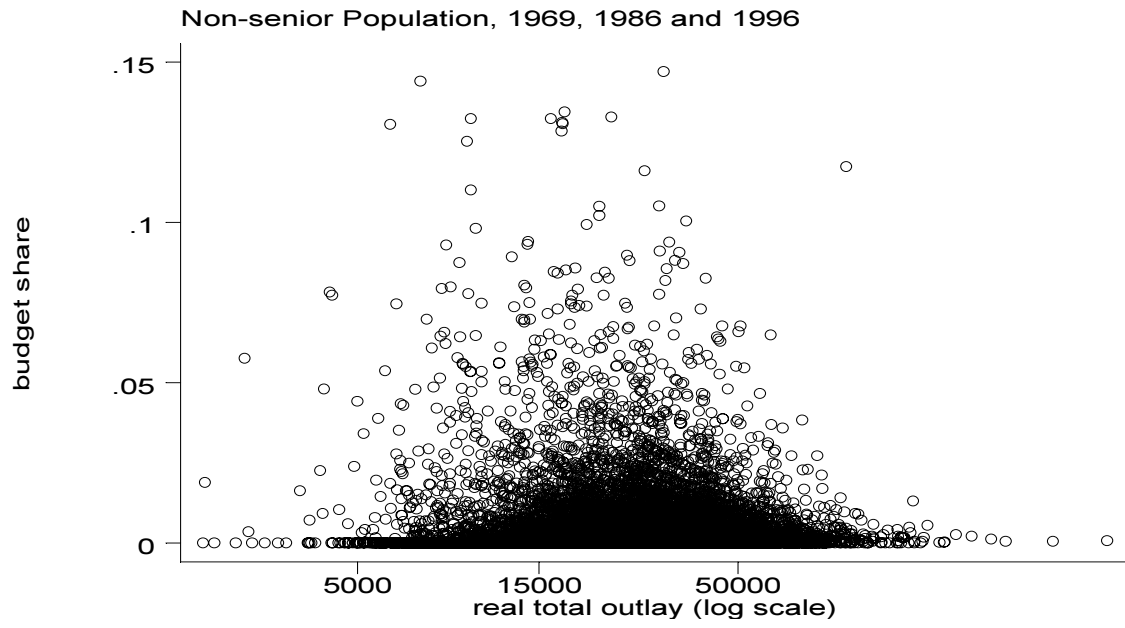


Fig 3: Out-of-Pocket Prescription Drug Expenditures

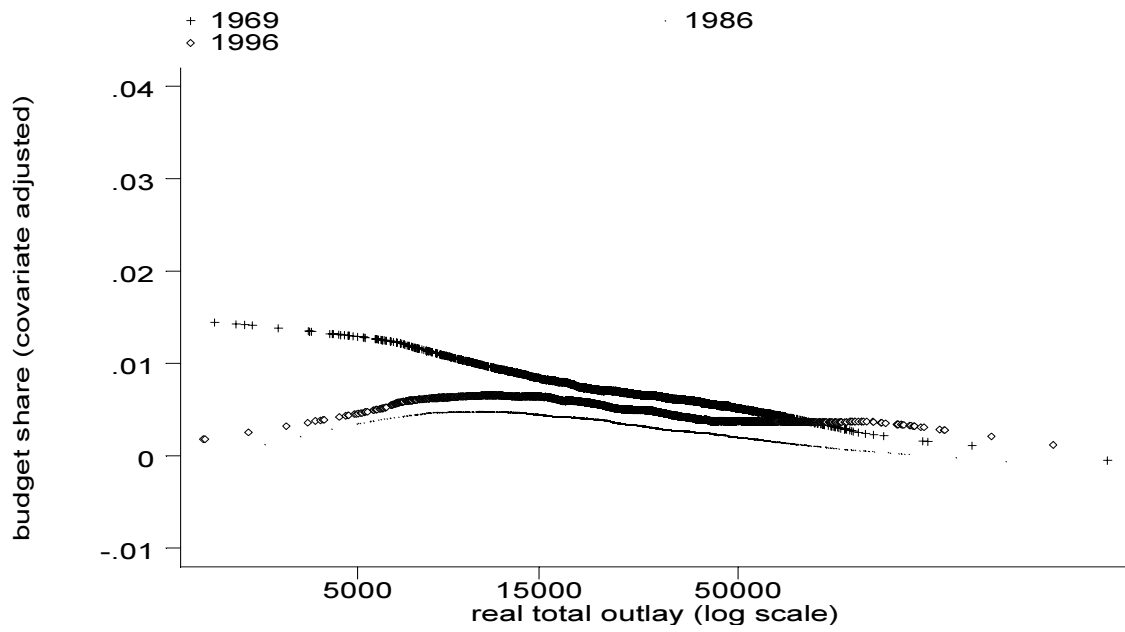


Fig 4: Engel Curves for Prescription Drugs, Nonseniors