Online Appendix for: "Do Employer Pension Contributions Reflect Employee Preferences? Evidence from a Retirement Savings Reform in Denmark," by Itzik Fadlon, Jessica Laird, and Torben Heien Nielsen

Online Appendix A: Verification of Employer Responses

Recall that contribution rates within a workplace, defined as all employees with the same 2-digit occupation code in the same firm, can vary since employers may set pension contributions at a finer level within the firm (i.e., higher-digit occupation codes), and since individuals have some ability to choose a different distribution of contributions between capital and annuity accounts than the default set by the employer. Our main analysis identifies employer default contribution rates using workplace-level medians. To validate our measure of choice and to verify that our results are not driven by employees' responses within their employer-sponsored accounts, but rather by the employers themselves, we augment the analysis in the following ways:

1. **Analysis of Modes:** Instead of workplace-level medians we calculate workplace-level modes for identifying employer contribution rates. Panel A.1 of Appendix Figure 2 replicates Panel B of Figure 1, but with changes in workplace-level modes of contribution rates instead of medians, and shows that our results persist with this choice of the outcome variable. To further show that the patterns are very similar to those provided by medians, Panel A.2 of Appendix Figure 2 replicates Panel B of Figure 1 that uses medians, but for the same sample that is included in Panel A.1 of Appendix Figure 2. This sample includes only workplaces with unique mode values. Due to rounding issues and multiplicity of possible modes we are left with 59,956 workplace-year observations, compared to 84,764 workplace-year observations in the main analysis of medians, which is the reason for our choice of medians over modes.

2. **Deviation from Aggregates:** Panels B.1 and B.2 of Appendix Figure 2 plot the distribution of the distance between employee-level capital contribution rates and workplace-level aggregates, for modes and medians, respectively. The analysis verifies that most employee contributions bunch exactly at these aggregates, supporting our design and choice of measures for identifying employer behavior.

3. **Workplace Size:** Statistically, medians are more likely to accurately identify default contribution rates in large workplaces. Conceptually, the firm decision making process is more likely to be tailoring defaults to groups of employees of similar occupations in larger workplaces. Therefore, we study the sensitivity of our analysis to the size of workplaces that are included in our sample. Appendix Figure 3 plots changes in medians for the samples of workplaces with more than ten, twenty, and fifty employees. The patterns of the results are very similar when we restrict the analysis to larger workplaces, with potentially stronger responses by larger firms. We explore the difference between smaller and larger firms further in Section III.D, when we analyze the optimality of the firms' responses, and again find that larger firms are more responsive to the reform.

4. **Workplaces with No Contributions to Annuity Accounts:** To focus on a sample of employees with less discretion over contributions to employer-sponsored accounts, we repeat the analysis for employees who could not have reallocated contributions across different types of accounts. In particular, Panel C of Appendix Figure 2 constrains the sample to workplaces whose median annuity contribution rate in the years prior to the reform (1996-1998) was zero. In addition, we include only workplaces whose median capital contribution rate in 1998 was economically meaningful (here we choose having rates larger than 1.5 percent), to focus on employers that had non-negligible potential to reduce capital contributions in response to the

reform. These restrictions substantially reduce the sample size (to a total of 4,056 observations), but reveal the same patterns.

Online Appendix B: Distribution of Employee-Level Changes in Contribution Rates

In Section III.B we compared employer responses to the reform to the responses of individuals within their private accounts by using workplace-level aggregates. To account for differential baseline contribution rates to private vs. employer-sponsored accounts, we analyze percent changes in the two types of accounts at the employee level, by plotting the distribution of employee-level year-to-year percent changes in capital contribution rates. In addition, to conduct a within-employee analysis when we compare responses within private vs. employer-sponsored accounts, we balance the sample such that we keep only employees that had positive contributions to both types of accounts in a previous year.

In Appendix Figure 4 we plot histograms of individual-level percent changes in contributions to capital accounts for employer-sponsored capital accounts (Panel A) and private capital accounts (Panel B). In each panel we plot the distributions for the two years prior to the reform (so that we average the changes from 1996 to 1997 and from 1997 to 1998) and the distribution of changes following the reform – which captures changes from 1998 to 1999.

Comparing the before and after distributions, we see that in both types of accounts most of the effect of the reform is driven by exiting capital accounts altogether (the large differences in the mass points at -100 in both panels). In fact, in both employer-sponsored and private accounts, there was an increase of 23 pp in the fraction of employees who exited capital accounts.[1]

Recall from Section III.B that employer responses were much larger than individual responses in the aggregate. The evidence here, which results from analyzing the contributions of the special sample of individuals with positive lagged contributions to both accounts, suggests that at the individual level percent change responses in private accounts were similar to those in employer accounts. However, this result is not entirely surprising since the analysis here diverges from the ideal experiment that we mentioned is Section III.B for two main reasons. First, we analyze only a small share of individuals. While among those that were at the top tax bracket in 1999 55 percent had positive contributions to employer-sponsored accounts and 30 percent had positive contributions to private accounts, less than 13 percent had positive contributions to both. Specifically, these workers are likely to be the most attentive to their pension accounts than a randomly selected individual who does not typically contribute to private pension accounts. Second, the sample includes affected individuals in workplaces that also had to cater to employees who were not affected by the reform. Therefore, changes in employer-sponsored accounts do not capture the full potential extent of employer responses. The average fraction of workers at the top income tax bracket in these workplaces was 74 percent in 1999, and given the linear response we found in Section III.A, there is a potential attenuation in the response of this sample's employers by approximately 26 percent compared to the response of employers with all workers at the top income tax bracket.[2]

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[1]Note, however, that while the responses to the reform within private accounts were composed of opting out of capital accounts by almost exclusively those who would otherwise have small increases or no changes in contributions, opting out of employer-sponsored accounts was also equally driven by workplaces who would have otherwise decreased their contributions (the decrease in Panel A from 10 pp to 3 pp in the mass point at -4 percent that includes changes larger or equal to -4 percent and smaller than 0 percent).

[2]Note that in Section III.D we do indeed find larger employer responses for workplaces in which all workers were affected by the reform.

Online Appendix C: Capital Contributions vs. Labor Income Responses

Since we are analyzing employer capital contributions as a fraction of labor income, the heterogeneous responses of firms by the fraction of workers above the top threshold could be due to differential changes in the numerator, employer capital contributions, or the denominator, taxable labor income. Appendix Figure 5 breaks down the responses in capital contribution rates plotted in Panel A of Figure 1 into annual earnings and capital contribution levels.

Using different workplace-level measures for annual labor earnings, Panels A, B, and C show no noticeable differential patterns over the years across workplaces with different shares of employees above the top tax threshold. In contrast, Panel D, which plots workplace-level medians of contribution levels, exhibits exactly the same patterns of Panel A of Figure 1, confirming that our results are driven by changes in employer contributions to pension accounts.

This analysis also allows us to test an implication of the standard model of employee compensation. Recall that the decrease in subsidies to capital contributions potentially led to an income effect, as it reduced the overall compensation of workers above the top tax threshold. However, Appendix Figure 5, as well as the time series of the log of labor income in Panel B of Appendix Figure 1, display no detectable change in compensation through increased annual earnings, either in the aggregate or as a function of the share of employees above the top tax threshold.[3]

Online Appendix D: Inclusion of Workers Covered by Collective Agreements

Recall that our analysis aims at isolating workplaces in which default contribution rates are set by the employer. To this end, we excluded workers in the public sector or with blue-collar occupations (as they are likely covered by collective agreements), so that we included only workers in private firms with white-collar occupations. However, some white-collar jobs in the private sector are covered by collective bargaining.

In this appendix, we assess how inadvertently including workers covered by collective agreements may have affected our results. Inclusion of such workers can alter the results in two different ways. First, given that there are union representatives within the collective bargaining process, employer contributions for these workers may be more closely related to workers' preferences than employer contributions that are set exclusively by firms. Thus, employer capital contributions for them may respond more to the reform. In this case, inadvertently including workplaces that are covered by collective bargaining could increase the magnitude of the coefficients. On the other hand, in such workplaces, employer contributions are set for groups of occupation-level worker unions and employer associations, and not at the finer occupation-firm level. Since we analyze the occupation-firm cell as the decision cell in our analysis, variation in the share of employees above the top tax threshold across employers but within the same worker union-employer association unit will not exhibit differential responses. This will tend to flatten the gradient of responses with respect to the share of affected employees and to attenuate our results.

In order to empirically quantify how unintentionally including workplaces covered by collective

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[3]This is consistent with the required compensation of the loss incurred at the initial bundle of contributions (on the order of no more than a few thousands of DKr) being negligible relative to annual labor earnings (on the order of hundred thousands of DKr). Empirically, such small changes are hard to detect, and, conceptually, some degree of wage rigidity due to, e.g., re-negotiation costs, would render these small changes non-profitable.

bargaining affects our estimates, we analyze the relationship between employer capital contributions and the fraction of workers above the top tax threshold for different groups that are either more or less likely to be covered by collective bargaining agreements, as compared to workers with white-collar occupations in the private sector. Specifically, in column (3) of Appendix Table 1 we restrict the analysis to employees in the public sector or those with blue-collar occupations, who are more likely to be covered by collective bargaining. The coefficient of interest – on the interaction of the fraction of workers above the top threshold with the indicator for year 1999 – is -0.35, which is an order of magnitude smaller than (and statistically different from) the corresponding coefficient of -2.18 in our main sample analysis of employees with white-collar occupations in the private sector (replicated in column (1) of Appendix Table 1). In column (2) of Appendix Table 1 we restrict the analysis to private-sector workplaces of white-collar occupations with a highly-educated workforce. In particular, we focus on workplaces in which more than twenty percent of workers had more than sixteen years of education, which are even less likely to be covered by collective bargaining (as compared to all private-sector workplaces of white-collar occupations). The point estimate of the coefficient of interest in this case is large, -3.68 pp, and is significantly different from the coefficient for the remainder sample of private-sector white-collar occupations.

Put together, the results suggest that inadvertently including some workers who are covered by collective bargaining in our main specification may have attenuated our results.

Online Appendix E: Occupation Codes

In this appendix, we list the 2-digit ISCO occupation codes used by Statistics Denmark. In our analysis, white-collar occupations are defined as occupations with codes whose first digit is between 1 and 5.

Occupation Codes:

1 Leadership at the top level of companies, organizations and the public sector
    11 Legislative work and leadership in public administration and interest groups
    12 Senior management of the company
2 Work that requires knowledge at the highest level in the area
    21 Work within the non-biological branches of science and computer science, statistics, architecture and engineering sciences
    22 Work in medicine, pharmacy, and biological branches of science, as well as midwives, general nursing work etc.
    23 Teaching in primary schools, vocational schools, colleges, universities, and research organizations
    24 Work within the social sciences and humanities
3 Work that requires Intermediate knowledge
    31 Technicians in non-biological topics
    32 Technicians and other work in biological topics
    33 Caring and educational work
    34 Work in sales, finance, business, administration, etc.
4 Office jobs
    41 Internal office work
    42 Office work with customer service
5 Retail sales, service and care work

51 Service and care work

52 Retail and models

6 Work in agriculture, horticulture, forestry, hunting and fishing

61 Work in agriculture, horticulture, forestry, hunting and fishing

7 Craft and related trades workers

71 Work in mining and construction

72 Metal and engineering work

73 Precision craftsmanship, graphic work, etc.

74 Other craft and work in related trades

8 Machine operating and work in transportation and civil engineering

81 Stationary plant

82 Operation of industrial machinery

83 Transportation

9 Other work

91 Cleaning and renovation work, messenger and security services, telephone canvassing

92 Assisting in agriculture, horticulture, fisheries and forestry

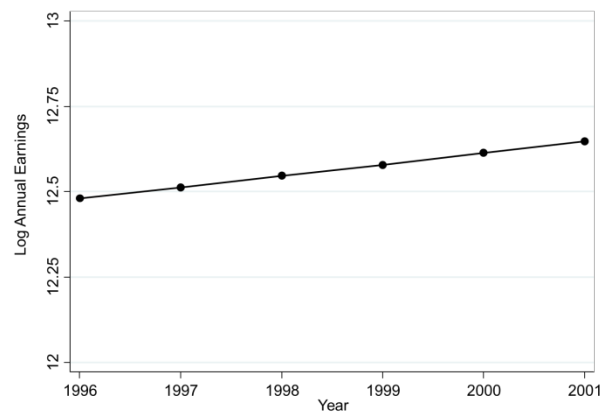93 Manual work in the construction sector, manufacturing and transportation

APPENDIX FIGURE 1
Capital Contributions and Labor Income by Year

(a) Workplace-Level Medians of Employer Capital Contribution Rates
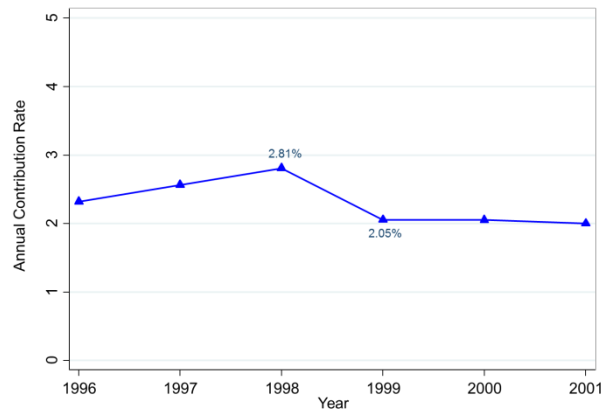

### (b) Workplace-Level Medians of the Log of Labor Income

Notes: These figures plot means of different workplace-level outcomes by year, for years 1996-2001. The outcome in Panel A is the median contribution rate to employer-sponsored capital accounts, and the outcome in Panel B is the median of the log of annual labor income. A workplace is defined as the group of all employees with the same 2-digit occupation code in the same firm. The sample includes employees in private-sector firms with white-collar occupations, and excludes self-employed individuals and workplaces with less than five employees.

APPENDIX FIGURE 2
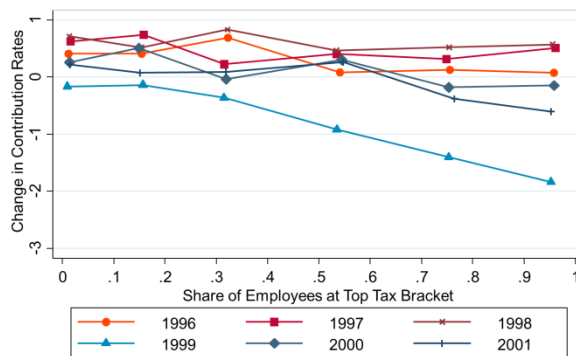## Robustness of Employer Responses in Capital Contributions

(a) Changes in Contribution Rates by the Share of Workers above the Top Tax Threshold
(1) Modes   (2) Medians for Same Sample
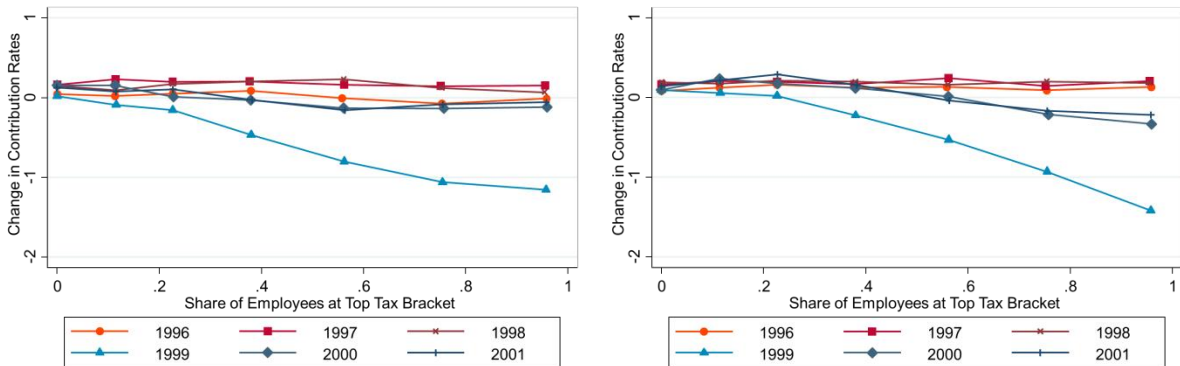
(b) Distance of Individual-Level Measures from Workplace-Level Aggregates
#### (1) Modes   (2) Medians
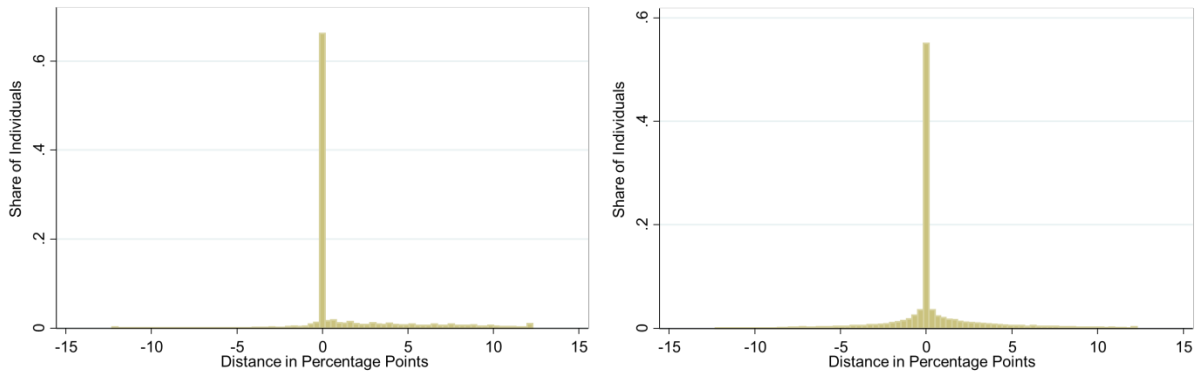
### (c) Workplaces with No Annuity Contributions

Notes: The sample for these figures includes private-sector firms and white-collar occupations, and excludes self-employed individuals and workplaces with less than five employees. Panel A.1 plots changes in workplace-level modes of contribution rates to capital accounts as a function of a workplace's share of employees above the top tax threshold, for years 1996-2001, including only workplaces with unique mode values. Panel A.2 plots workplace-level medians, including only the sample that is included in Panel A.1. These figures are plotted in the same way as the figure in Panel B of Figure 1. Panels B.1 and B.2 plot the distribution of the distance between employee-level capital contribution rates and workplace-level modes and medians, respectively. Panel C replicates Panel A.2 for all private-sector firms and white-collar occupations but constrains the sample to workplaces whose median annuity contribution rate in the years prior to the reform (1996-1998) was zero and whose median capital contribution rate in 1998 was larger than 1.5% (so that they had non-negligible potential to reduce capital contributions in response to the reform), with a total of 4,056 observations.

APPENDIX FIGURE 3
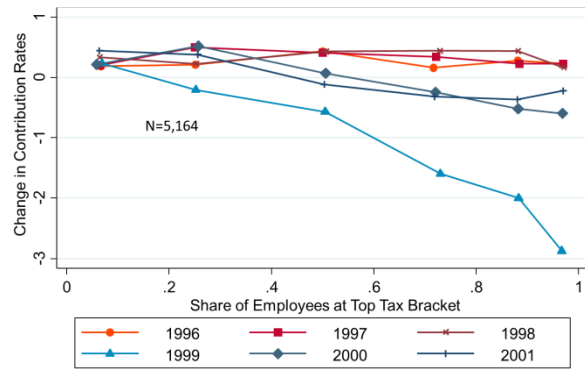## Employer Capital Contributions Responses by Size of the Workforce

(a) Workforce Larger than 10 Employees

N=37,891
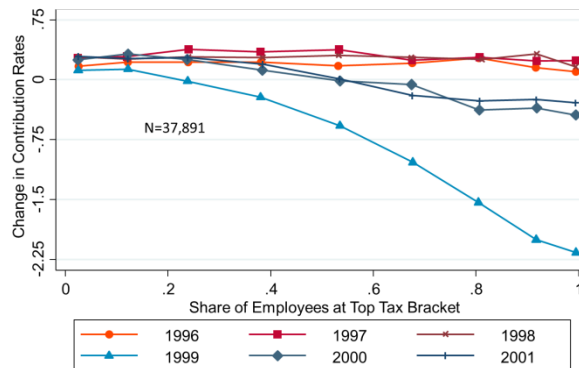
(b) Workforce Larger than 20 Employees


N=16,116
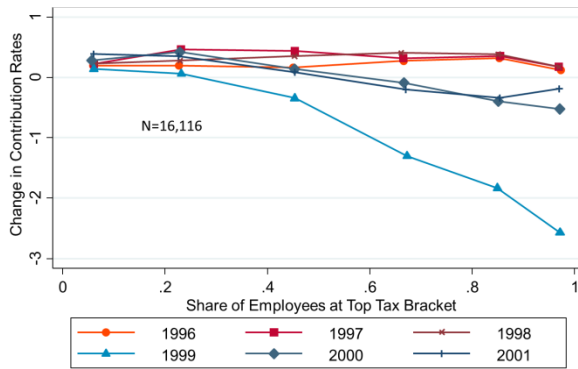
(c) Workforce Larger than 50 Employees

N=5,164

Notes: These figures plot changes in employers' contribution rates to capital pension accounts as a function of the share of their employees whose earnings placed them above the top labor-income tax threshold, for years 1996-2001. Panel A excludes workplaces with less than ten employees, Panel B excludes workplaces with less than twenty employees, and Panel C excludes workplaces with less than fifty employees. In each panel we indicate the number of included observations, denoted by N. The observation units are workplaces, defined as all employees with the same 2-digit occupation code in the same firm, where employer contribution rates are calculated as the median annual contribution rate within each workplace in a given year. We plot these figures by dividing the sample into equal-sized groups according to the share of employees above the top tax threshold, and plotting for each group the mean outcome (on the y-axis) against the mean share of employees above the top tax threshold (on the x-axis). The sample includes private-sector firms and white-collar occupations and excludes self-employed individuals.

APPENDIX FIGURE 4
Changes in Employer vs. Individual Contributions to Capital Pension Accounts of Workers above the Top Tax Threshold

(a) Distribution of Employee-Level Changes in Contributions to Employer-Sponsored Accounts
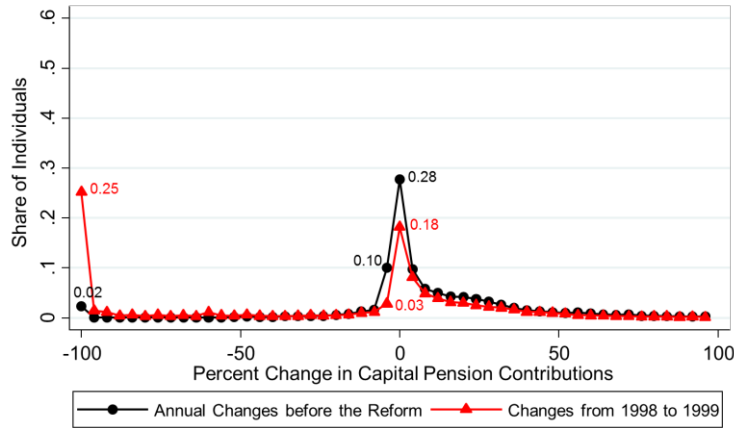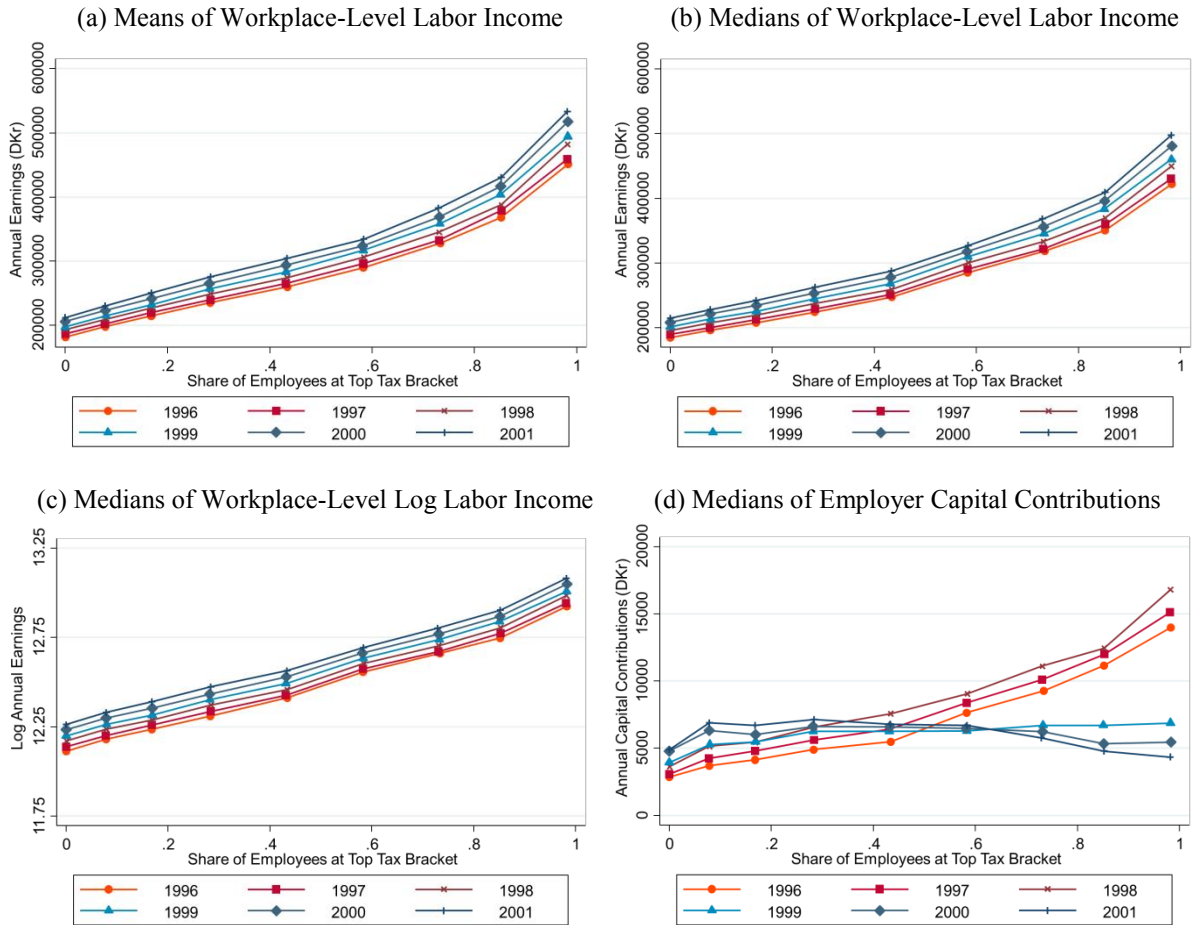

(b) Distribution of Employee-Level Changes in Contributions to Private Accounts
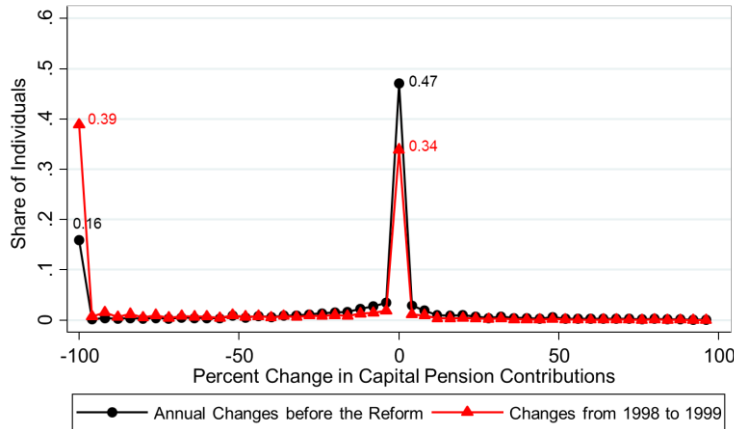
Notes: These figures plot the distribution of changes in employee-level capital pension contributions in percents relative to lagged contributions for individuals above the top tax cutoff for the years before the reform (black lines and circles) and from 1998 to 1999 (red lines and triangles). Panel A plots changes in contributions to employer-sponsored (401(k)-like) accounts, and Panel B plots changes in contributions to private (IRA-like) accounts. The figures include only individuals with positive lagged contributions to both types of accounts. Each point represents the floor of bins of 4% width, so that the point at 0% represents individuals with changes in the range [0%,4%). The curves for the distribution of annual changes in the years prior to the reform (in black lines and circles) include changes from 1996 to 1997 and 1997 to 1998. The sample includes private-sector firms and white-collar occupations, and excludes self-employed individuals, workplaces with less than five employees, and employees with earnings below the top income threshold.

APPENDIX FIGURE 5
Employer Capital Contributions and Labor Income
by the Share of Workers above the Top Tax Threshold

(a) Means of Workplace-Level Labor Income

(b) Medians of Workplace-Level Labor Income

(c) Medians of Workplace-Level Log Labor Income

(d) Medians of Employer Capital Contributions

Notes: These figures plot different workplace-level outcomes as a function of the share of employees whose earnings placed them above the top labor-income tax threshold, for years 1996-2001. Panel A plots means of annual labor income, Panel B plots medians of annual labor income, Panel C plots medians of log annual labor income, and Panel D plots median employer contributions to capital pension accounts. The observation units are workplaces, defined as all employees with the same 2-digit occupation code in the same firm. We plot these figures by dividing the sample into equal-sized groups according to the share of employees above the top tax threshold, and plotting for each group the mean outcome (on the y-axis) against the mean share of employees above the top tax threshold (on the x-axis). The sample includes private-sector firms and white-collar occupations, and excludes self-employed individuals and workplaces with less than five employees.

APPENDIX TABLE 1

Changes in Employer Contribution Rates to Capital Pension Accounts for Different Samples

Dependent Variable:	Δ Capital Contributions		
Sample:	White-Collar in Private Sector		Blue-Collar or in Public Sector
	All (1)	Highly-Educated (2)	(3)
Fraction of Employees Above Top Tax Threshold (Baseline Year 1998)	0.132 (0.145)	0.303 (0.611)	0.138** (0.074)
Fraction of Employees Above Top Tax Threshold Interacted With:			
Year 1996	0.273 (0.167)	-0.159 (0.752)	-0.093 (0.081)
Year 1997	0.096 (0.147)	-0.234 (0.675)	0.063 (0.076)
Year 1999	-2.182*** (0.203)	-3.681*** (0.861)	-0.347*** (0.084)
Year 2000	-0.593*** (0.173)	-1.467** (0.747)	-0.129* (0.077)
Year 2001	-0.553*** (0.176)	-0.178 (0.915)	-0.080 (0.078)
Year Fixed Effects	X	X	X
Income and Workforce Size Controls	X	X	X
2-Digit Occupation-Firm Fixed Effects	X	X	X
2-Digit Occupation-Year Fixed Effects	X	X	X
Number of Observations	60,643	7,989	78,533
Number of Clusters	20,642	3,742	25,932

Notes: This table reports estimates of employers' responses to the reform, for different samples, as a function of the share of their employees whose earnings were above the top labor-income tax threshold. The outcome variable is the change in employer capital contribution rates from the previous year. We regress this outcome on the fraction of workers above the top tax threshold, year fixed effects, the fraction of workers above the top tax threshold interacted with year fixed effects, and a set of controls as indicated in the table. The baseline year is 1998, so that the coefficient on the fraction of employees above the top tax threshold refers to that year. The coefficient on the fraction of employees above the top tax threshold interacted with other year indicators estimates this relationship relative to the relationship in the baseline year. Income controls include a fifth-order polynomial of the mean workplace-level labor income, separately for workers above and below the top tax threshold, as well as their interactions with year indicators. Workforce size controls include the number of workers in a workplace and its square, as well as their interactions with year indicators. Column (1) replicates exactly column (4) of Table 2, which restricts the sample to private-sector firms and white-collar occupations. Column (2) repeats the analysis of column (1) for private-sector firms and white-collar occupations, but restricts the sample to workplaces with a highly-educated workforce. Specifically, we focus on workplaces in which more than twenty percent of workers had more than sixteen years of education. Column (3) restricts the estimation to the sample of employees in the public sector or those with blue-collar occupations. All the regressions exclude self-employed individuals and workplaces with less than five employees. The observation units are workplaces, defined as all employees with the same 2-digit occupation code in the same firm, where employer contribution rates are calculated as the median annual contribution rate within each workplace in a given year. Standard errors are clustered at the workplace level. Coefficients are multiplied by 100 so that they are converted to percentage point units.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.