

HOW DO TAX-DEFERRED SAVINGS ACCOUNTS AFFECT SAVINGS BEHAVIOR? EVIDENCE FROM DENMARK*

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ABSTRACT

Tax-deferred savings accounts such as IRAs are the major policy tool for increasing savings in the U.S.. Unfortunately, the evidence on the impacts of these accounts on saving is mixed, largely because of the lack of good wealth data on a large population of individuals. In this paper, we use tax data from Denmark that provide accurate measures of wealth for all households in a long panel. We study the impacts of a tax reform in 1999 that significantly altered the tax-advantage of pension contributions on the quantity of pension contributions. In this paper, we demonstrate that this reform had large and statistically significant effects on pension contributions. These results motivate future research to evaluate the aggregate impact of the reform on total savings and wealth accumulation.

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I Introduction

What are the impacts of incentives to save? As the net savings rate has fallen, policy makers have increasingly turned to two forms of incentives to encourage savings. First, government policy has expanded the availability of tax-deferred savings accounts, such as 401(k) plans or IRAs. By allowing savings in these accounts to compound tax-free, these policies increase the net-of-tax returns to savings. Second, governments (as well as firms) directly subsidize contributions to long-run savings accounts by matching individual contributions. Firms often match as much as the first 10 percent of savings, while policies such as the United States Saver's Credit provide a similar function for low-income individuals saving in IRA accounts. In other countries, governments tax post-retirement withdrawals from tax-deferred savings accounts at a special lower rate, providing a similar function. But despite the many new policies to encourage savings, little is known about aggregate impact of these reforms.

Economic theory provides relatively little guidance for this problem. Theory is unambiguous in its prediction of the impact of such incentives on savings in these subsidized accounts; the greater the tax savings, the more individuals should invest in tax-deferred accounts. However, theory does not make a clear prediction on the impact on *total* savings. On the one hand, the substitution effect predicts that subsidized savings accounts decrease the current price of future consumption, thereby decreasing current consumption and increasing total savings. On the other hand, the income and so-called "wealth" effects push in the opposite direction by increasing current consumption. Intuitively, an individual must save less in order to ensure that he has enough money to retire, driving total savings down. It is therefore an empirical question whether these many policies actually increase total savings, or whether they merely encourage individuals to move money between the available savings accounts.

A long empirical literature has attempted to measure the impact of savings incentives on behavior. The literature provides unambiguous evidence that incentives increase savings in the subsidized accounts. For instance, Choi et al. (2002, 2007) use 401(k) data from a number of large firms to demonstrate that contributions increase when firm match-rates increase. Similarly, Dufflo et al. (2006, 2007) show that low-income taxpayers respond to the match rate implicit in the Saver's Credit by increasing both probability of opening an IRA account and the level of contributions to it.

The literature has been less successful in measuring the impact on total savings. Poterba, Venti

and Wise (1994, 1995, and 1998) and Hubbard and Skinner (1996) argue that the observed increases in 401(k) savings represent a true increase in total savings; but Engen, Gale and Scholz (1994, 1996) argue that this merely reflects substitution of savings into tax-deferred accounts from other, non-tax-advantaged accounts. Attanasio and Brugiavini (2003) and Attanasio and Rohwedder (2003) have shown that individuals offset decreases in the amount of public pension with private savings but have less evidence on the effects of marginal tax subsidies.

The primary difficulty in this literature has been a lack of good data on individual savings across all possible account types and that includes reductions in liabilities. We resolve this problem by exploiting Danish administrative records on wealth for the full population. In years before 1997, Denmark levied a small wealth tax; as a result, Danish records include detailed information on assets and liabilities including stocks, bonds, bank accounts, credit card debt, household assets or mortgages, and other secured debt.

We use these data to analyze the impacts of a tax reform in 1999 that sharply changed the deductibility of pension contributions. We use two identification strategies. The first exploits variation in tax incentives across income groups over time. The second exploits variation across municipalities conditional on income within a given year. In this paper, we estimate the impact of the reform on pension contributions. We find clear evidence that individuals reduced pension contributions in response to a decrease in tax advantage over other forms of savings. The magnitude of this response is fairly large; we estimate the elasticity of pension contributions with respect to the net-of-tax advantage of $\varepsilon = 1.16$ or $\varepsilon = 1.6$, depending on the specification. These results provide the first stage in a two-part agenda. Having demonstrated the impact of the reform on tax-advantaged pension contributions, the next step in future work is to repeat the analysis including all savings.

The remainder of this paper is organized as follows. Section II provides background information on the Danish Institutional setting, as well as the 1999 reform that we analyze. Section III describes the data, while Section IV presents our analyses. Section V concludes.

II The Danish Institutional Setting

II.A The Tax System

The Danish tax system is an individual tax system.¹ Table 1 presents a schematic for the different components of the system. The Danish income tax system is built around a flat payroll tax for wage earners (the Labor market contribution, LMC), followed by a three-tiered progressive system levied on net-of-payroll-tax income. The progressive tax develops stepwise by accumulating a bottom tax (BOT), middle tax (MID) and a top tax (TOP).

Table 1: The Danish Tax System (1998)

Tax bracket	MTR
Personal allowance	LMC
Bottom	$LMC + [(1-LMC)(M+BOT)]$
Middle	$LMC + [(1-LMC)(M+BOT+MID)]$
Top	$LMC + [(1-LMC)(M+BOT+MID+TOP)]$
Tax ceiling	58%

Notes: The tax bracket thresholds are adjusted every year. LMC=8%. M=32.4% (on average), BOT=8%, MID=6%, TOP=15%. Thresholds (1998 values) for bottom tax=31,400DKK, middle tax=139,000DKK, top taxes=251,200DKK.

Unlike in the U.S, each tier of this progressive system has its own tax base; therefore, individuals with a large amount of income may pay the taxes for all three tiers on some forms of income, while paying only the bottom and middle tax for others.

In addition to the national taxes, there is a flat local tax rate levied on net-of-payroll-tax income. While the gross tax and the progressive schedule is the same for everyone in Denmark, the local government tax rates vary across municipalities between 28% and 34%. A tax ceiling, however, ensures a maximum marginal tax rate. In practice, virtually all local tax rates are high enough such that individuals paying the top tax hit the tax-ceiling and face the same marginal rate. Those in the middle tax bracket never hit the tax-ceiling, though, so there is substantial variation in the size of the final step in the tax system across cities. In addition to the income and payroll taxes, Danes face a 25% VAT on all purchases.

¹There are a few aspects of the system which are joint, including the exemption for the middle tax and the treatment of capital gains. We account for all such features in our TaxSim program, but they affect only a small share of the population.

II.B The Pension System and the Tax Treatment of Pension Contributions

The Danish pension system is based on three pillars. The first pillar consists of a universal, defined benefit (DB), pay-as-you-go, public financed old-age pension program, allowing people to retire at age 67; and an early retirement program (post-employment-wage) allowing people to retire from age 60. Eligibility for the latter scheme depends on membership in an unemployment insurance fund, which are organized at the occupation level. The old-age pension system includes a basic benefit (only reduced if a person has labour market income) and a pension supplement that is means-tested on all income types, including pension savings benefits.

The second pillar consists of savings based defined contributions (DC) occupational pensions. Contributions are made in relation to an employment contract. Without severe tax-punishments, occupational pension benefits can be withdrawn from age 60. Through common labor market agreements, occupational pensions have been part of employment contracts in the public sector since the 1960's. In the private sector, however, occupational pension contributions were not comprehensive before the 1990's. Contributions to occupational pension schemes (second pillar) are deductible and deductions are made by the employer before earnings are paid-out. There is generally no limit to the size of contributions and deduction to occupational pension schemes except for capital pension contributions

The third pillar consists of DC pension schemes that are privately organized. The tax-system provides incentives for contributing to pension savings schemes. There are two forms of private pensions: capital pensions, which pay out a lump-sum at retirement, and rate pensions which pay out an annuity. Contributions to privately organized capital pension schemes (third pillar) are deductible up to \$5,200 per year. Deductions can be made as long as the contributions are covered by taxable income in the tax year. It is not possible to postpone deductions for subsequent years, and it is not possible to transfer deductions to the spouse. The deduction limit of \$5,200 applies to the sum of private and employer organized capital pension contributions. Capital pension payouts are taxed at a flat rate of 40%. If the pension is paid out before the policy holder has turned 60, an additional tax has to be paid. Privately organized capital pension schemes must have been established before the contributor turns 60 to qualify for the tax deduction.

Contributions to privately organized rate pension schemes and life annuities are fully deductible from income in the year contributions are made if the contributions are less than \$4,170 DKK. Contributions larger than \$4,170 can be deducted in equal portions over the following 10 years.

If contributions are made for a period of less than 10 years the total contribution can only be deducted in equal portions over a period of 10 years. However, if the deductions distributed in 10 portions are each smaller than \$4,170, then it is possible to deduct \$4,170 per year until the full deduction is reached. For example, if a contribution of \$25,000 is made then this can be deducted over 6 years. The ten-year rule is hence only effective if the contribution is at least \$61,700. Rate pensions are taxed as income when they are paid out. To qualify for the tax deduction, rate pension schemes must have been established before the account holder turns 55 years. No age limit applies to contributions to life annuities, and contributions to such schemes are fully deductible.

In practice, most individuals contribute first to capital pensions, and then to rate pensions only if they reach their deduction limit. This is because of the favorable tax treatment upon payout. However, the existence of rate pensions as a close substitute for capital pensions may make individuals especially sensitive to the tax rules.

II.C The 1999 Reform

Denmark reformed its pension system before the tax year 1999. The reform changed the rules for deducting contributions to capital pension schemes. Before the reform, contributions to capital pensions (up to a threshold of \$5,200 in 1998) were fully deductible from the tax base for all municipal and national taxes. The reform removed the deductibility of capital pension contributions for the top tax. Taxation of benefits remained unchanged at 40%. The deduction possibility for rate and life annuities remained unchanged, though the age limit for establishing a rate pension increased to 60.

The tax reform brings at least two types of variation that can be exploited for identification. First, the tax value of contributions to capital pension schemes changes for top tax payers but not for middle tax payers. This suggests an estimation procedure of comparing people on either side of the top tax threshold, and before vs. after the tax reform. Second, the application of the tax ceiling together with the heterogeneous local government tax rates generates differential changes in the tax value of deductions for capital pension contributions for people living in different municipalities.

Figures 1a and 1b illustrates the changes in marginal tax rates due to the reform for a high-tax and a low-tax municipality. The figures present the marginal tax rate schedule in two representative municipalities, one with a high municipal tax rate (34%) and one with a low rate (28%). This implies that the marginal tax rate in the middle bracket in these two cities would be 51% and 45%, respectively. The tax reform eliminates the deductibility of pension contributions for the top

tax. Note that individuals at all income levels could still deduct pension contributions for the base for the middle tax; the loss of deductibility only applies to the final step in the tax rate schedule. Therefore, in both Figures 1a and 1b, the tax-advantage of pension contributions falls from the solid line to the dashed line in 1999 for those in the highest income bracket. For a high-income person living in the city with a high local government tax, in Figure 1a, the tax advantage of pension contributions falls by only 7 percentage points. For a similar person living in a municipality with the low local government tax rate, the marginal tax rate falls by a full 13 percentage points. We exploit these differences in changes of marginal tax rates for identifying the effect of changes in marginal tax rates on pension savings.

III Data

The data used in this study are merged Danish public administrative datasets. These datasets include annual longitudinal information on information for the entire Danish population (approximately 5 million people) for the period, 1980-2008. Within these data we focus on the years 1998-2000 around the reform of interest. These data include tax-relevant variables such as income, public and private pension contributions, deductions, fringe benefits, and capital income; household and demographic characteristics such as gender, age, education, marital status, child's information, occupation, firm, and experience; and wealth measures including stocks, bonds, home equity, other large durable goods, bank account assets, unsecured (credit card) debt, home mortgages, and any other liabilities. Such data exist because Denmark levied a wealth tax until 1997; data collection continued until 2001. See Chetty et al. (2011) or Kleven et al. (2010) for more detailed information on the dataset.

IV Results

We use two strategies to study the impact of the 1999 pension reform on savings. First, we study the changes in pension contributions for all those paying the top tax, using those in slightly lower income brackets as a control group. Second, we exploit the cross-municipality differences in the magnitude of the reform generated by the tax ceiling.

IV.1 Strategy 1

In 1999, individuals lost the tax deductibility of pension contributions for the top tax, generating a sharp change in the incentives for savings for those with incomes above \$43,100 DKK, but not those

below. This reform motivates a difference-in-differences or regression kink identification strategy. We compare the savings contributions of those above vs. below the threshold for the top tax, before vs. after the reform.

The tax literature suggests two different techniques for such a study: panel analysis of individuals and cross-sectional analysis of distributions. Gruber and Saez (2002) advocate a panel approach, using simulated instruments for the impact of the reform on each individual based on a projection of income based on lagged income. Intuitively, such an approach compares an individual's behavior after the reform to that same individual's past behavior. In many settings, however, the projection of income may be a complicated non-linear function of lagged income in order to correct for severe mean-reversion in the income process. Therefore, we instead follow Saez et al. (2009) and analyze the impact of the reform on the joint distribution of income and savings. Intuitively, our approach instead compares the level of savings at a given point in the income distribution to the savings at that same income level before the reform.

We present the results from this identification strategy in Figure 2. We split the income distribution into 1000 Danish Kroner (\$166) cells relative to the top tax cutoff and plot the average year-on-year change in pension contributions in each income bin. Panel A shows changes from 1998 to 1999, the year the reform was implemented. Individuals above the top tax cutoff — that is, the individuals affected by the reform — cut back sharply on pension contributions. In contrast, the individuals below the top tax cutoff do not change their pension contributions much. The magnitude of the changes savings behavior is large; on average, those above the top tax cutoff reduce pension contributions by \$265 DKK more than those below the threshold. Since the average pension contribution for individuals in this sample who are above the top tax bracket is \$917 DKK, the response to the reform represents a 29% reduction in pension contributions for this group. The reform reduced the tax advantage of pension savings by 25%, so the implied elasticity of savings with respect to the change in net-of-tax pension advantage is $\varepsilon = 1.16$.

The identification assumption underlying the strategy in Panel A is that the changes in pension contributions for those in the middle and top income tax brackets would have been the same absent the tax reform. Panel B evaluates this assumption by plotting the pension contribution changes from 1999 to 2000, the year after the reform. Pension contribution changes are roughly similar for all individuals within \$16,700 of the threshold, confirming that savings decisions within this income range exhibit similar time patterns. In the non-reform years, the top tax cutoff does not have any impact on the change in pension contributions across years.

IV..2 Strategy 2

Our first approach identifies the effect of the savings reform using variation in the time series and across the income distribution. Our second approach instead takes advantage of cross-sectional variation in the magnitude of the reform across municipalities. As we described in Section II.2 above, municipalities and regions with higher local taxes actually experienced a smaller change in 1999 due to the effects of the tax ceiling.

We present the results of this identification strategy in Figure 3. We group individuals by the magnitude of the realized change in tax advantage on the x-axis, and then plot the average change in pension contributions for each group on the y-axis. Differences in local tax rates generate variation in the magnitude of the reform between 9 and 14 percentage points. Since this variation does not rely on the sharp change at the top tax threshold, we include all individuals who pay the top tax in this analysis. The average pension contribution for this group \$1,880.

Panel A plots the relationship between the change in incentives and the change in pension contributions during the year of the reform. Those individuals who experience a larger change in incentives reduce their pension contributions by more; for each percentage point reduction in the applicable net-of-tax rate, pension contributions are reduced by \$62. Panel B presents a placebo test analogous to that in Figure 2a. We replace the change in pension contributions the year of the reform with that between 1999 and 2000, the year after the reform. There is almost no relationship between the magnitude of the reform and pension changes, confirming that the pattern in Panel A is driven by the reform, and not other unobserved differences across municipalities.

Converting the estimated impacts into an elasticity yields an estimate of $\varepsilon = 1.6$. It is interesting to note that cross-sectional policy variation is independent of that in the previous section; we impose no restriction that the estimated elasticities be the same. The estimates are fairly similar, however, suggesting that the two different identification approaches are measuring the same, consistent phenomenon. The remaining difference may be accounted for by the differences in sample. In the cross-sectional approach, we include all individuals who pay the top tax, and so the sample is, on average, richer. These individuals may have greater knowledge of the tax system, or they may have other similar investment options so that they respond to the reform more aggressively.

V Conclusion

Tax-deferred savings accounts have been the primary policy tool implemented in the past 30 years to increase savings. Yet the effect of such accounts on total savings is not well understood. The preceding analysis takes the first step towards understanding this fundamental question. We utilize Danish administrative wealth data, along with a reform in the tax-treatment of pension contributions, to move towards an answer to this question. This paper presents evidence on the first stage — the impact of tax-advantage on pension contribution. The strong first stage coupled with excellent wealth data suggest that analyzing the impact of the 1999 reform on total savings is a promising approach to identifying the impacts of tax deferred savings accounts on savings behavior.

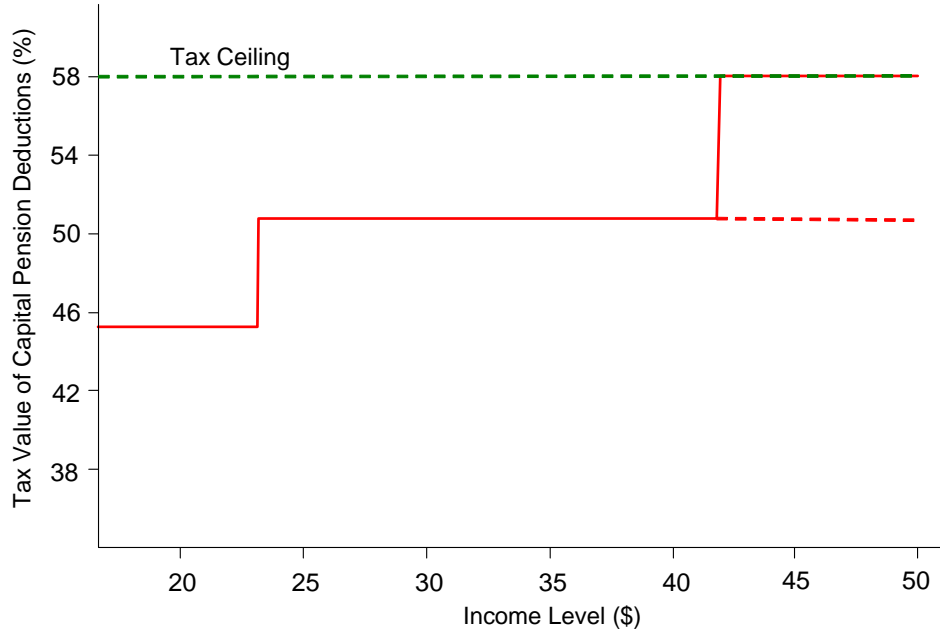
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FIGURE 1
Marginal Tax Rate Schedules in Denmark

(a) High-Tax Municipality



(b) Low-Tax Municipality

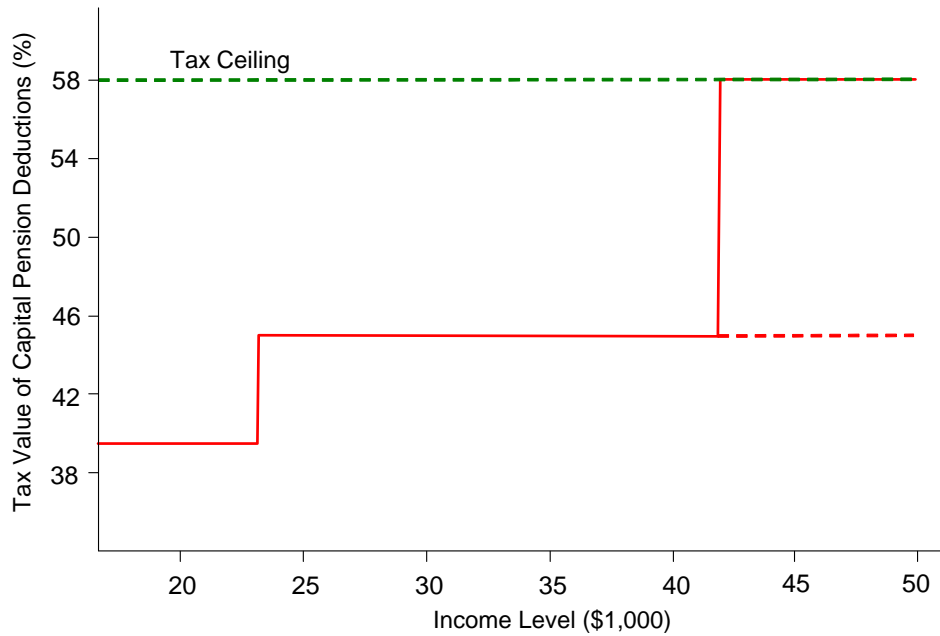


FIGURE 2
Impact of 1999 Pension Ductibility Reform on Pension Contributions in Denmark

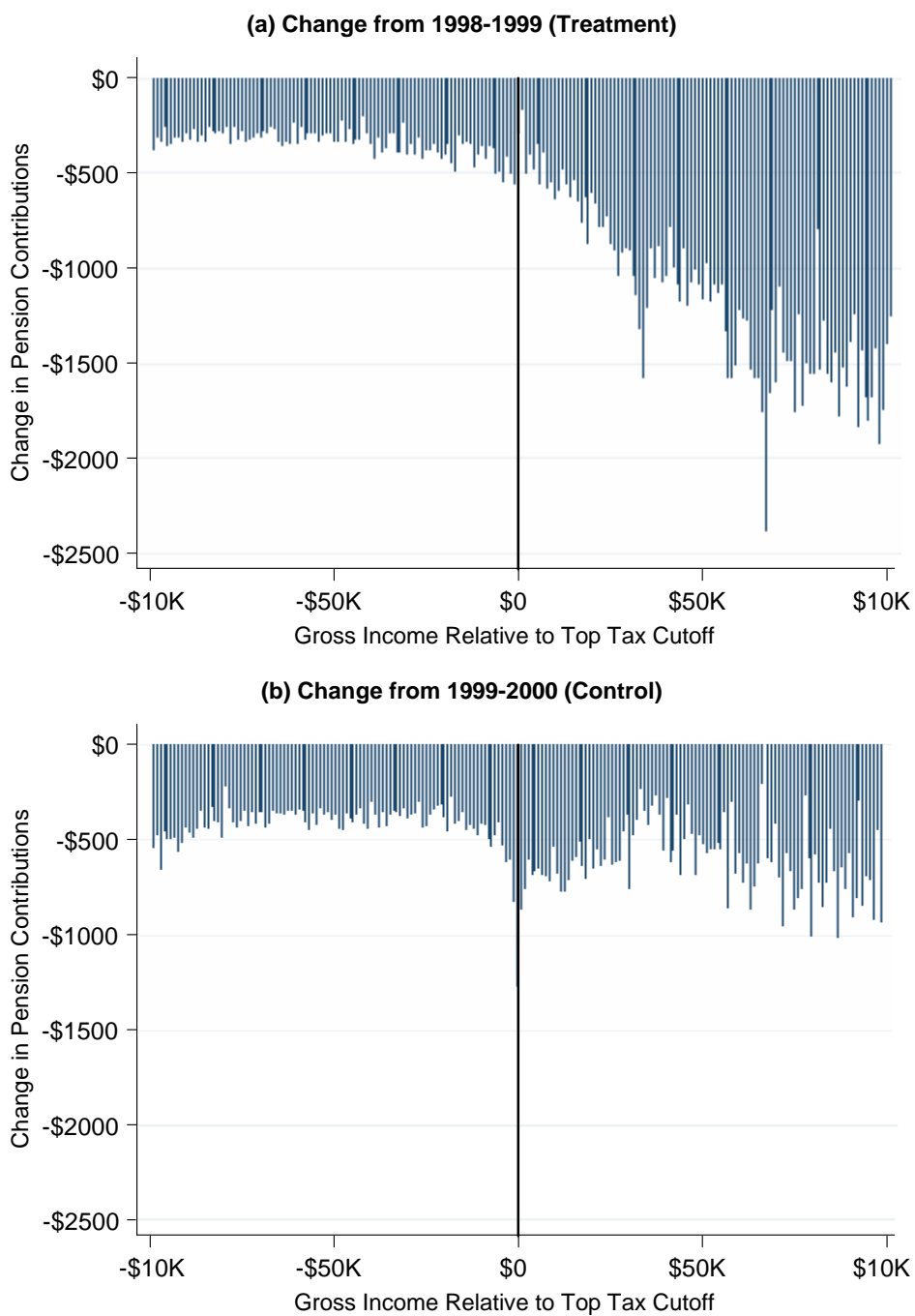


FIGURE 3
Impacts of 1999 Tax Reform Across Municipalities

