

# The Effects of Political Competition on the Funding and Generosity of Public-Sector Pension Plans\*

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## Abstract

In politically competitive jurisdictions, there can be strong electoral incentives to underfund public pensions in order to keep current taxes low. I examine this hypothesis using panel data for 2,000 municipal pension plans from Pennsylvania. The results suggest that as a municipality becomes more politically competitive, it tends to have pension plans that are less funded, more generous, and that use higher interest rates to discount actuarial liabilities. The effects of political competition are pronounced in municipalities which have a higher proportion of less informed voters and are absent for defined contribution plans and pension plans offered by municipal authorities.

**Keywords:** Public-sector pensions, political competition, unfunded liabilities, actuarial funded ratio

**JEL codes:** H75, J45

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*The sky really is falling. The people of Jacksonville need to know this. When they look at the roads that are crumbling. When they look at the neglected infrastructure. When they look at certain ZIP codes that have had little to no investment, promises that were made in years gone by that haven't been kept. It's because we don't have the cash to do it because our budget is being eaten alive by these unfunded pension liabilities.* – Mayor of Jacksonville (FL), Lenny Curry<sup>1</sup>

## **1 Introduction**

The bankruptcy of Stockton and San Bernardino has brought the issue of public-sector pension plans into focus. Unfunded pension and health care obligations have been key drivers behind the decisions of these municipalities to file for bankruptcy. However, as the leading quote suggests, the size and funding of public-sector pension plans are issues affecting states and municipalities throughout the country.

Under defined benefit (DB) pension plans, the dominant type of pension in the public sector, state and local governments promise pension benefits that are typically a specific fraction of an employee's last drawn salary. Sponsoring employers are expected to put money into a retirement trust fund so that, when combined with employees' contributions, the fund will grow sufficiently to provide the promised retirement benefits when the employee retires. In practice, however, large gaps often exist between the assets available in the retirement trust fund and the promises made to employees. Some estimates put the magnitude of unfunded liabilities – the excess of promises over assets – at approximately \$4.4 trillion at the end of 2011.<sup>2</sup> The aggregate level of unfunded pension liabilities, however, conceals considerable heterogeneity across plans, the reasons for which have not been explored adequately in the literature.

This paper offers an explanation for the existence of the underfunding that can also account for the wide variation in the generosity of public-sector pensions. It proposes that political competition, defined as the lack of a systematic electoral advantage by either political party, plays a key role in the underfunding of pension plans. To the extent that public-sector workers are better informed than workers in the private-sector, competition for votes creates incentives for politicians from both parties to offer generous retirement benefits to workers in the public sector and simultaneously, to not fund them fully, in order to avoid raising taxes on workers in the private sector. A higher degree of political competition will therefore be associated with a decline in the funding

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<sup>1</sup>Source: <http://news.wjct.org/post/curry-proposes-extending-sales-tax-pay-pension-debt-> Accessed 01/20/2016

<sup>2</sup>Rauh, J. (Oct. 5, 2011). "Shortfall for State and Local Pension Systems Today: Over \$4 Trillion": <http://kelloggfinance.wordpress.com/2011/10/06/shortfall-for-stateand-local-pension-systems-today-over-4-trillion> – Accessed 09/30/2013.

status of pension plans, an increase in the generosity of retirement benefits, and a choice of higher interest rates to discount the actuarial value of future liabilities.

To test the effects of political competition on funding and generosity, I examine local pension plans in the state of Pennsylvania. Pennsylvania provides a rich setting to investigate these issues because its local governments offer over 1,400 retirement systems which account for over 40 percent of all public-employee retirement systems nationally.<sup>3</sup> Panel data for all local pension plans from Pennsylvania are constructed using biennial reports of the Pennsylvania Public Employee Retirement Commission (PERC) available from 1985–2009. Using these data, I find that as the level of political competition in a municipality increases, pension plans become less funded and the level of unfunded liability per active member goes up. These results are obtained after controlling for municipality and decade fixed effects, suggesting that unobserved time-invariant heterogeneity across municipalities or aggregate time trends are not driving the results. The effects of political competition are economically large and statistically significant. A one standard deviation increase in the level of political competition is associated with a decrease in pension plan funding levels of approximately 7–10 percent and an increase in unfunded liabilities per active member of approximately \$2,400–3,300.<sup>4</sup>

In a different set of analyses using a second dataset from 2003 to 2009, I find that municipalities in Pennsylvania that are politically competitive offer more generous benefits and use a higher interest rate to discount actuarial liabilities. An increase in the level of political competition by one standard deviation is associated with an increase in annual average retirement benefits of about \$470–620 per retiree, or about 3.4% relative to their mean value. The interest rate used to discount future liabilities is also higher by about 5 basis points on average for the same increase in the level of political competition.

To account for the possible endogeneity of political competition, I use demographic characteristics of the population as instruments to predict variation in the intensity of political competition at the municipal level. I find that variation in the ancestral origins and ethnicity of the population predicts a considerable part of the variation in the Democratic vote share across municipalities in Pennsylvania. In particular, municipalities where a large fraction of the population is of German descent have a higher Republican vote share, whereas municipalities with large Irish-American,

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<sup>3</sup>Source: <http://www.census.gov/govs/retire/> Accessed 09/30/2013. Of the 3,418 public-employee retirement systems in the United States, 1,422 (or, 41.6%) are local retirement systems from Pennsylvania.

<sup>4</sup>A one standard deviation increase in the level of political competition, using the measure defined in Besley, Persson, and Sturm (2010), would result if the Democratic vote share were to go down from 57.2 percent (leaning Democratic) to 50 percent (most competitive), or go up from 42.8 percent (leaning Republican) to 50 percent (most competitive).

Italian-American, and Black populations, have a higher Democratic vote share. Instrumental Variable (IV) estimates of the effects of political competition using variation in these demographic characteristics corroborate the earlier findings.

I also provide results from three empirical tests that offer additional evidence supporting the predictions of the theoretical model. First, I examine the effects of political competition on the generosity of all defined contribution (DC) pension plans, as these plans are seen as less susceptible to political influence compared to DB plans.<sup>5</sup> In contrast to the results obtained earlier, I find that political competition has *no* effect on the employer contribution rate for DC plans.

Second, I examine the effects of political competition on the fiscal health of all DB plans offered by municipal authorities in Pennsylvania. In contrast to the governing body of a municipality that is directly impacted by the outcome of an election, the appointed board of a municipal authority is relatively removed from the electoral will of voters. The insulation of municipal authorities from political influence can be expected to result in a weaker relationship between political competition of the municipalities that constitute the service area of an authority and the fiscal health of pension plans operated by those authorities. This prediction is also confirmed in the data for all dependent variables of interest, viz. funding ratios, benefit levels, and interest rates. These results for municipal DC plans and DB plans operated by municipal authorities survive a host of robustness checks and are obtained in both an OLS and an IV set-up.

Third and finally, I examine a key implication of the theoretical model that the underfunding of pension plans by politicians can persist in equilibrium only if private-sector workers are not fully informed of the retirement benefits promised to public-sector workers. This test splits the sample of municipalities into two groups based on the level of voter awareness and engagement with the prediction that the effects of political competition will be larger in those municipalities that have a higher proportion of less informed voters. Using educational attainment of the population and length of residence in the same house as proxies for voter awareness and engagement, I find that the effects of political competition are indeed larger in municipalities (a) where the percentage of adult residents with a Bachelor's degree (or higher) is less than or equal to the median and (separately) (b) where the percentage of residents who have continuously stayed in the same residence is less than or equal to the median. The results from the sample-split analysis suggest that when faced with an electorate that is more aware and informed of the true cost of unfunded pension obligations, politicians are less likely to underfund public pensions.

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<sup>5</sup>“Defined contribution plans are retirement plans that specify the level of employer contributions, if any, and place those contributions in individual accounts. The value of an individual account is determined by the amount of money contributed and the rate of return on the money invested over time.” (BLS, 2010)

This paper contributes to a literature in political economy that has examined the effects of political competition on the choice of economic policy and on subsequent growth. Acemoglu and Robinson (2006) propose that more political competition may intensify political instability and diminish the incentives of elites to implement growth-enhancing reforms. Likewise, Lizzeri and Persico (2005) argue that competition, as measured by the number of parties, may reduce welfare as proliferation in parties may lead to an increase in targeted transfers rather than an increase in general-interest public goods. Unlike these models where political competition is detrimental for economic growth, Besley, Persson, and Sturm (2010) (henceforth BPS) propose a model in which political competition induces parties to adopt policies that promote growth rather than engage in rent-seeking. One key difference between the existing literature and this paper is that while the former focusses on the choice of policies that are easily visible to voters, this paper focuses on the effect of political competition on the choice of a policy – the funding level of a public pension – that has historically not been visible to the average voter.

This paper also contributes to a literature that has examined the existence of underfunding of public pensions. Theoretical explanations proposed focus on the differences in borrowing costs of citizens from the pension fund relative to the costs of borrowing in the private market (Mumy, 1978) or the desire of current residents to move out of a given jurisdiction and pass on the costs of these pensions to future residents (Inman, 1982). These explanations appear inadequate to explain the variation in the extent of funding found across retirement plans in practice.

Closest to the idea presented in this paper is Epple and Schipper (1981) who conjecture that increased political competition may induce politicians to underfund pension liabilities, so as to be able to reduce taxes in the short-run; this behavior is rewarded by those voters who are unaware of deferred pension obligations. Although the authors raise this possibility, they conclude otherwise based on their preliminary evidence. They examine variation in house prices across census tracts within various municipalities in the Pittsburgh SMSA and find some evidence that pension obligations are capitalized in house prices and, on that basis, conclude that these obligations are visible to local residents. Given data availability, their preferred specification is based on only 50-60 observations (census tracts) that are contained in 10 jurisdictions in the 1976 data and 25 jurisdictions in the 1978 data. Moreover, even if we accept their finding that unfunded pension obligations are reflected in house prices, that does not necessarily lead to the conclusion that *voters* are cognizant of unfunded pension obligations and consider them when casting their vote.

Rejecting the notion that public pensions are underfunded because they are not visible to voters, Epple and Schipper (1981) instead construct a model in which the desired time path of

consumption of public goods does not match the exogenously given revenue streams. They propose that if taxes are likely to be lower in the future than they are today when local governments need to contribute to the pension fund, then it may make sense to underfund the pension today in order to minimize the deadweight losses that would be incurred if taxes in the first period were high enough for the pension to be fully funded. However, for this to be plausible, future taxes would have to be projected to be significantly lower than where they are today.<sup>6</sup> In today's economic environment, given projections regarding the path of future government spending, such tax rates are unlikely to be realized any time in the near future (Summers, 2012). Hence motivating underfunding of pension plans by appealing to the possibility of lower tax rates in the future is not compelling.

On the empirical front, Eaton and Nofsinger (2008) analyze a relatively small sample of 60 state and local public pension plans and examine possible reasons for the growth in the underfunding of pension plans between 2002 and 2005. The authors find that plans having a higher proportion of women are less funded and suggest that this may be why teacher plans are less funded as these plans have a higher proportion of women than plans offered to other groups of public-sector employees. The paper suffers from a number of shortcomings. No evidence is provided of whether the sample of 60 plans analyzed is representative of the universe of public-sector pension plans. Second, in their analysis of the difference between contributions received and benefits paid out by the plans, the authors do not account for investment earnings even though they account for about six of every ten dollars in public retirement trust funds, with only the balance coming from employer and employee contributions (Fehr, 2011).

Munnell and co-authors (Munnell et al., 2010) consider variation in the actuarial funded ratios of 126 state and local defined benefit public-sector pension plans in 2009. The authors find that if the employer sponsoring the pension plan makes the actuarially required contribution (ARC) in full, the funded ratio is higher than in situations where the full ARC is not paid. One might expect a mechanical relationship between the actuarially funded ratio of the plan and whether a government has been making its actuarially required contribution or not. The endogeneity of the decision to make the actuarially required contribution is however not modeled.

Finally, Cogburn and Kearney (2009) consider unfunded liability per capita, aggregated at the state level across all plans offered by the 50 state governments as the dependent variable of interest. In their findings, the authors report a significant positive relationship between a state's level of fiscal constraint and unfunded pension liability. Consistent with the findings of this paper,

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<sup>6</sup>Inman (1982) does a numerical calibration and finds that tax rates would have to be approximately *half* of what they were in the 1970s to justify underfunding pensions.

they also find that “state decision makers’ relative liberalism and conservatism is unimportant to understanding unfunded pension liabilities.” Finally, they also find that an increase in the percent of state employees that are unionized does *not* lead to higher unfunded liabilities per capita.

These studies often have important limitations. All of the analyses (including those not reviewed here) introduce variables that are likely to be endogenous and are often based on cross-sectional analyses at the state level, raising the possibility that unobserved heterogeneity across states might be driving the relationships reported in these papers. This paper addresses these limitations by taking the endogeneity concerns of explanatory variables seriously. It is also the first paper to exclusively focus on local pension plans and one that employs a large panel dataset in the analysis.

The paper proceeds in seven sections. The next section outlines a theoretical model and derives two comparative statics results that inform the empirical analyses. Section 3 describes the data sources and the empirical specifications. Section 4 presents results, focusing on three key elements for municipal DB plans: the level of funding, the generosity of benefits, and the interest rate used for discounting actuarial liabilities. Section 5 presents three empirical tests that examine the assumptions of the theoretical model. Section 6 summarizes and makes a number of observations regarding the model and the internal and external validity of the results. Section 7 concludes.

## 2 Theoretical Model

In this section of the paper, I construct a stylized model that includes two groups of voters – workers in the public sector and workers in the private sector and focus on the role of political competition in explaining the variation in funding status of public pension plans. In the model, a higher intensity of political competition exacerbates the incentives of politicians to not fund the retirement benefits that have been promised to public-sector workers in order to avoid raising taxes on workers in the private sector. The two key assumptions made in constructing the model are that (i) politicians care about voter welfare in addition to winning elections (e.g. Ujhelyi, 2014), and (ii) as conjectured by Epple and Schipper (1981), private sector voters have imperfect information about the funding and generosity of public-sector pension plans (Glaeser and Ponzetto, 2014). The model then predicts that an increase in political competition will be associated with a decline in the funding status of pension plans.<sup>7</sup>

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<sup>7</sup>Without assumption (i), politicians would be tempted to minimize taxes by providing no funding for pension liabilities (which is inconsistent with the data), and without assumption (ii), private sector workers would be able to perfectly foresee and offset potential future tax hikes by adjusting their level of savings (a Ricardian equivalence type result).

The two groups of voters are denoted as  $P$  (private-sector workers) and  $G$  (public-sector workers). Two parties, denoted as  $L$  and  $R$  compete by choosing electoral platforms simultaneously.<sup>8</sup> To keep the model tractable, I focus on a single policy decision by the government and a single economic decision by public and private-sector workers. The government decides on the extent to which it funds the pension plan in the first period of a two-period model, taking as exogenous the level of wages in both sectors and the level of retirement benefits offered in the public sector. Workers decide on how much to save in the first period of the model, taking into account their wages, benefits (if any), consumption preferences, and projected path of taxes. The model is driven by the imperfect information problem private-sector workers face as they decide how much to save. Unable to anticipate the increase in taxes in the second period to make up for the shortfall that the government runs in the pension fund, private-sector workers face a decrease in utility caused by their sub-optimal savings decision and the resulting sub-optimal intertemporal allocation of consumption. The parties, in turn, decide on their electoral platform involving a choice of taxes for the first period of the model based on weighing the ego rents they receive from coming to office and the decrease in utility faced by private-sector workers as a result of the government running a deficit in the pension fund.

In the first stage of the model, both parties announce platforms simultaneously under uncertainty about an aggregate popularity shock. Second, the aggregate popularity shock is realized as voters consider the platforms announced by the two parties and cast their votes.<sup>9</sup> Finally, the party winning the election implements its announced platform and voters make private economic choices in light of the policy chosen.<sup>10</sup> The next subsections deal with these choices in reverse order.

## 2.1 The economic model

There are two time periods in the model. Workers in both sectors work in period 1 and retire in period 2. Thus, in each time period, there are two groups of workers in each sector – currently active workers and retired workers. The only choice for workers who are currently active is a decision of how much to save in the first period of the model.

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<sup>8</sup>I do not allow for free entry by other political parties. This keeps the model tractable and also reflects party competition in the United States. Local elections within Pennsylvania are held on partisan lines and an overwhelming proportion of candidates and an even larger proportion of winners are drawn from either of the two national parties.

<sup>9</sup>I assume full turnout in the model and do not consider abstentions.

<sup>10</sup>Although the model has two periods, I consider only one election, which is held prior to the first period of the model. Nothing hinges on this modeling choice. All that I require is that the government in office in period 2 is constrained to honor the pension obligations that were made by the government in period 1, irrespective of the identity of the party in power in that period.



I assume that the government is constrained to running a balanced budget as far as current compensation of public-sector workers is concerned and that the tax instrument available to the government is a lump-sum tax.<sup>11</sup> It inherits a pension fund at the start of period 1 that is balanced, i.e. has enough assets to cover all liabilities and operates under the constraint that the pension fund be balanced at the end of period 2. The only decision it makes is the extent, if any, to which it runs a deficit in the pension fund in period 1 of the model.

### 2.1.1 Optimization by private-sector workers

A critical assumption of the model is that private-sector workers are not fully informed of the retirement benefits that have been promised to public-sector workers. This is in line with the intuition in Epple and Schipper (1981) and the assumption made in Glaeser and Ponzetto (2014), who argue that pension obligations are shrouded because of lower availability of information about pensions than wages and because of the greater difficulty of understanding the accrual of pension obligations, in contrast to current compensation.<sup>12</sup> The implication of this assumption is that private-sector workers cannot figure out whether the level of taxes announced by the parties for period 1 corresponds to funding the pension plan fully or underfunding it. In what follows I model how politicians can use this lack of information to announce a lower level of taxes in period 1 than required for funding the pension plan fully and thereby increase their probability of election.

I model the savings decision for the representative private-sector worker. With  $c_1^P$  and  $c_2^P$  as consumption in periods 1 and 2, her utility across both periods can be expressed as:

$$U^P(c_1^P, c_2^P) = u(c_1^P) + \beta u(c_2^P), \quad (2.1)$$

If her earnings in period 1 are  $W^P$  (given exogenously), savings in period 1 are  $s^P$ , and period 1 and period 2 taxes are  $T_1$  and  $T_2$  respectively, then the problem for the private-sector worker is:

$$Max_{\{s^P\}} U_{per}^P(c_1^P, c_2^P) \equiv Max_{\{s^P\}} [u(W^P - s^P - T_1) + \beta u(s^P * (1 + r) - E(T_2|T_1))] \quad (2.2)$$

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<sup>11</sup>The model does not hinge on the assumption that the only tax instrument available is a lump-sum tax. Assuming a lump-sum tax is equivalent to allowing a proportional income tax with an inelastic labor supply and earnings that are given exogenously. Allowing for the labor supply to be elastic would offer another reason for politicians to fund pensions fully and balance taxes over time as deadweight losses would be higher with a tax rate that fluctuates significantly between the two periods than an alternative regime that is level over time but raises the same amount of revenue.

<sup>12</sup>In support of their claim, they mention that state employee salaries are publicly disclosed every year whereas no such database exists for the accruing pensions of currently employed civil servants. For example, salary data for state employees from the state of Pennsylvania are available at: [http://www.pennlive.com/midstate/index.ssf/2013/03/search\\_pennsylvania\\_state\\_empl.html](http://www.pennlive.com/midstate/index.ssf/2013/03/search_pennsylvania_state_empl.html).

where the “per” subscript denotes perceived (rather than realized) utility and  $E(T_2|T_1)$  reflects the expected value of period 2 taxes given the level of period 1 taxes. To focus attention on the political economy of pensions, I set

$$\beta = 1/(1+r) \quad (2.3)$$

Although the specific functional form assumed here is not subsequently used in the derivation of the political equilibrium or the comparative statics, assuming a logarithmic utility function enables a closed-form solution for the level of savings and offers additional insights. With that assumption, the solution to this optimization problem is for the private-sector worker to save an amount  $s^P$  from period 1 wages,  $W^P$  given by:

$$s^P = (W^P - T_1 + E(T_2|T_1))/(2 + r). \quad (2.4)$$

Based on the assumption that private-sector workers do not know the level of retirement benefits offered in the public sector, they are unaware of whether taxes announced for period 1 are adequate to fund the pension plan fully or whether they fall short of full funding. As a result, private-sector workers cannot correctly anticipate what the level of taxes in period 2 would be in order to have the pension plan be balanced at the end of that period. I make the assumption that the private-sector worker naively sets  $E(T_2|T_1) = T_1$ . With that assumption, (2.4) simplifies to:

$$s^P = W^P/(2 + r). \quad (2.5)$$

Based on the fact that period 1 taxes,  $T_1$ , must be adequate to support current compensation and partly fund the pension plan,  $T_1$  is given by the following expression:

$$T_1 = N^G * (W^G + a * \frac{B^G}{(1+r)}) \quad (2.6)$$

with  $a$ , the level of pension plan funding chosen in period 1 of the model  $\epsilon[0, 1]$  and where  $N^G$ ,  $W^G$ , and  $B^G$  denote the number of employees in the public sector, and wages and pensions offered to employees in that sector.<sup>13</sup> Substituting (2.3), (2.5), and (2.6) in (2.2), we see that:

$$U_{per}^P = \frac{(2+r)}{(1+r)} * u(W^P * \frac{(1+r)}{(2+r)} - N^G(W^G + a * \frac{B^G}{(1+r)})). \quad (2.7)$$

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<sup>13</sup>Recall that in any given period, there are two generations of workers in each sector of the economy, of which one generation is working and the other is retired. Thus, the total population at any given point of time is:  $2 * N^P + 2 * N^G$ . The normalization I choose is:  $(2 * N^P + 2 * N^G) = 1$ .

As the above expression suggests, the *perceived* utility of private-sector workers depends (negatively) on  $a$ , with no bound except at  $a = 0$ .

### 2.1.2 Optimization by public-sector workers

The optimization problem for public-sector workers is similar in spirit to the above optimization problem but with two differences. First, public-sector workers have a second source of income during retirement, besides their own savings, viz. a pension. Second, unlike workers in the private sector, who are uninformed of the level of benefits, public-sector workers are aware of the level of benefits that they have been promised. As a result, the decision by either political party to set a low level of taxes in period 1 (and hence underfund the pension plan) does not influence their voting behavior. A proof for this claim is provided in Appendix A.1.

## 2.2 The political model<sup>14</sup>

### 2.2.1 Parties

The two parties in the model differ on a dimension unrelated to their stance on economic issues, which I label as “ideology.” Ideology is not amenable to change at will during an election campaign and is assumed invariant over time.<sup>15</sup> Parties care about winning elections but they also care about voter well-being. This latter assumption, although non-standard, is not without precedence. Wittman (1977, 1983) argues that politicians care about policies and makes the point that in standard voting models voters are assumed to vote for the candidate whose policies will yield them the highest expected utility and are hence interested in policy themselves. It seems strange then to assume that, unlike voters, politicians do not care about substantive policy, even though the effects of government policies are experienced by all, including the politicians themselves (Wittman, 1983). Along related lines, we have the following from Ansolabehere (2008):

The labor market for politicians may sustain the expression of candidate preferences in electoral competition. . . . Local posts are usually part-time or volunteer jobs. The appeal of such posts is the ability to make a difference in the community, rather than the pay. Those who get involved in local government, then, are motivated at first by ideological or “consumption” benefits, rather than by the value of office.

Ujhelyi (2014) in studying the policy impact of civil service regulations implemented at the state level in the U.S. during the 20<sup>th</sup> century, also assumes that politicians care about social welfare in

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<sup>14</sup>The political model draws on the model of electoral competition laid out in Persson and Tabellini (2002).

<sup>15</sup>In the U.S. context, one might think of cultural issues such as abortion or gun control or gay marriage as non-economic issues along which voters sort across party lines.

addition to private benefits.

Therefore, I let the utility of politicians be a function of both the ego rents obtained from winning office and the realized utility of all voters, which depends on policies chosen by the incumbent government. I allow for the possibility of a systematic difference in the ex-ante utility as perceived by voters when the policies are announced (and on the basis of which they vote in the elections) from the ex-post utility as realized by them after policies in both periods have actually been implemented. This allows for the possibility that although some policies may initially appear favorable to voters (and hence popular with them), those policies may harm them in the long run. For example, taking on high levels of debt in one period to have them be repaid in a subsequent period may be an example of one such policy as long as voters misperceive the true costs of the debt and do not make fully offsetting adjustments by saving in a period of high debt accumulation and dis-saving in the subsequent period. In such a setting, the Ricardian equivalence would fail to hold.

## 2.2.2 Voters

$U_{per}^{ij}$  and  $U_{act}^{ij}$  capture the economic well-being of voter  $i$  belonging to group  $j$  as perceived by the voter prior to voting and that realized by the voter after the actual implementation of policies respectively,  $j \in \{P, G\}$ . In general,  $U_{per}^{iP} \neq U_{act}^{iP}$  whereas  $U_{per}^{iG} = U_{act}^{iG}$  because public-sector workers correctly anticipate the level of taxes in period 2.

All voters vote based on a combination of economic and ideological considerations. Let  $v_{per}^{ij}$  and  $v_{act}^{ij}$  denote the utility of voter  $i$  belonging to group  $j$  as perceived by the voters prior to voting and as realized after the actual implementation of policies respectively, reflecting both economic and ideological considerations that voters value. Voting behavior depends on  $v_{per}^{ij}$ , whereas actual realized voter well-being depends on  $v_{act}^{ij}$ .

Finally, let  $p^k$  denote the probability that politician from party  $k$  wins when the level of period 1 taxes announced are  $T_1^k$  and  $T_1^{-k}$  respectively,  $k \in \{L, R\}$ .<sup>16</sup> Let  $E$  denote the ego rents for politicians from coming to office.<sup>17</sup> Thus, I express  $V^k$ , the utility of politician from party  $k$ ,  $k \in \{L, R\}$  as:

$$V^k = p^k(a^k, a^{-k}) * [E + \sum_j N^j U_{act}^j(a^k)] + (1 - p^k(a^k, a^{-k})) * \sum_j N^j U_{act}^j(a^{-k}) \quad (2.8)$$

where  $U_{act}^j(a^k)$  ( $U_{act}^j(a^{-k})$ ) is the ex-post economic utility realized for voters belonging to group  $j$

<sup>16</sup>-k denotes the other party. For example,  $p^R = p^R(T_1^R, T_1^{-R})$ . I express the probability of winning in terms of the level of funding implicitly chosen for the pension plan as there is a one-to-one mapping between the level of period 1 taxes announced,  $T_1^k$  and the level of funding chosen,  $a^k$ .

<sup>17</sup>For simplicity, I let the ego rents,  $E$ , be the same for politicians of both parties.

when  $a^k$  ( $a^{-k}$ ) is the level of pension plan funding that is chosen. More simply,  $V^k$  is given by:<sup>18</sup>

$$V^k = p^k(a^k, a^{-k}) * [E + \sum_j N^j (U_{act}^j(a^k) - U_{act}^j(a^{-k}))] + \sum_j N^j U_{act}^j(a^{-k}) \quad (2.9)$$

I express the perceived utility of voters based on the policy chosen as:  $v_{per}^{ij}(a^k) = \kappa^j U_{per}^j(a^k) + (\sigma^{ij} + \theta) * D^L$ , where  $D^L$  takes a value of unity if party  $L$  wins the election and zero otherwise. Here  $\sigma^{ij}$  is an individual-specific parameter and  $\theta$  is a random variable capturing the preferences of the whole population. Individuals with  $\sigma^{ij} > 0$  ( $< 0$ ) have a bias in favor of (or against) party  $L$ , which is stronger the greater  $\sigma^{ij}$  is (in absolute value). I assume that  $\sigma^{ij} \sim U[-\frac{1}{2m^j}, \frac{1}{2m^j}]$ . Thus each group has members inherently biased towards each of the parties, even though the distribution of party bias may differ across groups. Groups may also differ in the extent to which they care about ideology. A higher  $\kappa^j$  reflects a higher weight placed by members of group  $j$  on economic well-being relative to ideology. Lastly,  $\theta$  captures the average popularity of party  $L$  in the overall electorate. I also assume that  $\theta \sim U[-\frac{1}{2h}, \frac{1}{2h}]$ . The specific realization of  $\theta$  is unknown to the parties when they announce their platforms, making the election outcome uncertain.<sup>19</sup>

## 2.3 Solution of the game

### 2.3.1 Equilibrium

I use backward induction to solve for the equilibrium of the game. The equilibrium concept used is that of sub-game perfect Nash equilibrium. To solve for the Nash equilibrium of the game, I derive the best response function for the candidate of each party. Following a set of steps outlined in the Appendix, I show that the best response function is symmetric for both parties,  $L$  and  $R$  and does not involve any variables which are party-specific. Thus, in Nash equilibrium, the parties announce identical policy platforms, i.e. the same level of taxes for period 1 of the model, which, in turn, correspond to identical pension plan funding levels. Thus in equilibrium,  $a^L = a^R$ . Furthermore, under the set of conditions laid out in (A.3), I can show that both parties choose to fund the pension plan less than fully, i.e.  $0 < a^L = a^R < 1$ .

<sup>18</sup>In order to rule out the possibility that the candidate wants to lose the election in order to maximize his utility, I impose the constraint that  $E$ , the ego rents from office, are large enough such that  $[E + \sum_j N^j (U_{act}^j(a^k) - U_{act}^j(a^{-k}))] > 0$  for all possible choices of  $a^k$  and  $a^{-k}$ ,  $k \in \{L, R\}$ .

<sup>19</sup>We might think of  $\theta$  as a piece of news (say, a scandal) which comes out shortly before an election, but after policies have already been announced by the parties, that affects the probability of voting for a particular candidate from a party for all voters equally.

### 2.3.2 Comparative Statics

In this sub-section I consider the effects of an increase in the level of political competition on the equilibrium pension plan funding levels,  $a^L$  and  $a^R$ . I derive two results, each of which reflects alternative ways of thinking about the effect of an increase in the level of political competition. All proofs are provided in the Appendix.

**(1) Result 1 – An increase in the weight voters place on economic well-being relative to ideology:** The parameter in this model that captures the weight placed by voters on economic well-being is  $\kappa^j$ . Groups with a higher value of  $\kappa^j$  are more mobile and politicians may weigh their welfare more (and announce policies accordingly) because doing so increases the politicians' chances of winning the election. Thus, the interest is in  $\frac{\partial a^k}{\partial \kappa^j}$ ,  $j \in \{P, G\}$  and  $k \in \{L, R\}$ . I use the implicit function theorem to show that  $\frac{\partial a^R}{\partial \kappa^P} < 0$  with  $\frac{\partial a^R}{\partial \kappa^G} = 0$ . Thus, as the weight placed by private-sector workers on (misperceived) economic well-being goes up (relative to the weight that they place on ideology), the policies announced by the politicians correspond to a lower level of funding of the pension plan in period 1. Interpreted more broadly, with an increase in the weight placed by individuals on economic well-being, politicians are less willing to announce policies that result in immediate economic pain at the cost of long-term gains because of the misperception by voters about the true costs of such policies.

**(2) Result 2 – Moderation of party preferences:** The second comparative statics I consider is the effect of a change in the density  $m^j$  on the policy choice that is made,  $j \in \{P, G\}$ . An increase in the density,  $m^j$  corresponds to a higher fraction of workers from the  $j$ -th sector having preferences that are “moderate.”<sup>20</sup> As before, I use the implicit function theorem to show that  $\frac{\partial a^R}{\partial m^P} < 0$  and  $\frac{\partial a^R}{\partial m^G} = 0$ . Thus, if private-sector workers become more ideologically neutral, as proxied by an increase in the density  $m^P$ , the model predicts a decline in equilibrium pension plan funding level.

In summary, an increase in the level of political competition, whether proxied by an increase in the weight private-sector workers place on economic well-being relative to ideology or by a moderation in their party preferences, is associated with a decline in the equilibrium pension plan funding level. Although the model does not directly predict that higher levels of political competition will be associated with more generous benefits (recall benefit levels were taken as exogenous), we can see that if the pension plan is not funded fully, then politicians would prefer compensating employees in the form of benefits, which are paid several years in the future, rather

<sup>20</sup>This can be seen more readily in case  $\sigma^{ij}$  had a smooth unimodal distribution. In that case, a shift of the mass in the distribution towards the middle would raise the probability distribution function,  $g_\sigma$  in that range. An increase in the density  $m^j$  of the assumed uniform distribution could be thought of as approximating such a shift towards a more ideologically neutral electorate.

than in the form of wages. Thus, in practice, we would expect to see more politically competitive jurisdictions also offering more generous benefits. A similar logic would apply to the interest rate used for discounting actuarial liabilities as the effect of choosing a higher interest rate is to make liabilities appear smaller than what they are and to reduce the actuarially required contribution to the pension fund.

### **3 Empirical analysis**

#### **3.1 Construction of Variables and Data Sources**

I now turn to empirically examine the hypothesis that a higher level of political competition is associated with a lower actuarial funded ratio and more generous benefits. In order to do so, I examine local pension plans from the state of Pennsylvania. Pennsylvania provides a rich setting for the empirical analysis as it accounts for two-fifths of the nation's distinct public sector retirement systems and offers more than thrice the number of retirement systems as that of any other state. The existence of such a large number of retirement systems in Pennsylvania can be attributed to its complex system of local government. General purpose local governments – cities, boroughs, and townships – total approximately 2,600 units. Moreover, unlike other states with a large number of municipal governments, most general purpose local governments in Pennsylvania establish separate pension plans for their police and non-uniformed employees and are not part of a larger state-wide plan.<sup>21</sup> The advantages of using municipal data to test the hypotheses are the large number of comparable cases that share the same national and state-level political context (e.g. state tax rates) at the same time they exhibit wide variation on the variables of interest, viz. political competition and funding status of pensions. In addition, the availability of rich municipal-level data from the Decennial Censuses and the American Community Surveys (ACS) enables me to control for many potentially important municipal characteristics.

Data regarding municipal pension plans offered by the various local governments within Pennsylvania are available from 1985 through 2009 in the form of biennial status reports prepared by the Pennsylvania Public Employee Retirement Commission (PERC). Status reports include the name of the municipal entity offering the plan, the employee group covered, the actuarial liabilities, actuarial assets, and number of active members in the plan. Using these reports, I construct two variables that are used in the empirical analysis: the actuarial funded percentage, defined as

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<sup>21</sup>Larger municipalities may also have a separate pension plan for firefighters. Teachers belong to a separate state-wide system, the Pennsylvania Public School Employees Retirement System (PSERS) that is not a part of this analysis.

the ratio of actuarial assets to actuarial liabilities multiplied by 100, and unfunded liabilities per active member, defined as (Actuarial Liabilities - Actuarial Assets)/ (Number of active members).<sup>22</sup>

Constructing measures of political competition at the local level is challenging as there is no central repository for data on municipal elections at either the federal or the state level. I construct proxy measures for political competition at the local level by looking at the vote shares for the two parties for all races held between 1980 and 2009 to any of the six offices for which elections are held on a state-wide basis, namely, U.S. President, U.S. Senator, Governor,<sup>23</sup> Attorney General, Auditor General, and Treasurer.<sup>24</sup> Data on votes cast for each of these offices for candidates from both the Republican and Democratic parties (and any other parties that may have contested) are available at the level of each individual municipality in successive issues of the Pennsylvania Manual. Because the results for a particular candidate in any one election cycle may have a large idiosyncratic component to it, I average the Democratic vote share<sup>25</sup> across all elections held within a given time period (either decade or year) to any of the six offices in constructing the average Democratic vote share for that time period. For example, in constructing a measure of political competition for a municipality for the 1990s decade, I examine all state-wide races held between 1990 and 1999 to any of the six offices for that municipality. The key measure of political competition I use in the paper is that used in BPS (2010); political competition for municipality  $m$  in decade  $d$  is defined as:  $PC_{md} = -|D_{md}-0.5|$  where  $D_{md}$  is the average Democratic vote share in municipality  $m$  in decade  $d$ .<sup>26</sup>

In the empirical analysis, I start off with a parsimonious specification that includes only the measure of political competition and average Democratic vote share along with municipality and decade fixed effects and employee-group dummies.<sup>27</sup> In subsequent specifications, I include time-varying controls at the municipal level that might affect pension plan funding level – the percentage of households that are owner-occupied (versus renter-occupied), the percentage of population

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<sup>22</sup>To take a numerical example, consider a plan with 100 active members whose actuarial liabilities and actuarial assets are valued at \$4 million and \$3 million respectively. For such a plan, the actuarial funded ratio is 3/4, or 75 percent, and unfunded liabilities per active member are (\$4 million - \$3 million)/100 or \$10,000.

<sup>23</sup>Election for the office of Lieutenant Governor is held separately in the primary election; for the general election each party's ticket for Governor and Lt. Governor is made up of the highest vote getters in the separate primary elections.

<sup>24</sup>As BPS (2010) note, name recognition of candidates for down-ballot offices is typically very low among voters, making it likely that measures of political competition based on races for these offices is driven largely by party attachment of voters rather than the popularity of individual politicians.

<sup>25</sup>Defined as Votes cast for Democrats/ (Votes cast for Democrats + Votes cast for Republicans).

<sup>26</sup>Following BPS (2010), note that I can include both the Democratic vote share ( $D_{md}$ ) and the measure of political competition ( $PC_{md}$ ) in the same regression because of the kink in the measure of competition when the Democratic vote share reaches 50 percent.

<sup>27</sup>Introducing average Democratic vote share lets us separately identify the effect of an increase in Democratic support from an increase in the level of political competition. My results are robust to excluding the average Democratic vote share and only including political competition in the regressions.



aged 75 or older, and the unemployment rate. The first control is included because owners may have a longer time horizon than renters, who are more transient, and we may therefore expect municipal pension plans to have a higher funded ratio in jurisdictions where a larger fraction of households are owners. I include the percentage of population aged 75 or older as a control for the age structure of the population as municipalities with a larger fraction of older voters may be more willing to simply pass on these obligations to future generations. Lastly, the local unemployment rate proxies for local economic conditions as municipalities experiencing high levels of fiscal stress may find it hard to fund their pension plans. All of these variables are drawn from the 1980, 1990, and 2000 Decennial Censuses.

In subsequent specifications, I also include two additional controls: the share of tax revenues spent on debt servicing and the percentage of pension costs paid by the state. The first control is constructed using municipal financial reports prepared on an annual basis by the Department of Community and Economic Development (DCED) of Pennsylvania and offers a snapshot of municipal fiscal health. For the second control, I note that Pennsylvania distributes about \$200 million each year as aid to municipalities in meeting their pension costs. This state aid is linked to the amount of tax collected on insurance premiums from all out-of-state insurance companies and can only be used to subsidize pension costs of municipalities. Aid is capped and limited to the entirety of the annual pension costs payable by the municipality. For other municipalities, where pensions costs are high enough that available state aid does not defray the full pension costs, the amount of aid per eligible employee is based on the total amount of money available for distribution and the total number of employee units across all municipalities.<sup>28</sup> I control for the percentage of pension costs borne by the state as one might expect unfunded liabilities to be smaller in municipalities where a greater share of the pension costs are borne by the state.

Although the variation in the amount of state aid from year to year is exogenous to pension plan characteristics for a given municipality or a municipality's own fiscal conditions, it is likely that the degree to which municipalities use up the amount of state aid available in any given year depends on their intensity of political competition. Municipalities that are more politically competitive may be more likely to set their compensation package such that they use up the entire state aid that is available.<sup>29</sup> Therefore, I instrument the percentage of pension costs reimbursed by the state with the weighted average percentage of pension costs borne by the state in all *other*

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<sup>28</sup>The only exception to these general rules is a specific cap for the city of Philadelphia which is limited to receiving a maximum of 25 percent of the total money available under this scheme.

<sup>29</sup>Preliminary evidence confirms that the level of political competition and the percentage of pension costs paid by the state are positively correlated.

municipalities located within the same county as the municipality in question.<sup>30</sup> This data on pension aid received by each municipality over the period 1985 and 1990–2009 has been obtained through filing a Right-to-Know request with the Auditor General’s office which is responsible for distributing the aid to municipalities.

Summary statistics for all variables are presented in Table 1 below. The table indicates the large amount of variation in each of the dependent variables of interest: the actuarial funded ratio, the annual average pension benefit, and the interest rate used for discounting actuarial liabilities.<sup>31</sup> I also note the considerable variation in the level of political competition observed from -0.401 (corresponding to a Democratic vote share of 0.901 in Yeadon Borough, Delaware County for the 2000s – least competitive) to -0.000 (corresponding to a Democratic vote share of 0.500 in Highspire Borough, Dauphin County for the 2000s – most competitive). The difference in the level of political competition between Yeadon and Highspire Boroughs is the maximum variation in the independent variable of interest observed in the data.

[Table 1 about here.]

### 3.2 Empirical Specification

When considering the funded ratio and the size of unfunded liabilities for which data is available on a biennial basis over a 25-year period from 1985 to 2009, the empirical specification used is:

$$F_{imd} = \alpha + \beta_1 * PC_{md} + \beta_2 * D_{md} + \beta_3 * C_{id} + \beta_4 * X_{md} + \lambda_m + \gamma_d + \varepsilon_{imd} \quad (3.1)$$

where:

- $F_{imd}$  is the dependent variable: either the average funded ratio (defined as the ratio of actuarial assets to actuarial liabilities multiplied by 100) for plan  $i$  in municipality  $m$  averaged over decade  $d$  or the level of unfunded liabilities per active member in the plan, averaged over the same time period.
- $PC_{md}$  is a measure of political competition in the municipality  $m$  averaged over decade  $d$ ;

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<sup>30</sup>Thus, for example, for State College Borough in Centre County for the 1990s, I instrument the percentage of pension costs paid for that municipality by the weighted average percentage of pension costs paid for in the remaining 35 municipalities within Centre County in that decade.

<sup>31</sup>I note that the summary statistics for actuarial funded ratio and unfunded liabilities per active member are based on numbers as reported by the municipalities themselves and discount future actuarial liabilities at an interest rate ranging between 5.5–8.0%. If an interest rate of 3.5% were used instead reflecting the nominal yield on long-term Treasury bonds, then using a back-of-the-envelope calculation, the median actuarial funded ratio would decline from 103.05 to 64.69. Assuming an interest rate of 5% for discounting actuarial liabilities, reflecting yields on high-grade corporate bonds, cause the median actuarial funded ratio to decline from 103.05 to 79.13.

- $D_{md}$  is the average Democratic vote share for municipality  $m$  as of that same period;
- $C_{id}$  are a set of dummy variables indicating which group of employees are covered by the plan (e.g. policemen or non-uniformed personnel, etc.);
- $X_{md}$  are time-variant controls at the municipal level. These include the percentage of households that are owner-occupied, the percentage of population aged 75 or older, the unemployment rate, the fraction of tax revenues spent on debt service, and the percentage of pension costs borne by the state, instrumented as described above.
- Lastly,  $\lambda_m$  are municipal fixed effects and  $\gamma_d$  are decade fixed effects.

The choice of control variables is influenced by the prior literature (Eaton and Nofsinger, 2008; Cogburn and Kearney, 2009; Munnell et al., 2010) and the availability of data. I include municipal fixed effects in all specifications and thus municipal-level factors that are invariant over time (such as class of municipality) are absorbed in these fixed effects. I cluster standard errors at the county level all throughout to account for inter-temporal correlation in the error terms (Bertrand, Duflo, and Mullainathan, 2004).

When considering the generosity of the pension plan and the interest rate used for discounting future actuarial liabilities, for which data is available on a biennial basis for a 7-year period from 2003 to 2009, the empirical specification needs to be modified. As it becomes less plausible for a change in the level of political competition within a municipality to have an effect on the features of the pension plan within this short time period, I dispense with the use of municipal fixed effects. Instead, I use county fixed effects,  $\lambda_c$  in the following specification. I also replace decade fixed effects with year fixed effects,  $\gamma_t$ . Thus, the specification used is modified as:

$$F_{imt} = \alpha + \beta_1 * PC_{m(t-1)} + \beta_2 * D_{m(t-1)} + \beta_3 * Z_{it} + \beta_4 * X_{mt} + \lambda_c + \gamma_t + \varepsilon_{imt}. \quad (3.2)$$

In addition to the differences noted above between (3.1) and (3.2), I lag the political variables by a year because elections to national and state offices are held in even-numbered years whereas the data on pensions is for odd-numbered years. I also introduce data on three additional control variables in these specifications – the fraction of employees that are organized under collective bargaining, a dummy variable that captures the coverage of local employees under Social Security, and the class to which a municipality belongs (for example, Township versus Borough versus City).<sup>32</sup>

<sup>32</sup>About 28 percent of state and local government employees in the U.S. were not covered by Social Security in 2008 (Nuschler, Shelton, and Topoleski, 2011). I find that extent of coverage of local employees within Pennsylvania under Social Security is similar to the national average, with about 26 percent of local employees in the sample not covered by Social Security in 2009.

Municipalities of different classes differ in the set-up of their local governments, which might also influence the characteristics of their pension plans. Lastly, given that the 2010 Census does not have data on the same set of demographic and socioeconomic characteristics as were available for prior Censuses, I use the 2007–2011 ACS to obtain necessary data on the control variables.<sup>33</sup>

## 4 Results

In this section, I present the results of analyzing the fiscal health of defined benefit pension plans operated by the various municipalities within Pennsylvania as judged on a number of dimensions. I present my results in three sub-sections: the first deals with the actuarial funded ratio and the level of unfunded liabilities, the second deals with the generosity of benefits, and the third with the interest rates used for discounting future actuarial liabilities.

### 4.1 Results on funded ratio and unfunded liabilities

The data available from the biennial status reports of the Pennsylvania PERC from 1985 through 2009 make it possible to analyze the actuarially funded ratio and the level of unfunded liabilities per active member. I present the results of estimating specification (3.1) with the actuarial funded ratio as the dependent variable in the first three columns of Table 2 and with unfunded liabilities per active member as the dependent variable in the last three columns of the same table. Column (1) corresponds to the most parsimonious specification and includes only controls for the average Democratic vote share, dummy variables for the various employee groups covered by the pension plans, and municipal and decade fixed effects. Column (2) introduces the time-variant controls from the Census that control for homeownership, the age structure of the population, and the local unemployment rate. Finally, column (3) is the most complete specification and includes all municipal-level controls including the fraction of tax revenues spent on debt service and percentage of pension costs paid by the state (instrumented as described earlier). Columns (4) through (6) follow the same pattern as columns (1) through (3).

[Table 2 about here.]

The estimated coefficients on political competition in the first row suggest that a higher level of political competition is associated with a statistically significant decline in the actuarial funded

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<sup>33</sup>I use a linear interpolation using data from the 2000 Census and the 2007–2011 5-year ACS for estimates of the municipal demographic controls for each year between 2003 and 2009.

ratio and an increase in the level of unfunded liabilities per active member. To provide a sense of magnitude of these effects, note that if the level of political competition were to increase by one standard deviation,<sup>34</sup> the funded ratio for the average pension plan would decline by about 7–8 percent and unfunded liabilities per active member would increase by about \$2,400–2,700.

In addition to using the above measure of political competition, I can also operationalize political competition differently. As pointed out by Boyne (1994), one ought to take the volatility of party strength into account when constructing a measure of political competition. Therefore, an alternative measure of political competition I construct is the standard deviation of Democratic vote share across all elections over a decade. Results with political competition, thus defined, as the independent variable are presented in Table 3 following the same pattern as used in Table 2.

[Table 3 about here]

As we can see, political competition continues to have a negative and statistically significant effect on the actuarial funded ratio and a positive and statistically significant effect on the size of unfunded liabilities per active member. A one standard deviation increase in the level of political competition leads to a decline in the actuarial funded ratio of about 10 percent and an increase in the unfunded liabilities per active member of about \$3,200.

## **4.2 Results on plan generosity**

Following the examination of the effects of political competition on the funding status of public-sector pension plans, I now turn to an analysis of the effects of political competition on the generosity of these plans. When defining the generosity of a plan, I include the pension offered to employees who retire from service in the normal course of events or employees who are enrolled in the Deferred Retirement Option Plans (DROP) but exclude the pension received by disabled employees or recipients of surviving spousal or surviving child benefits.<sup>35</sup>

The pattern in which the regression results are presented in the next two tables (Tables 4 and 5) is similar to that of the prior tables with the exception that, for these tables, I include county fixed effects rather than municipal fixed effects and year fixed effects rather than decade fixed

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<sup>34</sup>A one standard deviation increase in the level of political competition, using the measure defined in BPS (2010), would result if the Democratic vote share were to go down from 57.2 percent (leaning Democratic) to 50 percent (most competitive), or conversely, go up from 42.8 percent (leaning Republican) to 50 percent (most competitive).

<sup>35</sup>Under DROP, employees accumulate their monthly service retirement benefit in an interest-bearing account while continuing to be employed by their employer.

effects.<sup>36</sup> I am also able to include additional control variables: the fraction of employees covered by collective bargaining, Social Security coverage under the pension plan, and dummy variables for the class of municipality.

Columns (1) through (4) of the following table consider the variation in the level of benefits in absolute terms and do not control for the level of wages. Columns (5) through (8) introduce the log of benefits as the dependent variable and also control for the log of wages to allow for the possibility that wages may be lower to offset the increased generosity of pensions and in that case, looking at retirement benefits alone may offer a misleading picture of plan generosity.

[Table 4 about here.]

As the coefficients on political competition from the first row of Table 4 suggest, an increase in the level of political competition is associated with an increase in the average pension received by retirees. Based on the coefficients in columns (1) through (4), a one standard deviation increase in the level of political competition is associated with an increase in the average pension received by retirees of about \$470–620 per retiree. Given that the average annual pension received by retirees is about \$15,360, this translates to an increase in the generosity of the pension of about 3.0–4.0%.

The estimates in columns (5) through (8) support the conclusions reached on the basis of columns (1) through (4). The coefficients in the first row suggest that, controlling for the log of wages, a one standard deviation increase in the intensity of political competition is associated with an increase in the generosity of the pension benefit of about 3.2–3.8%. Contrary to the theory of compensating differentials (but consistent with much of the empirical literature), the coefficient on wages in these benefit regressions is positive and statistically significant across specifications.<sup>37</sup>

A number of the other coefficients also have expected signs, although only a few are statistically different from zero. The coefficient on the fraction of employees represented by collective bargaining is positive and statistically significant at the 1% level in each of the 8 specifications in which it is introduced, suggesting that unionization is associated with an increase in the generosity of these benefits. The estimated effects of being organized under collective bargaining are large, ranging from 27–32% when I do not control for wages and 20–27% when I do.

Among other findings, the negative coefficient on the unemployment rate in columns (3) and

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<sup>36</sup>Additional regressions that involve municipal fixed effects, in a long difference setting, are consistent with the conclusions of this section and are available from the author on request.

<sup>37</sup>However, this does not suggest that the higher retirement benefits simply result from higher wages. When I examine the effects of political competition on either the ratio of benefits to wages or the difference between the log of benefits and the log of wages, I continue to find positive effects of political competition that are economically and statistically significant.

(4) suggests that municipalities that are experiencing fiscal stress are less likely to offer generous retirement benefits to their public-sector workers. A one standard deviation increase in the local municipality-specific unemployment rate of 2.84% is associated with a decrease in the average annual pension of \$540 per retiree, roughly the same order of magnitude as a one standard deviation increase in the level of political competition. The coefficient on Social Security coverage is also negative, although statistically insignificant. This finding is consistent with pension plans that are not covered by Social Security providing somewhat more generous pensions to compensate their employees for the lack of coverage under the Social Security system.

### **4.3 Results on interest rates**

The choice of interest rate is crucial in arriving at an estimate of the level of liabilities for a pension plan as choosing a higher interest rate makes the liabilities appear smaller and reduces the actuarially required contribution to the pension fund. Moreover as Healey, Hess, and Nicholson (2012) note, variation in the interest rates used to discount future liabilities contributes to the wide variation in the estimates of unfunded liabilities at the state level. Therefore, in Table 5, I examine whether political competition has an effect on the choice of interest rate used to discount actuarial liabilities by local pension plans.

[Table 5 about here.]

The results in Table 5 suggest that politically competitive municipalities are more likely to choose a higher interest rate for discounting their actuarial liabilities. Using the point estimates of the coefficients in columns (1) through (4), the effect of a one standard deviation increase in the level of political competition is to increase the rate used for discounting actuarial liabilities by about 5–6 basis points. I also find that plans with a higher fraction of employees covered under collective bargaining are associated with a higher interest rate as are plans in which employees are not covered by Social Security.

### **4.4 Robustness Checks**

In this subsection, I check the robustness of the findings that political competition is associated with a decline in the actuarial funded ratio, an increase in the size of unfunded liabilities, and an increase in the level of retirement benefits.

Columns (1) through (3) of Table 6 present the robustness checks with actuarial funded ratio as the dependent variable, while columns (4) through (6) present the checks with unfunded

liabilities per active member as the dependent variable. In the interest of brevity, I discuss the robustness checks using the first measure of political competition, viz. the absolute difference of the Democratic vote share from 50% and present only the coefficient on the political competition variable, omitting coefficients on all controls. Results using the standard deviation of Democratic vote share as the measure of political competition are similar in statistical and economic significance. Complete results are available from the author on request.

*Robustness Check (RC) 1: Not controlling for average Democratic vote share:* In the regressions estimated thus far, I have included the average vote share for Democrats as this lets us separately identify the effect of an increase in Democratic support from an increase in the level of political competition. In order to explore the robustness of my findings to excluding this variable, I estimate the regressions with just the intensity of political competition and find that an increase in political competition continues to be associated with a decline in the funded ratio and an increase in the size of unfunded liabilities per active member.

*RC2: Using average vote share based on Presidential elections:* It could be argued that voters consider the performance of their local government officials in casting their votes for officials elected to state-level offices raising the possibility of reverse causality between fiscal health of the pension plan and the level of political competition in the municipality, as measured by us.<sup>38</sup> Voters are, however, least likely to consider the performance of their local government officials in deciding on their votes for the office of U.S. President. Thus, using vote share based on presidential elections is a way of minimizing the possibility of reverse causality associated with using data on elections to national and state-level offices. Introducing a measure of political competition based solely on votes cast in the Presidential elections, I find that the coefficients on political competition are similar to their previous values.

*RC3: Long differences:* In order to examine if long-run shifts in the intensity of political competition have the same effect as those found using data for all three decades, I estimate regressions using data from only the first and the last decade of the sample. The negative relationship between the intensity of political competition and actuarial funded ratio holds with this approach as well, and the coefficients are similar in economic and statistical significance to the base specifications.

*RC4: Weighting the regressions by the number of members:* The regressions reported above are unweighted, thereby according equal importance to a plan with a single member and a plan with several hundred members. To explore whether the results hold if I were to assign weights to plans

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<sup>38</sup>The importance of local politicians in influencing the electoral success of politicians at higher levels has been recognized in a variety of contexts including India (Bohlken, 2012), sub-Saharan Africa (Kasara, 2007 and Baldwin, 2013), and Latin America (Ames, 1994 and Samuels, 2000).



based on their size, I re-estimate the regressions with weights assigned based on the number of active members in the plan.<sup>39</sup> The results are similar to what I had before suggesting that the effects of political competition are present across plans of varying sizes.

*RC5: Operationalizing political competition in a non-parametric manner:* The primary measure of political competition used in the paper is that laid out by BPS (2010):  $PC_{md} = -|D_{md} - 0.5|$ . In addition to using the standard deviation of Democratic vote share as an alternative measure of political competition, another approach in terms of operationalizing political competition is to introduce a linear and squared term for the average Democratic vote share in the same specification. If political competition tends to decrease (increase) the funded ratio (level of unfunded liabilities), then one would expect to see a negative (positive) coefficient on the linear term and a positive (negative) coefficient on the squared term. This is, in fact, what I find with this alternative operationalization of political competition.

[Table 6 about here.]

Overall the results presented in Table 6 offer robust evidence that an increase in the level of political competition is associated with a decline in the funding status of these plans and an increase in the level of unfunded liabilities per active member.

To examine the robustness of the findings with regards to the generosity of the plans, I present a set of robustness checks in Table 1 of the Online Appendix, similar to those presented in Table 6. The only difference between the robustness checks undertaken in Table 6 versus those in Table 1 of the Online Appendix pertains to RC3. In this robustness check, instead of estimating long differences, I estimate regressions using only one year of data (2009). The rationale for this robustness check is that including observations over the entire sample period from 2003 to 2009 results in the inclusion of multiple observations for the same plan even though these observations are likely to exhibit strong serial correlation. Therefore, by choosing a single year of observation, I include each plan once in the estimation and exploit only the cross-sectional variation in the sample.<sup>40</sup>

The results of these robustness checks support the conclusions arrived at on the basis of Table 4. The results are robust to minor changes in specification and alternative operationalizations of political competition, endogeneity concerns regarding the use of national and state-level races to

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<sup>39</sup>To prevent some very large plans like those for Philadelphia and Pittsburgh from driving the results, I estimate the regression only using observations which have a leverage of less than 1. Leverage captures the deviation of an independent variable from its mean. As high leverage points can have a considerable effect on the estimate of regression coefficients, it is prudent to only include observations with leverage less than a pre-set threshold (in this case 1).

<sup>40</sup>Although the robustness check is presented using 2009 as the year of choice, the results are generally not sensitive to which year is chosen. Results using other years (2003, 2005, and 2007) are available from the author on request.

construct measures of local political competition, and concerns regarding sampling or the disproportionate influence of small plans on the estimates.

Finally, I also present results from robustness checks examining the effects of political competition on the interest rate used to discount actuarial liabilities in Table 2 of the Online Appendix. These checks, identical to those conducted with the generosity of benefits as the dependent variable of interest, demonstrate that an increase in political competition is robustly associated with an increase in the interest rate used by plans.

#### **4.5 IV Estimates**

A possible concern with the OLS estimates that have been presented thus far is that there may be unobserved factors (e.g. unobserved fiscal stress) that influence both local political competition and pension plan funding levels simultaneously and result in the negative relationship that has been captured above. In order to deal with such concerns, I look for Instrumental Variables (IV) which can predict variation in the intensity of political competition at the municipal level. Finding valid IVs in a non-experimental setting is obviously difficult. In the end, I find a set of instruments that satisfy the formal statistical test criteria, although they have conceptual weaknesses. These instruments draw on the literature referenced in *Beyond the Melting Pot* (Glazer and Moynihan, 1963) which emphasizes the role of ethnicity and its influence on political behavior. In particular, I exploit variation in the ancestral origins and ethnic composition of the Pennsylvania population to predict variation in the intensity of political competition at the local level.

Using data from the 1980, 1990, and 2000 Censuses and the 2007–2011 ACS, it is possible to construct estimates of the percentage of people that belong to any one of the six largest ancestries – English, French, German, Irish, Italian, and Polish for the entire sample period. Of these six different groups, I find that (1) municipalities where a higher percentage of the population is of German ancestry have a lower Democratic vote share in national and state-level races, whereas municipalities where a higher percentage of the population is of (2) Irish or (3) Italian descent have a higher Democratic vote share. (4) In addition, municipalities where a higher fraction of households are headed by Blacks have a higher Democratic vote share. I therefore include these four variables as instruments for Democratic Party support. A graphical representation illustrating the pattern of correlation of these instruments with Democratic vote share for the 2000s is presented in Figure 1.

[Figure 1 about here.]

The instruments however perform poorly when it comes to predicting variation in the intensity of political competition. In order to improve the predictive-fit of the first stage regression, I introduce meaningful interactions between the instruments. The two interactions introduced are the product of (5) percentage ancestry German and percentage ancestry Irish and (6) percentage ancestry German and percentage ancestry Italian. The intuition for introducing either of the interaction terms is the same: as both terms that constitute the interaction go up, the municipality becomes more politically competitive. For example, a municipality where the population is roughly evenly divided between those of German and those of Italian descent is likely to be highly competitive because both parties have a constituency that is naturally pre-disposed in their favor.<sup>41</sup>

Results using these four straight terms and the two interactions as instruments for the two potentially endogenous variables, political competition and average Democratic vote share, are presented in Tables 3 (funded ratios and unfunded liabilities per active member), 4 (benefit levels), and 5 (interest rates) of the Online Appendix. In the interest of brevity, only the coefficients on political competition and average Democratic vote share are included in Table 3 with full results available on request. In each case, based on the values of the first-stage F-statistic and the Hansen-J statistic, we can conclude that the instruments satisfy the statistical tests for relevance and validity. These results confirm our findings that political competition has a negative and statistically significant effect on the actuarial funded ratio and a positive and statistically significant effect on (1) the size of unfunded liabilities per active member, (2) the level of retirement benefits, and (3) the interest rate used for discounting actuarial liabilities.

While the instruments satisfy the tests for exclusion restriction, there may be other plausible channels through which variations in ancestry or ethnic composition affect the fiscal health of municipal pensions. Although it is not possible to control for every possible such channel, I control for some of the most obvious channels through which these instruments may affect the funding ratio or benefit levels offered by municipal plans. In particular, I control for household income, the level of taxes per capita, the level of expenses per capita, and within-municipality income inequality<sup>42</sup> – first by introducing them separately and then by introducing them all simultaneously.<sup>43</sup> The IV

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<sup>41</sup>I do not introduce interactions between any two variables each of which predicts higher levels of Democratic support. E.g. I do not introduce the interaction of percentage ancestry Irish and percentage ancestry Italian as that variable is *not* useful in predicting the level of political competition. I also do not introduce an interaction between the percentage ancestry German and the percentage households headed by Blacks even though it may appear that this variable should be correlated with a higher level of political competition because the interacted variable turns out to be *statistically insignificant* in the first-stage regression. That result is driven by the limited racial diversity of Pennsylvania's municipalities, with only about 1 percent of households headed by Blacks in the median municipality in Pennsylvania.

<sup>42</sup>Following the existing literature (e.g. Alesina, Baqir, and Easterly (1999)), this was defined as the ratio of mean to median household income.

<sup>43</sup>Like control variables elsewhere throughout the paper, these were also winsorized at the 2.5% and 97.5% levels.

estimates are robust to inclusion of these covariates and are available on request.

## 5 Empirical Tests of the Theoretical Model

This section offers three empirical tests that build on the theoretical model outlined in Section 2. The first test examines the effect of political competition on the contribution rate of employers to defined contribution (DC) pension plans. The second test examines the effect of political competition on the fiscal health of defined benefit (DB) pension plans offered by municipal authorities. The third and final test conducts a sample-split analysis and examines if the effects of political competition are larger in municipalities with a higher proportion of less informed voters. These tests examine the assumptions made in the construction of the model that associate the underfunding of public pensions with (1) the desire of politicians to be elected and (2) the lack of information among private-sector voters about the funding of public-sector pension plans.

### 5.1 Examining the Effects of Political Competition on Defined Contribution Plans

Anecdotal evidence suggests that political influences are less influential in affecting the parameters for a DC plan compared to a DB plan.<sup>44</sup> For example, a report prepared in the context of reform of Florida's Retirement System (FRS) (Florida TaxWatch Report, 2013) suggests that,

Another important benefit of the DC Investment Plan is that it is insulated from political temptations....Any benefit given under a DC plan must be paid for in that same year because it cannot be legally underfunded. This improves the financial health and security of the FRS because retirement assets belong to the individual state employees and are therefore not susceptible to the whims of the state.

In Table 7 therefore, I examine the effects of political competition on the employer contribution rate for all DC plans from Pennsylvania for the period 2003–2009. I choose to focus on the employer contribution rate because for DC plans, it is not meaningful to talk of funded ratios or the average pension benefit received on retirement. The employer contribution rate to the DC plan is however a meaningful parameter as it reflects the extent to which an employer puts aside money each year and comes closest to our conception of generosity of a retirement plan.

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<sup>44</sup>The decision of whether to offer a DB or a DC plan is, in itself, endogenous. In a set of regressions (not reported), using both OLS and probit estimation approaches, I find that an increase in political competition makes it more likely that a municipality offers a DB plan over a DC plan. That finding is consistent with the explanation that politicians in politically competitive jurisdictions are able to pass on the costs of pensions to future generations in the case of a DB plan but not in the case of a DC plan.

I first estimate the effects of political competition on the employer contribution rate using data for all years and for all plans hewing exactly to specification (3.2). Subsequent rows replicate the robustness checks that were conducted earlier with each row corresponding to a different robustness check. OLS estimates are presented in columns (1) through (4) and IV estimates in columns (5) through (8). In the interest of brevity, I only present the coefficients on the variable representing the intensity of political competition and omit coefficients on the control variables.

[Table 7 about here.]

As the coefficients on political competition suggest, DC plans appear less susceptible to political influence compared to DB plans. The coefficient on political competition is statistically insignificant in each of the 48 specifications presented in the table, in contrast to our previous set of findings on DB plans.<sup>45</sup> This null result likely follows from the fact that with DC plans, it is hard for politicians to pass on the costs of a more generous plan onto future generations of taxpayers; a more generous DC plan requires a higher level of contributions today that have to be met from current tax revenues and politicians are less willing to make a DC plan more generous in order to avoid the risk of alienating private-sector voters.

## 5.2 Examining the Effects of Political Competition for Municipal Authorities

Municipalities are one form of local government in Pennsylvania. Besides independent school districts, there are over 1,500 active municipal authorities in the state (DCED, 2015). Municipal authorities typically perform a very limited number of functions such as the provision of water supply or sewage treatment or solid waste disposal. A few examples of such bodies are the Philadelphia City Housing Authority, the Erie Metropolitan Transit Authority, and the Chester Water Authority.

Municipalities justify the provision of services through a municipal authority on multiple grounds. Beyond the single-minded focus that the board of an authority can have on its efficient operation and the fact that many services can be provided more efficiently only if a large service area spanning multiple municipalities is covered, the governance of municipal authorities may also be more conducive to their operation. Authority board members are appointed by the governing body of the municipalities where they provide service for five-year overlapping terms. Therefore in contrast to the governing body of a municipality that can change *en masse* following an election, the appointed board of an authority is relatively insulated from the electoral will of

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<sup>45</sup>A sample split, based on whether employees are represented by collective bargaining or not, suggests that the lack of effect of political competition on the generosity of these plans holds across both unionized and non-unionized samples.

voters. As a result, as Bennett and Dilorenzo (1982) note, “Off-Budget Enterprises can raise and spend money without reference to the immediate wishes of the electorate, whereas a government can raise and spend money only in the amounts and manner specified by the electorate under the constitution and statutes of the state.”

The insulation of municipal authorities from political influence along with their ability to establish pension plans for their employees forms the basis of our next test. Pension plans operated by municipal authorities are subject to the same reporting and funding standards as municipalities. However, the insulation of municipal authorities from political influence can be expected to result in a weaker relationship between political competition of the municipalities that constitute an authority’s service area and the fiscal health of pension plans operated by those authorities. Therefore, in Table 8, I examine the effects of political competition on the dependent variables of interest for all DB plans operated by municipal authorities, viz. (1) their actuarial funded ratio and unfunded liabilities per active member (Panels A1 and A2), (2) the average annual pension benefit received by a retiree (Panel B), and (3) the interest rate used to discount actuarial liabilities (Panel C).<sup>46</sup> In order to facilitate comparison, I report the coefficient on political competition for municipal plans in columns (1) through (3) and for plans operated by municipal authorities in columns (4) through (6). Columns (7) through (9) examine whether the coefficients on political competition for municipal plans differ from the corresponding coefficients for plans operated by municipal authorities.

[Table 8 about here.]

As we can see from Table 8, there is no statistically significant relationship between the level of political competition in the municipalities that constitute the service area of an authority and the fiscal health of pension plans offered by these authorities. The null result holds across all dependent variables of interest and is robust to the inclusion of a wide range of controls. Furthermore, the coefficient on political competition for plans operated by municipal authorities is statistically different from the coefficient on municipal plans for two dependent variables of inter-

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<sup>46</sup>Operationalizing this test requires assigning each authority to a single municipality. Doing so is straight-forward for an authority that serves a single municipality where the service area of an authority and a municipal boundary perfectly match. In the case of municipal authorities that service more than one municipality, the following rules were used in order to assign a municipal authority to a single municipality. First, I examine the composition of the board of the authority and assign the authority to that municipality which has the largest number of seats on the board. If that information is unavailable or is inconclusive (e.g. equal number of board members from two or more municipalities), I examine how the authority is financed; I assign the authority to whichever municipality (or municipal residents) pays the largest share of expenses associated with the operation of the authority. If such information is not available either or is inconclusive, then I assign the authority to that municipality which has the largest population among all the municipalities served by the authority. Full details of the assignment are available on request from the author.

est (unfunded liabilities per active member and the interest rate for discounting liabilities) and is smaller in absolute magnitude for all dependent variables. These results are consistent with the predictions of the theoretical model and confirm that insulation from political influence (and hence political competition) reduces the incentives for government officials to underfund pension plans and make them more generous.<sup>47</sup>

### **5.3 A sample-split test examining differential effects based on voter awareness**

A critical assumption of the theoretical model is that private-sector workers are not fully informed of the retirement benefits that have been promised to public-sector workers. This is in line with the assumptions in Glaeser and Ponzetto (2014) who also argue that pension obligations are shrouded because of lower availability of information about pensions than wages and because of the greater difficulty of understanding the accrual of pension obligations in contrast to current compensation. This suggests an empirical test. By splitting the sample of municipalities into two groups based on the level of voter awareness and information, we can examine if the effects of political competition are larger in municipalities that have a higher proportion of less informed voters. To operationalize these tests, I consider variables that likely reflect variations among the residents of a municipality in their ability to understand the complexities of local public finance and their incentives to do so.

Delli Carpini (2000) suggests that education is the strongest single predictor of political knowledge. Therefore, I first split municipalities into two groups based on the percentage of the population that has a Bachelor's degree (or higher), using data from the Decennial Censuses of 1980, 1990, and 2000 and the 2007–2011 ACS and present the results from that sample-split in Panel A of Table 9.<sup>48</sup> Columns (1) through (3) present the coefficient on political competition for those municipalities where the percentage of residents 25 years and older with a Bachelor's degree (or higher) is less than or equal to the median whereas Columns (4) through (6) present the coefficient for those municipalities where the percentage of such residents is more than the median. The last three columns examine whether coefficients in columns (1)–(3) are statistically different from the corresponding coefficients in columns (4)–(6).

[Table 9 about here.]

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<sup>47</sup>IV estimates of the effects of political competition on the fiscal health of plans operated by municipal authorities are presented in Table 6 of the Online Appendix and support these conclusions.

<sup>48</sup>Akhmedov and Zhuravskaya (2004) also use the regional share of population that has a higher education in examining how variations in voter awareness dampen the political budget cycle in the various regions of Russia between 1996 and 2003.

The second variable that I use for the sample-split analysis is the length of residence in the same house. The relationship of this variable with voter awareness and engagement can be traced to Putnam (1995) who notes that moving, “like frequent repotting of plants, tends to disrupt root systems, and it takes time for an uprooted individual to put down new roots” (p. 30). Therefore, in Panel B of Table 9, I split the sample of municipalities based on the percentage of residents who have stayed in the same house over either a 5-year or a 1-year horizon.<sup>49</sup> Columns (1) through (3) present the coefficient on political competition for those municipalities where the percentage of residents staying in the same house is less than or equal to the median while columns (4) through (6) present the coefficient for those municipalities where the percentage of residents staying in the same house is more than the median.

Results in Table 9 suggest that the effects of political competition are larger in municipalities (a) where the percentage of adult residents with a Bachelor’s degree (or higher) is less than or equal to the median and (separately) (b) where the percentage of residents who have stayed in the same residence over either a 5-year (or a 1-year) horizon is less than or equal to the median, with these differences being statistically significant in some (but not all) cases. As these variables are likely to correlate with voter awareness and engagement, the results suggest that when faced with an electorate that is more aware and informed of the true cost of unfunded pension obligations, politicians are less likely to underfund public pensions. These results are consistent with one of the key assumptions of the model as it pertains to limited information on the part of voters and provide an empirical basis for that assumption.

## 6 Summary & Discussion

I summarize the results of the analyses in Sections 4 and 5 in Table 10. Along with the sign of the coefficients on political competition, I note the impact of a one standard deviation increase in the level of political competition on each variable.

[Table 10 about here.]

As we can see, the hypothesized relationship between the intensity of political competition and funding level of municipal DB plans is borne out in the data. The evidence also suggests that an

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<sup>49</sup>In analyzing the effects of political competition on actuarial funded ratio, the data used comes from the three Census waves (1980, 1990, and 2000) which asked respondents about whether they had stayed in the same house 5 years ago. In analyzing the effects of political competition on benefit levels and interest rates, I merge data from the 2000 Census and the 2007–2011 ACS which asked respondents about whether they had stayed in the same house a year ago. For this variable, I impute the data from the 2000 Census for years 2003 and 2005 whereas for years 2007 and 2009, I use the data from the 2007–2011 ACS. Recall that data on benefit levels and interest rates span the period 2003–2009.



increase in political competition is associated with an increase in the generosity and the interest rate used for discounting actuarial liabilities. In contrast, political competition has no effect on the generosity of municipal DC plans or on the fiscal health of DB plans offered by municipal authorities.

## 6.1 Discussion regarding the theoretical model

My model captures a mechanism through which political competition may harm economic well-being. A government that operates in an environment of significant electoral competition is less likely to make decisions that involve short-term sacrifices at the cost of long-term gains. Jean-Claude Juncker, Prime Minister of Luxembourg, captured this sentiment for his party when he said in 2005: “We all know what to do, but we don’t know how to get reelected once we have done it.”

The benign motives ascribed to politicians in the model is not necessary for the predictions of the model to hold. Politicians may want to minimize the extent of unfunded liabilities motivated by considerations of self-interest rather than altruism. Politicians generally own residences in the jurisdictions that they govern<sup>50</sup> and may therefore desire to reduce the level of unfunded liabilities simply to avoid any possible capitalization of these liabilities in house prices. Politicians might also care about pension funding because of concerns about employment opportunities after their tenure in office as a politician may have fewer opportunities if voters associate his tenure in office with a poorly managed pension plan. Regardless, it seems plausible that politicians would like to fund the pension plan when in office, in addition to maximizing their electoral chances.

Another key assumption of the model is that all workers in the private sector are uninformed of benefits that are offered in the public sector. One could alternatively assume that only a fraction of those who work in the private sector are uninformed of the level of benefits offered in the public sector, and the qualitative predictions of the model would still hold. If I were to remove this friction in the model and assume full information on the part of both public-sector and private-sector workers, then it would be harder to argue that politicians would want to underfund pensions in order to reap immediate electoral benefits as voters would not care about the level of funding chosen but only about the absolute present value of wages and benefits.<sup>51</sup>

The assumption that private-sector workers misperceive the level of taxes in period 2 is in-

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<sup>50</sup>A residency requirement for elected officials is common within local governments in Pennsylvania.

<sup>51</sup>Workers from the public and private sectors would have opposing preferences on those and there would not be any theoretical predictions about whether the level of wages and benefits would be higher (or lower) in politically competitive jurisdictions. In this scenario of full information, the final outcome would depend on the relative sizes of the two sectors and turnout (which, for simplicity, I have assumed to be 1), in addition to the other primitives of the model.

extricably linked with the previous assumption of lack of information for private-sector workers regarding the level of benefits in the public sector. As long as that assumption holds, private-sector workers are likely to erroneously estimate the level of taxes they would be subject to in the second period of the model and this erroneous estimation on their part would induce a loss in welfare.

## **6.2 Discussion regarding internal and external validity of the results**

Because of data limitations, I have used data on national and state elections to construct measures of political competition at the local level. A sense for how reasonable that assumption is can be gauged by investigating the correlations between the limited data available for local races and races to national and state-level offices for the same time period. Local election data, obtained through filing Right-to-Know requests with various County Boards of Elections, are available for a total of 190 municipalities across five counties of Pennsylvania for the 1980s.<sup>52</sup> The correlation coefficient for the Democratic vote share in the 1980s for local and all concurrent national and state races is 0.7011, ( $p < 0.001$ ) suggesting that measures of Democratic support across the two data sources are strongly correlated with each other. A similar calculation using composition of municipal councils reveals a correlation coefficient of 0.6525 ( $p < 0.001$ ) between the share of council seats held by Democrats in 2009 (as a fraction of the seats held by either Democrats or Republicans) and the average Democratic vote share for all national and state races held in 2008. These patterns suggest that the average Democratic vote share for national and state races offers a reasonable picture of the dynamics of local municipal elections within Pennsylvania for the period 1985–2009.

In addition to examining the effects of political competition on the fiscal health of municipal pension plans, I investigate the effects of such competition on a number of municipal fiscal characteristics. Although I do not find a statistically significant relationship between the intensity of political competition and either revenues per capita or tax burden per capita or deficit per capita,<sup>53</sup> I find a relationship between political competition and the extent to which various revenue sources are used. Politically competitive municipalities appear to raise a lower share of their revenues

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<sup>52</sup>The five counties are: Bucks, Chester, Dauphin, Lancaster, and Lehigh. These counties were not chosen at random among the 67 counties in Pennsylvania. Instead a series of Right-to-Know requests for providing local election data were made to the 18 counties with the largest number of pension plans. The five chosen here were among the most responsive in terms of providing the election data, going back to the 1980s, a period during which these data were not recorded or archived electronically.

<sup>53</sup>The lack of a relationship between the intensity of political competition and the level of deficit per capita can be expected because (a) municipal governments in Pennsylvania operate under a balanced budget requirement and (b) deficits are likely to be visible to (i) voters and (ii) financial market participants. In fact this result is reassuring; it suggests that the negative relationship between political competition and actuarial funded ratio is being driven by the difficulty that voters have in understanding the long-term commitments associated with defined benefit municipal pensions rather than being driven by other municipal characteristics (e.g. general financial distress).

in the form of taxes and a higher share from non-tax sources such as transfers, charges, and miscellaneous items. Political competition also appears to affect the mix of taxes used by municipalities. Politically competitive municipalities rely less on more salient taxes such as the property tax (Cabral and Hoxby, 2013) and more on other sources of revenue such as the earned income tax. These findings are consistent with those reported for Italian municipalities by Bordignon and Piazza (2010) and Bracco, Porcelli, and Redoano (2013).

With respect to the validity of these findings beyond Pennsylvania, I note that preliminary work conducted using data on state plans support the conclusions of this paper. Using panel data on 85 DB plans from the Wisconsin Legislative Council for 1989 to 2009 and a measure of political competition,<sup>54</sup> I find that as the level of political competition in a state goes up, the actuarial funded ratio of plans offered by that state declines. The estimated effects of political competition are similar in magnitude to those reported here.<sup>55</sup>

## 7 Conclusions

This paper suggests that political competition plays a key role in influencing the level of funding of defined benefit pension plans offered to public-sector employees. In their desire to win re-election, politicians in jurisdictions that are politically competitive may end up promising generous benefits to public-sector workers and then fail to make the actuarial contribution necessary to fund them fully in order to avoid having to raise taxes. The results presented support this hypothesis and indicate that an increase in political competition is associated with a decline in the funding level of pension plans. The results are robust to controlling for municipal and decade fixed effects, suggesting that unobserved time-invariant heterogeneity across municipalities or aggregate time trends are not driving the results. Politically competitive municipalities are also more likely to offer higher retirement benefits and to strategically use higher interest rates for discounting these future liabilities. Each of these findings is robust to a host of robustness checks and instrumenting for the level of political competition using variation in demographic characteristics of the population as instruments.

Given the magnitude of unfunded liabilities and their trajectory, reforming their pension plans has become a matter of first-order importance for policy makers in state and local governments. Reforms are currently on the table in state and local governments across the country of various

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<sup>54</sup>This measure of political competition is constructed using the closeness of all state-wide races. I am grateful to Jim Snyder for sharing this dataset, which is an update of the data used in Ansolabehere and Snyder (2002).

<sup>55</sup>All of these additional results are available on request.

political proclivities to reduce their liabilities, acknowledging that the costs they face for these benefits exceed what they are willing or able to pay. An understanding of the complex issues around public-sector pensions, towards which this paper has taken a step, can contribute to the development of such reforms and constrain the ability of politicians to pass on the costs of current labor services to future taxpayers. Moving from defined benefit plans that are susceptible to political influence to defined contribution plans (or cash balance plans) that the paper finds as less susceptible to such influence may be one step in that direction.

Beyond its policy implications, the paper contributes to the broader field of political economy by focusing on the effects of political competition on the choice of a policy that has historically not been visible to the average voter. It also demonstrates that political competition systematically alters the behavior of politicians when in office and induces them to make decisions that are sub-optimal for society in the long run. However, as we also see, voter awareness and engagement as well as institutional checks and balances can help moderate some of the negative effects associated with political competition.

Although these ideas were developed in the specific context of public-sector pensions, the notion that political competition may promote behavior oriented towards the short-term on issues that are less salient to voters, may be of much broader relevance than simply the context examined here. Researchers should explore the role of political competition in other settings and see if introducing it in their models can help them make better sense of their phenomena of interest.

## References

- Acemoglu, Daron and James A. Robinson.** 2006. "Economic Backwardness in Political Perspective." *American Political Science Review*. 100(1): 115–131.
- Akhmedov, Akhmed and Ekaterina Zhuravskaya.** 2004. "Opportunistic Political Cycles: Test in a Young Democracy Setting." *The Quarterly Journal of Economics*. 119(4): 1301–1338.
- Alesina, Alberto, Reza Baqir, and William Easterly.** 1999. "Public Goods and Ethnic Divisions." *The Quarterly Journal of Economics*. 114(4): 1243–1284.
- Ames, Barry.** 1994. "The Reverse Coattails Effect: Local Party Organization in the 1989 Brazilian Presidential Election." *American Political Science Review*. 88(1): 95–111.
- Ansolabehere, Stephen and James M. Snyder Jr.** 2002. "The Incumbency Advantage in U.S. Elections: An Analysis of State and Federal Offices, 1942–2000." *Election Law Journal*. 1(3): 315–338.

- Ansolabehere, Stephen.** 2008. "Voters, Candidates and Parties," *Oxford Handbook of Political Economy* (ed. Barry Weingast and Donald Wittman), Oxford University Press, USA.
- Baldwin, Kate.** 2013. "Why Vote with the Chief? Political Connections and Public Goods Provision in Zambia." *American Journal of Political Science*. 57(4): 794–809.
- Bennett, James T. and Thomas J. Dilorenzo.** 1982. "Off-Budget Activities of Local Government: The Bane of the Tax Revolt." *Public Choice*. 39(3): 333–342.
- Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan.** 2004. "How Much Should We Trust Differences-in-Differences Estimates?" *The Quarterly Journal of Economics*. 119(1): 249–275.
- Besley, Timothy, Torsten Persson, and Daniel M. Sturm.** 2010. "Political Competition, Policy and Growth: Theory and Evidence from the US." *Review of Economic Studies*. 77(4): 1329–1352.
- Bohlken, Anjali T.** 2012. "Upward Accountability: Village Politicians and the Electoral Success of Party Machines in India." Working Paper.
- Bordignon Massimo and Santino Piazza.** 2010. "Who do you Blame in Local Finance? An Analysis of Municipal Financing in Italy." CESifo Working Paper No. 3100. CESifo, Munich, Germany.
- Boyne, George A.** 1998. "Party Competition and Local Spending Decisions." *British Journal of Political Science*. 28(1): 210–222.
- Bracco, Emanuele, Francesco Porcelli, and Michela Redoano.** 2013. "Political Competition, Tax Salience and Accountability: Theory and Some Evidence from Italy." CESifo Working Paper No. 4167. CESifo, Munich, Germany.
- Bureau of Labor Statistics (BLS).** 2010. "Program Perspectives on Defined Contribution Plans." *Program Perspectives*. 2(6): 1–4.
- Cabral, Marika and Caroline Hoxby.** 2013. "The Hated Property Tax: Salience, Tax Rates, and Tax Revolts." Working Paper.
- Cogburn, Jerrell D. and Richard C. Kearney.** 2010. "Trouble Keeping Promises? An Analysis of Underfunding in State Retiree Benefits." *Public Administration Review*. 70(1): 97–108.
- Delli Carpini, Michael X.** 2000. "In search of the Informed Citizen: What Americans Know about Politics and Why it Matters." *The Communication Review*. 4(1): 129–164.
- Department of Community and Economic Development.** 2015. "Municipal Authorities in Pennsylvania." Governor's Center for Local Government Services, Harrisburg, PA.
- Eaton, Timothy and John R. Nofsinger.** 2008. "Funding Levels and Gender in Public Pension Plans." *Public Budgeting & Finance*. 28(3): 108–128.
- Epple, Dennis and Katherine Schipper.** 1981. "Municipal Pension Funding: A Theory and Some Evidence." *Public Choice*. 37(1): 141–178.
- Fehr, Stephen C.** 2011. "Pension Plans Look Toward Rate of Return." *Stateline*, December 22.
- Florida TaxWatch Report.** 2013. "Modernizing the Florida Retirement System: Switching to a Defined Contribution Plan." Tallahassee, FL.

- Glaeser, Edward L. and Giacomo A. M. Ponzetto.** 2014. “Shrouded Costs of Government: The Political Economy of State and Local Public Pensions.” *Journal of Public Economics*. 116(C): 89–105.
- Glazer, Nathan, and Daniel P. Moynihan.** 1963. “Beyond the Melting Pot: The Negroes, Puerto Ricans, Jews, Italians, and Irish of New York City.” Cambridge: The MIT Press.
- Healey, Thomas J., Carl Hess, and, Kevin Nicholson.** 2012. “Underfunded Public Pensions in the United States: The Size of the Problem, the Obstacles to Reform and the Path Forward.” M-RCBG Faculty Working Paper No. 2012-08.
- Inman, Robert P.** 1982. “Public Employee Pensions and the Local Labor Budget.” *Journal of Public Economics*. 19(1): 49–71.
- Kasara Kimuli.** 2007. “Tax Me If You Can: Ethnic Geography, Democracy, and the Taxation of Agriculture in Africa.” *American Political Science Review*. 101(1): 159–172.
- Lizzeri, Alessandro and Nicola Persico.** 2005. “A Drawback of Electoral Competition.” *Journal of the European Economic Association*. 3(6): 1318–1348.
- Mumy, Gene E.** 1978. “The Economics of Local Government Pensions and Pension Funding.” *Journal of Political Economy*. 86(3): 517–527.
- Munnell, Alicia H., Jean-Pierre Aubry, and Laura Quinby.** 2010. “Public Pension Funding in Practice.” NBER Working Paper No. 16442. National Bureau of Economic Research, Cambridge, MA.
- Nuschler, Dawn, Alison M. Shelton, and, John J. Topoleski.** 2011. “Social Security: Mandatory Coverage of New State and Local Government Employees.” CRS Report R41936. Congressional Research Service, Washington, DC.
- Pennsylvania Public Employee Retirement Commission.** Status Report on Local Government Pension Plans. Various years. Public Employee Retirement Commission, Harrisburg, PA.
- Persson, Torsten and Guido Tabellini.** 2002. “Political Economics and Public Finance,” In *Handbook of Public Economics*, edited by Alan. J. Auerbach & Martin Feldstein, Edition 1, Vol. 3, Chapter 24, 1549–1659. Philadelphia: Elsevier.
- Putnam, Robert D.** 1995. “Bowling alone, revisited.” *The Responsive Community*. 5: 18–33.
- Samuels, David J.** 2000. “The Gubernatorial Coattails Effect: Federalism and Congressional Elections in Brazil.” *The Journal of Politics*. 62(1): 240–253.
- Summers, Lawrence.** 2012. “The reality of trying to shrink government.” *The Washington Post*, August 19.
- Ujhelyi, Gergely.** 2013. “Civil Service Rules and Policy Choices: Evidence from US State Governments.” *American Economic Journal: Economic Policy*. 6(2): 338–380.
- Wittman, Donald.** 1983. “Candidate Motivation: A Synthesis of Alternative Theories.” *American Political Science Review*. 77(1): 142–157.
- 1977. “Candidates with Policy Preferences: A Dynamic Model.” *Journal of Economic Theory*. 14(1): 180–189.

Table 1: Summary Statistics

Variable	Units	Mean	Median	Standard deviation	Minimum	Maximum
Pension plan characteristics						
Actuarial funded ratio	In percent terms	133.46	103.05	103.57	26.63	522.79
Unfunded liabilities per active member	In dollars	(11,095)	(1,005)	42,385	(128,128)	68,558
Average annual pension	In dollars	15,362	13,886	9,378	1,672	36,943
Interest rates used for discounting actuarial liabilities	In percent terms	6.98	7.00	0.77	5.50	8.00
Plan-level controls						
Employees covered by collective bargaining	In percent terms	35.27	35.29	32.17	0	89.78
Coverage in Social Security	0 = No, 1 = Yes	0.742	1	0.437	0	1
Controls at the municipal level						
Households that are owner-occupied	In percent terms	72.19	73.80	13.39	9.16	98.36
Population aged 75 or older	In percent terms	6.98	6.58	3.14	0.18	27.18
Unemployment rate	In percent terms	5.80	5.10	3.26	0.00	38.90
Taxes spent on debt servicing	In percent terms	11.96	4.66	21.54	0.00	360.78
Pension costs paid by state as aid	In percent terms	63.76	62.95	19.88	17.63	100
Political variables						
Average Democratic vote share	As a fraction	0.476	0.460	0.126	0.108	0.901
Political Competition	As defined in BPS (2010)	-0.106	-0.097	0.072	-0.401	-0.000
Political Competition	Defined as the standard deviation of Democratic vote share	0.087	0.085	0.026	0.026	0.211

Summary statistics for the first two dependent variables, actuarial funded ratio and unfunded liabilities per active member, are based on biennial data from 1985–2009. Those for the next two dependent variables, average annual pension and interest rates used for discounting actuarial liabilities, are based on biennial data from 2003–2009. These four variables were available from the Pennsylvania PERC. Data on Social Security coverage summarized are for the year 2009 and are also from the Pennsylvania PERC. The percentage of employees organized under collective bargaining is for 1982 from the Employment Summary Statistics of Census of Governments. Percentage of households that are owner-occupied, percentage of the population aged 75 or older, and unemployment rate are for years 1980, 1990, and 2000 and are from the Decennial Censuses. Taxes spent on debt servicing is based on annual data from 1985–2009 from the Pennsylvania DCED. Pension costs paid by the state of Pennsylvania in the form of state aid is based on annual data for 1985 and for years 1990–2009 from the Office of the Auditor General and has been instrumented as described in the text. All of these variables have been winsorized at the 2.5% and 97.5% levels. Lastly, the political variables, average Democratic vote share and measures of political competition are based on all elections to national and state-level offices held in even-numbered years between 1980–2009 and are constructed using successive issues of the Pennsylvania Manual.

Table 2: Effect of Political Competition on Actuarial Funded Ratio and Unfunded Liabilities per Active Member using the Absolute Difference of the Democratic Vote Share from 50% as the Measure of Political Competition

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: Actuarial Funded Ratio			Dependent variable: Unfunded liabilities per active member		
Political Competition	-108.1*** (36.95)	-100.0*** (34.73)	-98.90*** (34.42)	37.23*** (13.43)	33.02** (12.70)	32.93** (12.91)
Average Democratic vote share	105.6*** (38.97)	100.1** (39.06)	103.2** (40.12)	19.06 (12.74)	27.26* (14.62)	25.92 (15.65)
Employee-group dummies:						
Plan for non-uniformed personnel	-33.19*** (5.564)	-33.03*** (5.562)	-33.01*** (5.559)	2.968 (3.571)	2.955 (3.582)	2.956 (3.582)
Plan for policemen	34.94*** (7.322)	35.02*** (7.294)	35.00*** (7.297)	-26.17*** (5.315)	-26.17*** (5.314)	-26.17*** (5.312)
Municipality-level controls:						
Percentage of households that are owner-occupied		-0.884 (0.751)	-0.873 (0.750)		0.296 (0.209)	0.297 (0.209)
Percentage of the population aged 75 or older		1.018 (1.240)	0.988 (1.260)		0.552 (0.526)	0.556 (0.524)
Unemployment rate		1.544** (0.767)	1.539** (0.765)		-0.452 (0.323)	-0.451 (0.324)
Fraction of tax revenues spent on debt service			14.74 (10.97)			0.485 (4.838)
Percentage of pension costs paid by the state			0.0846 (0.270)			-0.0269 (0.0851)
Constant	91.58*** (17.94)	144.0*** (53.41)	136.9** (63.98)	-3.363 (8.695)	-28.95* (16.53)	-27.01 (19.94)
Observations	5130	5130	5130	5130	5130	5130
R <sup>2</sup>	0.21	0.21	0.21	0.19	0.19	0.19

Regressions estimated on all municipal defined benefit pension plans from Pennsylvania for the period 1985–2009. The dependent variable in columns (1) through (3), the actuarial funded ratio, is defined as the percent of pension liabilities funded. The dependent variable in columns (4) through (6), the unfunded liabilities per active member, is defined as (Actuarial Liabilities - Actuarial Assets)/ Number of active members in the plan. It has been rescaled by dividing by \$1,000. The measure of political competition used is that defined by BPS (2010), viz.  $PC_{md} = -|0.5 - D_{md}|$ . The fiscal controls introduced in columns (3) and (6) are the fraction of tax revenues spent on debt service, defined as the ratio of debt service to all taxes collected by the municipality and percentage of pension costs paid by the state. This percentage has been instrumented by the weighted average percentage of pension costs paid by the state in all other municipalities within that same county in that decade. The dependent variables and all control variables have been winsorized at the 2.5% and 97.5% levels. Municipality and decade fixed effects are included in all specifications. Robust standard errors are clustered at the county level and are in parentheses; \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.



Table 3: Effect of Political Competition on Actuarial Funded Ratio and Unfunded Liabilities per Active Member using the Standard Deviation of Democratic Vote Share as the Measure of Political Competition

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: Actuarial Funded Ratio			Dependent variable: Unfunded liabilities per active member		
Political Competition	-375.6*** (130.3)	-368.3*** (131.7)	-368.3** (139.0)	126.6*** (35.44)	122.1*** (35.86)	121.5*** (36.68)
Average Democratic vote share	152.4*** (43.72)	147.4*** (47.59)	149.1*** (45.30)	3.423 (13.17)	11.55 (16.33)	10.85 (16.58)
Employee-group dummies:						
Plan for non-uniformed personnel	-32.98*** (5.589)	-32.87*** (5.589)	-32.85*** (5.586)	2.896 (3.552)	2.901 (3.566)	2.902 (3.567)
Plan for policemen	35.10*** (7.352)	35.14*** (7.318)	35.12*** (7.320)	-26.23*** (5.308)	-26.21*** (5.309)	-26.21*** (5.307)
Municipality-level controls:						
Percentage of households that are owner-occupied		-1.119 (0.752)	-1.103 (0.750)		0.374* (0.214)	0.374* (0.214)
Percentage of the population aged 75 or older		0.926 (1.282)	0.903 (1.301)		0.582 (0.535)	0.585 (0.533)
Unemployment rate		1.440* (0.778)	1.437* (0.774)		-0.418 (0.322)	-0.417 (0.322)
Fraction of tax revenues spent on debt service			16.71 (11.59)			-0.169 (4.873)
Percentage of pension costs paid by the state			0.0537 (0.253)			-0.0167 (0.0816)
Constant	111.3*** (16.75)	180.2*** (54.43)	174.9*** (64.45)	-10.14 (7.075)	-40.90** (16.73)	-39.65* (20.04)
Observations	5130	5130	5130	5130	5130	5130
R <sup>2</sup>	0.21	0.22	0.22	0.19	0.20	0.20

Regressions estimated on all municipal defined benefit pension plans from Pennsylvania for the period 1985–2009. The dependent variable in columns (1) through (3), the actuarial funded ratio, is defined as the percent of pension liabilities funded. The dependent variable in columns (4) through (6), the unfunded liabilities per active member is defined as (Actuarial Liabilities - Actuarial Assets)/ Number of active members in the plan. It has been rescaled by dividing by \$1,000. The measure of political competition used is the standard deviation of Democratic vote share. The fiscal controls introduced in columns (3) and (6) are the fraction of tax revenues spent on debt service, defined as the ratio of debt service to all taxes collected by the municipality and percentage of pension costs paid by the state. This percentage has been instrumented by the weighted average percentage of pension costs paid by the state in all other municipalities within that same county in that decade. The dependent variables and all control variables have been winsorized at the 2.5% and 97.5% levels. Municipality and decade fixed effects are included in all specifications. Robust standard errors are clustered at the county level and are in parentheses; \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.

Table 4: Effect of Political Competition on the Average Pension Benefit Received by Retirees

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable: Annual pension per retiree							
Political Competition	8.289*** (2.645)	6.778** (2.625)	6.282** (2.539)	6.325** (2.551)	0.513*** (0.182)	0.474** (0.186)	0.423** (0.180)	0.424** (0.181)
Average Democratic vote share	3.787 (3.170)	-1.659 (2.952)	0.195 (2.565)	0.159 (2.566)	0.777*** (0.187)	0.482*** (0.168)	0.281 (0.190)	0.283 (0.192)
Log of wages					1.116*** (0.0971)	0.966*** (0.102)	0.934*** (0.105)	0.932*** (0.106)
Employee-group dummies:								
Plan for non-uniformed personnel	-11.46*** (0.755)	-10.16*** (0.835)	-9.565*** (0.832)	-9.546*** (0.833)	-0.566*** (0.0475)	-0.554*** (0.0507)	-0.496*** (0.0493)	-0.497*** (0.0497)
Plan for policemen	0.972 (0.698)	1.854*** (0.664)	2.541*** (0.669)	2.572*** (0.666)	-0.0339 (0.0400)	0.0174 (0.0409)	0.0951** (0.0433)	0.0952** (0.0433)
Plan-specific controls:								
Fraction of employees organized under collective bargaining		4.911*** (0.554)	4.190*** (0.674)	4.138*** (0.682)		0.268*** (0.0419)	0.201*** (0.0448)	0.199*** (0.0448)
Coverage in Social Security (0 = No, 1 = Yes)		-0.761 (0.510)	-0.760 (0.543)	-0.754 (0.544)		-0.0252 (0.0321)	-0.00752 (0.0361)	-0.00735 (0.0362)
Municipal-level controls								
Percentage of households that are owner-occupied			-0.0338 (0.0342)	-0.0322 (0.0337)			-0.00477* (0.00243)	-0.00471* (0.00243)
Percentage of the population aged 75 or older			-0.0101 (0.0692)	-0.00755 (0.0679)			0.00589 (0.00649)	0.00586 (0.00647)
Unemployment rate			-0.191** (0.0774)	-0.190** (0.0772)			-0.00714 (0.00595)	-0.00722 (0.00590)
Fraction of tax revenues spent on debt service			0.903* (0.486)	0.903* (0.486)			0.0408 (0.0460)	0.0408 (0.0460)
Percentage of pension costs paid by the state			0.0212 (0.0160)	0.0212 (0.0160)			-0.000 (0.0012)	-0.000 (0.0012)
Constant	17.68*** (2.092)	18.04*** (1.934)	21.40*** (2.477)	19.58*** (2.967)	-2.602** (1.027)	-0.979 (1.067)	-0.196 (1.161)	-0.151 (1.182)
Observations	5157	5157	5157	5157	5157	5157	5157	5157
R <sup>2</sup>	0.52	0.55	0.55	0.56	0.52	0.53	0.53	0.53

Regressions estimated on all municipal defined benefit pension plans from Pennsylvania for the period 2003–2009. The dependent variable in columns (1)–(4) is the absolute level of average benefit received by all retirees (rescaled by \$1,000 and including Deferred Retirement Option Plan (DROP) beneficiaries but excluding disability, surviving spousal, and surviving child beneficiaries) while the dependent variable in columns (5)–(8) is the log of annual average benefit. Controls for class of municipality are included in columns (3), (4), (7), and (8). Fraction of tax revenues spent on debt service is defined as the ratio of debt service to all taxes collected by the municipality and the percentage of pension costs paid by the state has been instrumented by the weighted average percentage of pension costs paid by the state in all other municipalities within that same county in that year. The dependent variables and all control variables have been winsorized at the 2.5% and 97.5% levels. County and year fixed effects are included in all specifications. Robust standard errors are clustered at the county level and are in parentheses; \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.

Table 5: Effect of Political Competition on the Interest Rate chosen to Discount Actuarial Liabilities

	(1)	(2)	(3)	(4)
Dependent Variable: Interest rate used by plan sponsors for discounting actuarial liabilities (in percent)				
Political Competition	0.875*** (0.248)	0.753*** (0.241)	0.664*** (0.247)	0.665*** (0.248)
Average Democratic vote share	1.772*** (0.292)	1.145*** (0.260)	0.816*** (0.301)	0.813*** (0.301)
Employee-group dummies:				
Plan for non-uniformed personnel	-0.456*** (0.0745)	-0.298*** (0.0702)	-0.183*** (0.0642)	-0.183*** (0.0638)
Plan for policemen	-0.163** (0.0762)	-0.0493 (0.0706)	0.0754 (0.0624)	0.0753 (0.0621)
Plan-specific controls:				
Fraction of employees organized under collective bargaining		0.549*** (0.0691)	0.421*** (0.0724)	0.416*** (0.0732)
Coverage in Social Security (0 = No, 1 = Yes)		-0.128*** (0.0437)	-0.0817** (0.0395)	-0.0807** (0.0394)
Municipal-level controls				
Percentage of households that are owner-occupied			-0.00440 (0.00284)	-0.00427 (0.00286)
Percentage of the population aged 75 or older			0.00326 (0.00711)	0.00328 (0.00706)
Unemployment rate			-0.0257*** (0.00649)	-0.0257*** (0.00658)
Fraction of tax revenues spent on debt service				0.0869 (0.0707)
Percentage of pension costs paid by the state				0.00186 (0.00143)
Constant	6.573*** (0.162)	6.678*** (0.156)	7.260*** (0.329)	7.102*** (0.328)
Observations	6882	6882	6882	6882
R <sup>2</sup>	0.27	0.31	0.33	0.33

Regressions estimated on all municipal defined benefit pension plans from Pennsylvania for the period 2003–2009. The dependent variable is the interest rate used for discounting long-term actuarial liabilities. Controls for class of municipality are included in columns (3) and (4). The dependent variables and all control variables have been winsorized at the 2.5% and 97.5% levels. Fraction of tax revenues spent on debt service is defined as the ratio of debt service to all taxes collected by the municipality and the percentage of pension costs paid by the state has been instrumented by the weighted average percentage of pension costs paid by the state in all other municipalities within that same county in that year. County and year fixed effects are included in all specifications. Robust standard errors are clustered at the county level and are in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 6: Robustness Checks for the Effect of Political Competition on Actuarial Funded Ratio and Unfunded Liabilities per Active Employee

	(1)	(2)	(3)	(4)	(5)	(6)
	D.v.: Actuarial funded ratio			D.v.: Unfunded liabilities/ Active		
Base Specification	-108.1*** (36.95)	-100.0*** (34.73)	-98.90*** (34.42)	37.23*** (13.43)	33.02** (12.70)	32.93** (12.91)
RC1: Not controlling for average Democratic vote share	-91.37** (35.88)	-83.84** (33.97)	-83.33** (33.33)	40.03*** (12.90)	37.26*** (12.32)	36.68*** (12.75)
RC2: Using average vote share based on Presidential elections	-98.24*** (24.77)	-92.13*** (24.02)	-92.53*** (23.71)	25.37** (10.31)	22.21** (9.768)	22.40** (9.896)
RC3: Long differences	-111.5*** (40.24)	-97.13*** (35.90)	-92.50** (34.84)	46.57*** (14.61)	40.14*** (13.53)	40.05*** (13.95)
RC4: Weighting regression by number of active members	-158.0*** (40.95)	-124.5*** (40.69)	-122.4*** (42.07)	88.90* (49.09)	65.91 (48.21)	73.18 (45.16)
RC5: Including average vote share for Democrats and average vote share squared						
(i) Coefficient on the linear term	-409.6** (189.2)	-395.2** (182.3)	-390.5** (189.5)	192.0*** (55.71)	185.7*** (53.57)	184.3*** (55.44)
(ii) Coefficient on the squared term	509.3*** (186.1)	491.2*** (180.4)	490.0*** (181.3)	-170.8*** (59.79)	-157.0*** (57.59)	-157.0*** (58.44)
Employee group dummies	✓	✓	✓	✓	✓	✓
Municipal demographic controls		✓	✓		✓	✓
Municipal fiscal controls			✓			✓

Regressions estimated on all municipal defined benefit pension plans from Pennsylvania for the period 1985–2009. The dependent variable in columns (1) - (3), the actuarial funded ratio, is defined as the percent of pension liabilities funded. The dependent variable in columns (4) - (6), the unfunded liabilities per active member, is defined as (Actuarial Liabilities - Actuarial Assets)/ Number of active members in the plan. It has been rescaled by dividing by \$1,000. The measure of political competition used is that defined by BPS (2010), viz.  $PC_{md} = -|0.5 - D_{md}|$ . Municipal demographic controls included are the percentage of households that are owner-occupied, the percentage of population aged 75 or older, and the local unemployment rate. Municipal fiscal controls included are the fraction of tax revenues spent on debt service and percentage of pension costs paid by the state, instrumented by the weighted average percentage of pension costs paid by the state in all other municipalities within that same county in that decade. The dependent variables and all control variables have been winsorized at the 2.5% and 97.5% levels. Municipality and decade fixed effects are included in all specifications. Robust standard errors are clustered at the county level and are in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 7: Effect of Political Competition on Employer Contribution Rate of Defined Contribution (DC) plans

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: Employer Contribution Rate to the DC plan (As a percentage of payroll)								
	OLS				IV			
Base Specification	1.155 (2.355)	1.037 (2.393)	1.202 (2.381)	1.186 (2.367)	6.470 (8.597)	5.938 (8.704)	7.587 (9.701)	7.521 (9.698)
RC1: Not controlling for average Democratic vote share	1.541 (2.326)	1.369 (2.353)	1.415 (2.434)	1.396 (2.419)	2.172 (5.380)	0.449 (5.663)	0.0373 (6.011)	0.190 (6.027)
RC2: Using average vote share based on Presidential elections	-0.809 (2.868)	-0.989 (2.906)	-0.387 (2.960)	-0.422 (2.951)	4.421 (6.689)	3.937 (6.777)	5.525 (7.980)	5.459 (7.987)
RC3: Using data for 2009 only	-2.344 (3.627)	-2.237 (3.708)	-1.810 (3.703)	-1.637 (3.679)	2.782 (8.521)	3.292 (8.697)	4.892 (9.898)	5.159 (9.918)
RC4: Weighting regression by number of active members	2.823 (2.442)	2.795 (2.475)	2.881 (2.752)	2.882 (2.761)	-0.793 (10.34)	4.201 (9.523)	14.22 (10.06)	14.29 (10.05)
RC5: Including average vote share for Democrats and average vote share squared								
(i) Coefficient on the linear term	-3.049 (8.806)	-3.185 (8.978)	-3.675 (9.008)	-3.743 (8.979)	22.28 (25.00)	20.51 (25.60)	31.22 (30.51)	30.84 (30.70)
(ii) Coefficient on the squared term	-1.169 (8.527)	-0.740 (8.637)	-1.246 (8.739)	-1.175 (8.702)	-20.02 (22.41)	-17.49 (22.88)	-25.45 (26.50)	-25.15 (26.61)
Employee group dummies	✓	✓	✓	✓	✓	✓	✓	✓
Plan-specific controls		✓	✓	✓		✓	✓	✓
Municipal demographic controls			✓	✓			✓	✓
Municipal fiscal controls				✓				✓

Regressions estimated on all municipal defined contribution pension plans from Pennsylvania for the period 2003–2009. The number of observations varies based on specification and equals 2085 for the base specification, RC1, RC2, and RC5, 526 for RC3, and 2017 for RC4. The dependent variable is the employer contribution rate to the defined contribution plan, expressed as a percentage of payroll. The measure of political competition used is that defined by BPS (2010), viz.  $PC_{md} = -|0.5 - D_{md}|$ . Plan-specific controls included are the fraction of employees organized under collective bargaining and coverage under Social Security. Municipal demographic controls included are the percentage of households that are owner-occupied, percentage of the population aged 75 or older, and local unemployment rate. Municipal fiscal controls included are the fraction of tax revenues spent on debt service and percentage of pension costs paid by the state, instrumented by the weighted average percentage of pension costs paid by the state in all other municipalities within that same county in that year. The IVs included are: the percentage of the population (i) of German ancestry, (ii) of Irish ancestry, (iii) of Italian ancestry, (iv) percentage of households headed by Blacks and the product of (v) percentage ancestry German and percentage ancestry Irish and (vi) percentage ancestry German and percentage ancestry Italian. The dependent variable and all control variables have been winsorized at the 2.5% and 97.5% levels. County and year fixed effects are included in all specifications, except in RC3 where the estimation involves only one year of data (2009). Robust standard errors are clustered at the county level and are in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 8: Effects of Political Competition on Actuarial Funded Ratio, Unfunded Liabilities per Active Member, Average Annual Pension, and Interest Rate for Municipalities and for Municipal Authorities

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Municipalities			Municipal Authorities			p-value coefficients differ across samples		
Panel A1: Effect of Political Competition on Actuarial Funded Ratio									
Political Competition	-108.1*** (36.95)	-100.0*** (34.73)	-98.90*** (34.42)	-9.703 (59.34)	-20.87 (61.66)	-19.46 (60.81)	0.0632	0.1517	0.1490
Panel A2: Effect of Political Competition on Unfunded Liabilities Per Active Member									
Political Competition	37.23*** (13.43)	33.02** (12.70)	32.93** (12.91)	-37.30 (26.29)	-34.63 (26.17)	-34.74 (26.35)	0.0006	0.0019	0.0020
Panel B: Effect of Political Competition on Average Annual Pension									
Political Competition	8.289*** (2.645)	6.282** (2.539)	6.325** (2.551)	0.0896 (10.86)	2.551 (9.476)	3.309 (9.708)	0.1321	0.5023	0.5951
Panel C: Effect of Political Competition on Interest Rate									
Political Competition	0.875*** (0.248)	0.664*** (0.247)	0.665*** (0.248)	-0.890 (1.236)	-0.990 (1.298)	-1.232 (1.242)	0.0026	0.0024	0.0005
Average Democratic vote	✓	✓	✓	✓	✓	✓			
Employee group dummies	✓	✓	✓	✓	✓	✓			
Municipal demographic controls		✓	✓	✓	✓	✓			
Municipal fiscal controls			✓			✓			

Regression results in columns (1) - (3) pertain to DB plans offered by municipalities and those in columns (4) - (6) pertain to DB plans offered by municipal authorities in Pennsylvania. The p-value in columns (7) - (9) is generated from statistical tests which examine whether the coefficient on political competition for municipalities and municipal authorities differs from each other or not. Regressions involving actuarial funded ratio and unfunded liabilities per active member are estimated for the period 1985–2009 and include municipal fixed effects (in cols. (1) - (3)) / municipal authority fixed effects (in cols. (4) - (6)) and decade fixed effects. Actuarial funded ratio is defined as the percent of pension liabilities funded. Unfunded liabilities per active member is defined as (Actuarial Liabilities - Actuarial Assets) / Number of active members in the plan. It has been rescaled by dividing by \$1,000. Regressions involving the average annual pension and interest rate are estimated for the period 2003–2009 and include county and year fixed effects. Average annual pension is the annual average benefit received by all retirees (including Deferred Retirement Option Plan (DROP) beneficiaries but excluding disability, surviving spousal, and surviving child beneficiaries). It has been rescaled by dividing by \$1,000. Interest rate is the rate used for discounting long-term actuarial liabilities. The measure of political competition used is that defined by BPS (2010), viz.  $PC_{md} = -|0.5 - D_{md}|$ . Municipal demographic controls included are the percentage of households that are owner-occupied, percentage of the population aged 75 or older, and local unemployment rate. The municipal fiscal controls included are the fraction of tax revenues spent on debt service and percentage of pension costs paid by the state. For plans operated by municipal authorities, these are calculated for that municipality that enjoys a primal position in the operation of the authority. (Refer fn. 46) Municipal authorities do not receive any state aid for defraying pension costs and hence that control variable drops out of regressions in columns (4) - (6). Columns (2), (3), (5), and (6) in panels B and C also include the class of municipality, the fraction of employees organized under collective bargaining, and coverage under Social Security as additional controls. The dependent variable and all control variables have been winsorized at the 2.5% and 97.5% levels. Robust standard errors are clustered at the county level and are in parentheses; \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.

Table 9: Sample-split test examining the Effects of Political Competition on Funded Ratio, Benefit Levels, and Interest Rate

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Split using educational attainment of the population 25 years and older									
	Percentage of residents with a Bachelor's degree <= Median						p-value coefficients differ across samples		
	Percentage of residents with a Bachelor's degree > Median								
Panel A1: Effect of Political Competition on Actuarial Funded Ratio									
Political Competition	-114.8* (63.64)	-106.2 (64.51)	-115.1* (64.08)	-68.44** (29.06)	-61.05** (28.88)	-61.42** (29.25)	0.06057	0.04459	0.02627
Panel A2: Effect of Political Competition on Average Annual Pension									
Political Competition	6.428** (3.123)	5.330* (3.118)	5.423* (3.104)	5.624 (4.326)	2.880 (4.833)	2.857 (4.840)	0.7764	0.3901	0.3687
Panel A3: Effect of Political Competition on Interest Rate									
Political Competition	0.839** (0.321)	0.692** (0.314)	0.691** (0.313)	0.209 (0.399)	-0.0374 (0.379)	-0.0681 (0.381)	0.0109	0.0025	0.0016
Panel B: Split using length of residence in same house									
	Percentage of residents staying in the same house <= Median						p-value coefficients differ across samples		
	Percentage of residents staying in the same house > Median								
Panel B1: Effect of Political Competition on Actuarial Funded Ratio									
Political Competition	-103.2** (46.23)	-95.17** (45.99)	-92.24** (45.25)	-89.61 (69.82)	-88.39 (69.66)	-84.91 (71.26)	0.9051	0.9038	0.9277
Panel B2: Effect of Political Competition on Average Annual Pension									
Political Competition	7.596** (3.311)	5.336* (3.178)	5.446* (3.177)	5.191 (4.709)	4.051 (3.991)	3.973 (3.998)	0.4589	0.6827	0.6391
Panel B3: Effect of Political Competition on Interest Rate									
Political Competition	1.066*** (0.362)	0.780** (0.366)	0.786** (0.368)	0.210 (0.373)	0.159 (0.342)	0.155 (0.342)	0.0009	0.0118	0.0105
Average Democratic vote	✓	✓	✓	✓	✓	✓			
Employee group dummies	✓	✓	✓	✓	✓	✓			
Municipal demogr. controls		✓	✓	✓	✓	✓			
Municipal fiscal controls			✓	✓	✓	✓			

The p-value in columns (7) - (9) is generated from statistical tests which examine whether the coefficient on political competition in columns (1) through (3) differs from corresponding coefficients in columns (4) through (6). Regressions involving actuarial funded ratio are estimated on all municipal DB plans from Pennsylvania for the period 1985–2009 and include municipality and decade fixed effects. Regressions involving the average annual pension and interest rate are estimated on all municipal DB plans from Pennsylvania for the period 2003–2009 and include county and year fixed effects. Definitions for dependent variables are provided in notes following Table 8. The measure of political competition used is that defined by BPS (2010), viz.  $PC_{md} = -|0.5 - D_{md}|$ . The data used in Panel B1 comes from the Decennial Censuses of 1980, 1990, and 2000 which asked respondents about whether they had stayed in the same house 5 years ago. For Panels B2 and B3, I merge data from the 2000 Census and the 2007–2011 ACS which asked respondents about whether they had stayed in the same house a year ago. Municipal demographic controls included are the percentage of households that are owner-occupied, percentage of the population aged 75 or older, and local unemployment rate. Municipal fiscal controls included are the fraction of tax revenues spent on debt service and percentage of pension costs paid by the state. Columns (2), (3), (5), and (6) in panels A2, A3, B2, and B3 also include the class of municipality, the fraction of employees organized under collective bargaining, and coverage under Social Security as controls. The dependent variable and all control variables have been winsorized at the 2.5% and 97.5% levels. Robust standard errors are clustered at the county level and are in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 10: Summary of all Results

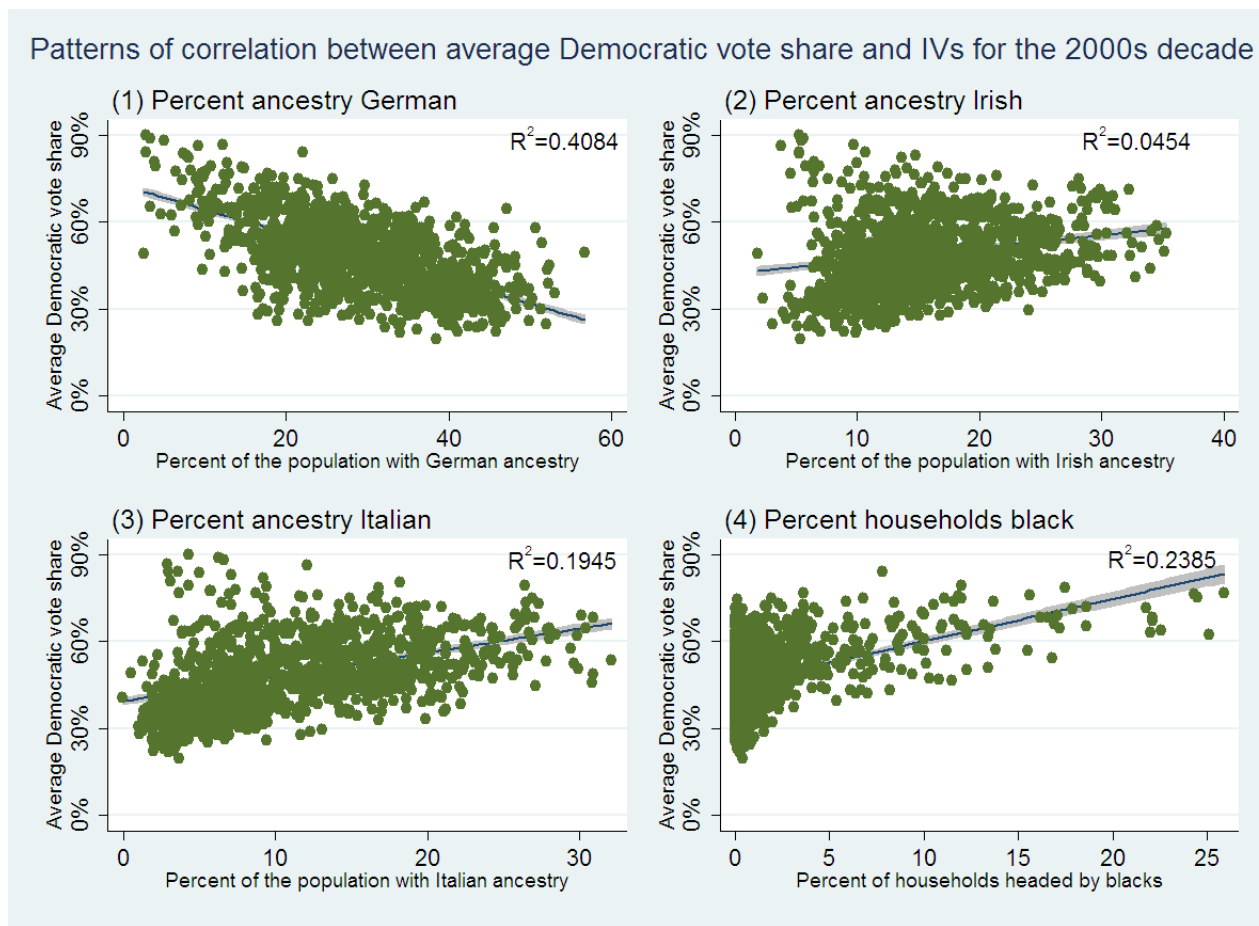
	Mean of dependent variable	Units	Direction of change	1 standard deviation increase
Panel A: Effect of political competition on the funding levels of municipal DB plans				
Panel A1: Defining political competition as the absolute deviation of Democratic vote share from 50%				
Actuarial funded ratio	133.46	Percent	Decrease	7.1–7.7
Unfunded liabilities per active member	(11,038)	Dollars	Increase	2,358–2,666
Panel A2: Defining political competition as the standard deviation of Democratic vote share				
Actuarial funded ratio	133.46	Percent	Decrease	9.6–9.8
Unfunded liabilities per active member	(11,038)	Dollars	Increase	3,183–3,317
Panel B: Effect of political competition on generosity and interest rates of municipal DB plans				
Annual pension benefit per retiree	15,362	Dollars	Increase	468–618
Interest rate for discounting actuarial liabilities	698	Basis points	Increase	4.9–6.4
Panel C: Effect of political competition on municipal DC plans				
Employer contribution rate	5.69	Percent	No effect	–
Panel D: Effect of political competition on the funding levels, generosity, and interest rate of DB plans offered by municipal authorities				
Actuarial funded ratio	103.95	Percent	No effect	–
Unfunded liabilities per active member	(1,244)	Dollars	No effect	–
Annual pension benefit per retiree	9,811	Dollars	No effect	–
Interest rate for discounting actuarial liabilities	655	Basis points	No effect	–

Results in Panel A are based on regressions estimated on all municipal DB plans from Pennsylvania for the period 1985–2009. Actuarial funded ratio is defined as the percent of pension liabilities funded. Unfunded liabilities per active member is defined as (Actuarial Liabilities - Actuarial Assets)/ Number of active members in the plan. The measure of political competition used in Panel A1 is that defined by BPS (2010), viz.  $PC_{md} = -|0.5 - D_{md}|$ . The measure of political competition used in Panel A2 is the standard deviation of Democratic vote share. Results involving annual pension benefit per retiree and interest rate for discounting actuarial liabilities in Panel B are based on regressions estimated on all municipal DB plans from Pennsylvania for the period 2003–2009. Annual pension benefit per retiree is the average annual benefit received by all retirees (including Deferred Retirement Option Plan (DROP) beneficiaries but excluding disability, surviving spousal, and surviving child beneficiaries). Results involving employer contribution rate of DC plans in Panel C are based on regressions estimated for all municipal DC plans from Pennsylvania for the period 2003–2009. The dependent variable is the employer's contribution rate to the plan, expressed as a percentage of payroll. Results in Panel D are based on regressions estimated on all DB plans from Pennsylvania for municipal authorities. Results for actuarial funded ratio and unfunded liabilities per active member are obtained for the period 1985–2009. Results involving annual pension benefit per retiree and interest rate for discounting actuarial liabilities are obtained for the period 2003–2009. These variables are defined identically to those used in the analysis of all municipal DB plans.

The measure of political competition used in Panels B, C, and D is that defined in BPS (2010), viz.  $PC_{md} = -|0.5 - D_{md}|$ .



Figure 1: Patterns of correlation between average Democratic vote share and IVs (percentage ancestry German, percentage ancestry Irish, percentage ancestry Italian, and percentage households headed by Blacks) for the 2000s decade



All variables were constructed using the 2000 Census. The dependent variable, average Democratic vote share, was constructed using results of all national and state-level elections held in Pennsylvania in even-numbered years between 2000–2009 and were available from successive issues of the Pennsylvania Manual. For each of the variables: percent ancestry German, percent ancestry Irish, percent ancestry Italian, and percent households headed by Blacks, observations more than 3 std. deviations from the mean were not included in constructing the graphs. Predicted values along with 95 percent confidence intervals and with the R-squared from a linear fit are included for each plot.

## A Proofs of results stated in the theoretical model

### A.1 Optimization by public-sector workers

Proof that utility of public-sector workers does not depend on the level of funding for the pension plan chosen in period 1 of the model:

The optimization problem for the representative public-sector worker is:

$$Max_{\{s^G\}} U(c_1^G, c_2^G) = Max_{\{s^G\}} [u(W^G - s^G - T_1) + \frac{1}{(1+r)} u(s^G * (1+r) + B^G - T_2)], \quad (A.1)$$

where  $T_1$  is given by

$$T_1 = N^G * (W^G + a * \frac{B^G}{(1+r)}). \quad (A.2)$$

Public-sector workers know three elements of (A.2):  $N^G$ ,  $W^G$ , and  $B^G$  and the platforms announced by the parties. Thus, using (A.2), they would be able to correctly infer  $a$ , the level of funding chosen for the pension plan in period 1. Under the requirement that pension obligations must be honored in full and the constraint that the pension plan must be balanced at the end of period 2, the budget balance equation for period 2 is:

$$T_2 = N^G * (W^G + (1-a) * B^G + \frac{B^G}{(1+r)}). \quad (A.3)$$

Thus, public-sector workers would be able to exactly predict  $T_2$  using (A.3). In particular, when  $a < 1$  a public-sector worker will correctly anticipate the increased taxes in period 2 and adjust her savings behavior accordingly. As the well-being of public-sector workers (either perceived or actual) does not depend on  $a$ , public-sector workers do not condition their voting behavior based on  $a$ .

### A.2 Nash Equilibrium of the game

In terms of voting behavior, an individual from group  $j$  will vote for party  $R$  if:

$$\kappa^j U_{per}^j(a^L) + (\sigma^{ij} + \theta) < \kappa^j U_{per}^j(a^R).$$

$$\Rightarrow \text{She will vote for party } R \text{ iff: } \sigma^{ij} < \kappa^j (U_{per}^j(a^R) - U_{per}^j(a^L)) - \theta.$$

I identify the “swing voter” in group  $j$  as the individual who, given the parties’ platforms, is indifferent between the two parties. I denote these voters’ party bias as:

$$\sigma^j \equiv \kappa^j (U_{per}^j(a^R) - U_{per}^j(a^L)) - \theta. \quad (A.4)$$

Swing voters toss a fair coin when deciding how to vote. In terms of the political equilibrium, we need to consider the first stage of the game when parties are choosing which platforms to announce. Based on the distributional assumptions for  $\sigma^{ij}$ , I can write the vote share for party  $R$  as:

$$\pi^R = \sum_j \frac{N^j}{N} m^j [\sigma^j(a^R, a^L, \theta) + \frac{1}{2m^j}].$$

By definition of  $\sigma^j$  in equation (A.4) and the assumption that  $\theta \sim U[-\frac{1}{2h}, \frac{1}{2h}]$ ,  $p^R$  is given by:

$$p^R = \frac{1}{2} + h[\sum_j j \frac{N^j}{N} \frac{m^j}{m} \kappa^j (U_{per}^j(a^R) - U_{per}^j(a^L))] \quad (\text{A.5})$$

where  $m \equiv \sum_j \frac{N^j}{N} m^j$  denotes the average density of party bias across groups.

Thus, party  $R$  chooses its platform,  $a^R$  to maximize  $V^R$  which is given by:

$$V^R = p^R(a^R, a^L) * [E + \sum_j N^j (U_{act}^j(a^R) - U_{act}^j(a^L))] + \sum_j N^j U_{act}^j(a^L) \quad (\text{A.6})$$

This involves setting  $\frac{\partial V^R}{\partial a^R} = 0$  which results in:

$$\frac{\partial p^R}{\partial a^R} * [E + \sum_j N^j (U_{act}^j(a^R) - U_{act}^j(a^L))] + p^R * \sum_j N^j U_{act}^{\prime j}(a^R) = 0. \quad (\text{A.7})$$

This is the best response function for party  $R$  in response to the choice of funding level,  $a^L$  by party  $L$  where  $p^R$  is given by equation (A.5) and  $\frac{\partial p^R}{\partial a^R} = h \sum_j \frac{N^j}{N} \frac{m^j}{m} \kappa^j (U_{per}^{\prime j}(a^R))$ .<sup>56</sup> Thus, in deciding on an optimal policy, the politician from party  $R$  would not only consider the responsiveness of the probability that he wins to the policy chosen but also the sensitivity of voter well-being to that policy. Unlike candidates who only care about winning elections as in the standard Downsian models, a politician may sacrifice a marginally higher probability of winning if that comes at the cost of a significant reduction in voter well-being. The optimal policy level of  $a^R$  involves considering these tradeoffs. Note that the best response function is symmetric for both parties  $L$  and  $R$ , does not involve any variables which are party-specific<sup>57</sup> and therefore in Nash equilibrium, the parties set identical policy platforms:

$$a^L = a^R.$$

<sup>56</sup>Prime is used to denote a derivative.

<sup>57</sup>The problem would not be symmetric if I let the ego rents be different for the two parties or if I let the two parties attach different weights to the ego rents from office vis-a-vis voter well-being. Assuming that these are the same for both parties, enables us to simplify the problem. However, the essential idea that in the presence of two competing forces that push the politicians in different directions on pension plan funding, politicians strive for a balance between them, holds regardless of whether the ego rents are the same for politicians of both parties or whether they attach the same weight to ego rents vis-a-vis voter well-being.

### A.3 Conditions for existence of an interior solution and corresponding second-order condition

For an interior solution to exist,  $\frac{\partial V^R}{\partial a^R} = 0$  for  $a^R \in (0, 1)$ . This can be guaranteed if  $\frac{\partial V^R}{\partial a^R} > 0$  for  $a^R = 0$  and  $\frac{\partial V^R}{\partial a^R} < 0$  for  $a^R = 1$ , given that  $V^R$  is continuous with respect to the argument,  $a^R$ . The first condition requires that:

$$\frac{\partial p^R(0, a^L)}{\partial a^R} * [E + N^P(U_{act}^P(0) - U_{act}^P(a^L))] + p^R(0, a^L) * N^P U_{act}^{\prime P}(0) > 0 \quad (\text{A.8})$$

and the second condition requires that:

$$\frac{\partial p^R(1, a^L)}{\partial a^R} * [E + N^P(U_{act}^P(1) - U_{act}^P(a^L))] + p^R(1, a^L) * N^P U_{act}^{\prime P}(1) < 0. \quad (\text{A.9})$$

Intuitively, if we were to think of the first term as representing the marginal change in utility for the politician from party R resulting from a change in the funded ratio and the second term as representing the marginal change in utility for private-sector workers resulting from such a change of policy, then condition (A.8) requires that the marginal benefit to private-sector workers of increasing the pension plan funding levels at the point of maximum distortion,  $a^R = 0$  be large enough to dominate the marginal cost to the politician of increasing funding levels at that point. Condition (A.9) requires that the marginal cost to private-sector workers from a decrease in pension plan funding levels at the point of least distortion,  $a^R = 1$  be small enough that it is overwhelmed by the marginal benefit to the politician resulting from a decrease in pension plan funding levels at that point.

Finally note that if  $\frac{\partial V^R}{\partial a^R} > 0$  for  $a^R = 0$  and  $\frac{\partial V^R}{\partial a^R} < 0$  for  $a^R = 1$ , given that  $V^R$  is continuous with respect to  $a^R$ ,  $\frac{\partial^2 V^R}{\partial a^{R2}} < 0$  at the point where  $\frac{\partial V^R}{\partial a^R} = 0$ . Thus, whenever it is the case that  $\frac{\partial V^R}{\partial a^R} > 0$  for  $a^R = 0$  and  $\frac{\partial V^R}{\partial a^R} < 0$  for  $a^R = 1$ , we are guaranteed an interior solution for  $a^R$  and furthermore, that interior solution corresponds to a maximum for  $V^R$ . Thus, politicians from both parties would choose to partially fund the pension plan.

### A.4 Proof of Comparative Statics Results

Let

$$F \equiv \frac{\partial p^R}{\partial a^R} * [E + \sum_j N^j (U_{act}^j(a^R) - U_{act}^j(a^L))] + p^R * \sum_j N^j U_{act}^{\prime j}(a^R) \quad (\text{A.10})$$

Or,

$$F \equiv h * \left[ \sum_j \frac{N^j m^j}{N} \kappa^j (U'_{per}(a^R)) \right] * [E + \sum_j N^j (U_{act}^j(a^R) - U_{act}^j(a^L))] + \left( \frac{1}{2} + h \left[ \sum_j \frac{N^j m^j}{N} \kappa^j (U_{per}^j(a^R) - U_{per}^j(a^L)) \right] \right) * \sum_j N^j U'_{act}(a^R) \quad (\text{A.11})$$

### Proof of Result 1

Using the implicit function theorem,

$$\frac{\partial a^k}{\partial \kappa^j} = - \frac{\partial F / \partial \kappa^j}{\partial F / \partial a^k} \quad (\text{A.12})$$

Without loss of generality, consider  $\frac{\partial a^R}{\partial \kappa^j}$ . First,

$$\begin{aligned} \partial F / \partial \kappa^j &= h * \left[ \frac{N^j m^j}{N} (U'_{per}(a^R)) \right] * [E + \sum_j N^j (U_{act}^j(a^R) - U_{act}^j(a^L))] + \\ &h \left[ \frac{N^j m^j}{N} (U_{per}^j(a^R) - U_{per}^j(a^L)) \right] * \sum_j N^j U'_{act}(a^R) \end{aligned}$$

At the Nash equilibrium, when  $a^R = a^L$ , this simplifies to:

$$\partial F / \partial \kappa^j = h * \left[ \frac{N^j m^j}{N} (U'_{per}(a^R)) \right] * E \quad (\text{A.13})$$

Given that  $U'_{per}(a^R) < 0$ ,  $\partial F / \partial \kappa^j < 0$ . For obtaining  $\partial F / \partial a^R$ , I use the form of  $F$  suggested by (A.10).

$$\partial F / \partial a^R = \partial^2 p^R / \partial a^{R2} * [E + \sum_j N^j (U_{act}^j(a^R) - U_{act}^j(a^L))] + 2 * \partial p^R / \partial a^R * \sum_j N^j U'_{act}(a^R) + p^R * \sum_j N^j U''_{act}(a^R)$$

In equilibrium,  $a^L = a^R$  and hence the above expression simplifies to:

$$\partial F / \partial a^R = \partial^2 p^R / \partial a^{R2} * E + 2 * \partial p^R / \partial a^R * \sum_j N^j U'_{act}(a^R) + p^R * \sum_j N^j U''_{act}(a^R) \quad (\text{A.14})$$

Substituting for  $p^R$ ,  $\partial p^R / \partial a^R$ , and  $\partial^2 p^R / \partial a^{R2}$ , I get:

$$\partial F / \partial a^R = h \sum_j \frac{N^j m^j}{N} \kappa^j (U''_{per}(a^R)) * E + 2 * h \sum_j \frac{N^j m^j}{N} \kappa^j (U'_{per}(a^R)) * \sum_j N^j U'_{act}(a^R) + p^R * \sum_j N^j U''_{act}(a^R) \quad (\text{A.15})$$

Given the concavity of  $U$ , both the first and the last terms are negative. In the second term,  $U'_{per}(a^R)$  and  $U'_{act}(a^R)$  are of opposite signs with  $U'_{per}(a^R) < 0$  and  $U'_{act}(a^R) > 0$ . Thus, all three terms in the expression for  $\partial F/\partial a^R$  are negative. Thus,  $\partial F/\partial a^R < 0$  and hence using  $\partial F/\partial \kappa^P < 0$  and (A.12),  $\partial a^R/\partial \kappa^P < 0$ . QED.

As  $U'^G_{per}(a^R) = 0$ , using (A.12) and (A.13),  $\partial a^R/\partial \kappa^G = 0$ . QED.

## Proof of Result 2

Using the implicit function theorem,

$$\frac{\partial a^k}{\partial m^j} = -\frac{\partial F/\partial m^j}{\partial F/\partial a^k} \quad (\text{A.16})$$

Without loss of generality, consider  $\frac{\partial a^R}{\partial m^j}$ . First,

$$\frac{\partial F}{\partial m^j} = [h\kappa^j \frac{\partial U^j_{per}(a^R)}{\partial a^R} * \{E + \sum_j N^j (U^j_{act}(a^R) - U^j_{act}(a^L))\} + h\kappa^j (U^j_{per}(a^R) - U^j_{per}(a^L)) * \sum N^j \frac{\partial U^j_{act}(a^R)}{\partial a^R}] * \frac{\partial}{\partial m^j} (\frac{N^j m^j}{Nm})$$

At equilibrium,  $a^R = a^L$  and the above expression simplifies to:

$$\frac{\partial F}{\partial m^j} = h\kappa^j \frac{\partial U^j_{per}(a^R)}{\partial a^R} * E * \frac{(Nm * N^j - N^j m^j * N^j)}{(Nm)^2} = h\kappa^j \frac{\partial U^j_{per}(a^R)}{\partial a^R} * E * \frac{N^P N^G m^{-j}}{(Nm)^2} \quad (\text{A.17})$$

Given that  $\frac{\partial U^P_{per}(a^R)}{\partial a^R} < 0$ ,  $\frac{\partial F}{\partial m^P} < 0$ . As before,  $\partial F/\partial a^R < 0$ . Thus, using (A.16),  $\frac{\partial a^R}{\partial m^P} < 0$ . QED.

As  $U'^G_{per}(a^R) = 0$ , using (A.16) and (A.17),  $\partial a^R/\partial m^G = 0$ . QED.

# Online Appendix to “The Effects of Political Competition on the Funding and Generosity of Public-Sector Pension Plans”

January 27, 2016

The following tables have been provided in this Online Appendix.

- Table 1: Robustness Checks for the Effect of Political Competition on Annual Pension Received by Retirees
- Table 2: Robustness Checks for the Effect of Political Competition on Interest Rate chosen to Discount Actuarial Liabilities
- Table 3: Effect of Political Competition on Actuarial Funded Ratio and Unfunded Liabilities per Active Member (IV estimates)
- Table 4: Effect of Political Competition on the Average Pension Benefit Received by Retirees (IV Estimates)
- Table 5: Effect of Political Competition on the Interest Rate chosen to Discount Actuarial Liabilities (IV Estimates)
- Table 6: Effects of Political Competition on Actuarial Funded Ratio, Unfunded Liabilities per Active Member, Average Annual Pension, and Interest Rate for Municipal Authorities (IV estimates)
- Table 7: Effect of Political Competition on Actuarial Funded Ratio, Normalized to Common Interest Rates

## **Robustness Checks on the Effects of Political Competition on the Generosity of Benefits**

To examine the robustness of the finding that an increase in political competition is associated with an increase in the generosity of retirement benefits, I present a set of robustness checks in Table 1 of this Online Appendix.

[Table 1 about here.]

The robustness checks support the conclusions presented in Table 4 of the main paper. I find that the results are robust to minor changes in specification and alternative operationalizations of political competition, endogeneity concerns regarding the use of national and state-level races to

construct measures of local political competition, and concerns regarding sampling or the disproportionate influence of small plans on the estimates.

### **Robustness Checks on the Effects of Political Competition on Interest Rates**

To examine the robustness of the findings that an increase in political competition is associated with an increase in the interest rate used for discounting actuarial liabilities, I present a set of robustness checks in Table 2 of this Online Appendix.

[Table 2 about here.]

The results of the robustness checks generally support the conclusions presented in Table 5 of the main paper. The notable differences pertain to RC1, when the average Democratic vote share is excluded and RC4, when I use a weighted regression with the number of active members as weights. The coefficients are statistically insignificant for RC4 in the OLS specification and for RC1 in the IV specification suggesting that the effects of political competition may be sensitive to the inclusion of controls for partisan tendencies of the population and that small plans may have a disproportionate influence in the unweighted regressions. Beyond that, the results are robust to concerns regarding sampling, endogeneity concerns regarding the use of national and state-level races to construct measures of local political competition, and alternative operationalizations of political competition.

### **Effect of Political Competition on Actuarial Funded Ratio and Unfunded Liabilities per Active Member (IV estimates)**

Table 3 of the Online Appendix presents the IV estimates of the effect of political competition on the actuarial funded ratio (columns (1) - (3)) and unfunded liabilities per active member (columns (4) - (6)). Panel A operationalizes political competition as the difference of Democratic vote share from 50%, while in Panel B, I use the standard deviation of Democratic vote share as the measure of political competition. In the interest of brevity, only the coefficients on political competition and average Democratic vote share are included in the table with full results available on request.

[Table 3 about here.]

The results in Table 3 confirm our findings that political competition has a negative and statistically significant effect on the actuarial funded ratio and a positive and statistically significant effect on the size of unfunded liabilities per active member. Moreover, the values of the first-stage F-statistic and the Hansen-J statistic suggest that the instruments satisfy the statistical tests for relevance and validity.



## **Effect of Political Competition on the Average Pension Benefit Received by Retirees (IV Estimates)**

Table 4 of the Online Appendix presents the IV estimates of the effect of political competition on the annual pension per retiree in the first four columns and the log of annual pension per retiree in the next four columns. I control for the log of wages in columns (5)–(8) to allow for the possibility that wages may be lower to offset the increased generosity of pensions and in that case, looking at retirement benefits alone may offer a misleading picture of plan generosity.

[Table 4 about here.]

The results in Table 4 suggest that political competition continues to have an economically and statistically significant effect on the generosity of pension benefits. The effects of the other control variables, including unionization are generally similar to those that were reported in the OLS specifications in Table 4 of the main paper. Being represented in collective bargaining is associated with an increase in benefits of about \$3,900–4,600 per retiree or 26–29%. The effect of Social Security coverage is statistically significant in some specifications and the coefficients suggest that employees who are covered by Social Security receive about \$1,000 less in benefits annually. Finally, the values of the first-stage F-statistic and the Hansen-J statistic suggest that the instruments satisfy the statistical tests for relevance and validity.

## **Effect of Political Competition on the Interest Rate chosen to Discount Actuarial Liabilities (IV Estimates)**

Table 5 of the Online Appendix presents the IV estimates of the effect of political competition on the interest rate used by pension plans to discount actuarial liabilities.

[Table 5 about here.]

The results in Table 5 suggest that political competition continues to have an economically and statistically significant effect on the interest rate that plans use to discount actuarial liabilities. As before, the instruments continue to satisfy the statistical tests for relevance and validity.

## **Effects of Political Competition on Actuarial Funded Ratio, Unfunded Liabilities per Active Member, Average Annual Pension, and Interest Rate for Municipal Authorities (IV estimates)**

In Table 6 of the Online Appendix, I present the IV estimates of the effects of political competition on (1) the actuarial funded ratio and unfunded liabilities per active member (Panels A1 and A2); (2) the average annual pension benefit received by a retiree (Panels B1 and B2), and (3) the interest

rate used to discount actuarial liabilities (Panel C) for defined benefit pension plans operated by municipal authorities.

[Table 6 about here.]

As we can see from each of the panels in Table 6, there is no statistically significant relationship between the level of political competition in the municipalities that constitute the service area of an authority and the fiscal health of pension plans offered by these authorities. The null result holds across all dependent variables of interest in these IV estimations and is robust to the inclusion of a wide range of controls pertaining to municipal demographic and fiscal characteristics. This is in contrast to the results presented elsewhere in which we find that an increase in political competition is associated with a decline in the funded ratio and an increase in the unfunded liabilities per member, the level of pension benefits, and the interest rate used for discounting actuarial liabilities for defined benefit plans offered by municipalities.

### **Calibrating all reported funded ratios to a common interest rate**

In the paper, I have used the actuarial funded ratios as provided by municipalities themselves in calculating the effects of political competition. The implicit assumption that is being made in these estimations is that the interest rate used by municipalities in discounting their actuarial liabilities are uncorrelated with their underlying levels of political competition. However, as Table 5 of the main paper suggests (and Tables 2 and 5 of this Online Appendix confirm) that is not the case; it appears that municipalities that are more politically competitive also choose higher interest rates. That finding strengthens the conclusions arrived at previously with respect to the effects of political competition on actuarial funded ratios and suggests that the estimates presented may in fact be lower-bound estimates of the true effects of political competition on the funding level of municipal pension plans.

With this in mind, I attempt to recalculate the reported funded ratios using a common interest rate. The task is challenging because pension plans rarely disclose the stream of cash flows that are discounted to arrive at an estimate of the actuarial liabilities. One has to go through an elaborate series of calculations to “reverse-engineer” the underlying cash flows before discounting them back and arriving at estimates of the liabilities for various different interest rates (Novy-Marx and Rauh, 2011). In this case, however, not all of the data that are necessary for undertaking the series of steps are available making it impossible to replicate that process.<sup>1</sup> Beyond that, data regarding the interest rates chosen by the various plans is not available in the biennial reports that are available from 1985–2009 but are only available over the shorter time period from 2003–2009.

I deal with these data limitations by, first, noting that estimates of the effective average duration of pension liabilities range from 13 years (Novy-Marx and Rauh, 2011) to 15 years (Waring 2004a, 2004b). Second, lacking data on interest rates for each year for which the data on funded

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<sup>1</sup>For example, data on the Cost of Living Adjustments (COLAs) for these plans are unavailable in the datasets.

ratios is available, I assume that the interest rate used by the plans for the period 2003–2009 is what was used over the entire sample period from 1985–2009. I discount all liabilities with respect to two different choices of interest rates.

The first interest rate chosen is 7 percent, corresponding to the median across all municipal pension plans in the sample. However, as the 7 percent rate is likely too high (see for example, Brown and Wilcox, 2009 and Novy-Marx and Rauh, 2011), I also discount them back to an interest rate corresponding to the nominal yield on zero-coupon Treasury bonds of similar duration. Based on recent market conditions and expectations of market participants about future economic conditions, I use 1.5 percent for the real yield on long-term zero-coupon Treasury bonds and add in 2 percent to reflect inflation expectations, for a nominal yield of 3.5 percent. Thus, Table 7 presents the results for both measures of political competition, two choices of interest rates – 7 percent and 3.5 percent, and two choices of the weighted average duration of liabilities – 13 years and 15 years. For brevity, only the coefficients on political competition are included in the table. Full results are available from the author.

[Table 7 about here.]

As we can see, the coefficients on political competition are negative and statistically significant in each of the panels using either measure of political competition, under both OLS and IV estimation techniques, and for all combinations of interest rates and duration of liabilities. The smaller absolute magnitude of the coefficient on political competition when I use Treasury yields can be reconciled with the fact that the range of variation in the dependent variable is reduced when liabilities are re-calculated using an interest rate of 3.5%. For example, when a weighted average duration of liabilities of 13 years is used, the inter-quartile range of the dependent variable, actuarial funded ratio, re-calibrated with a 3.5 percent interest rate and winsorized at the 2.5% and 97.5% levels, is 35 percent, whereas the inter-quartile range for the actuarial funded ratio, as reported by the plans themselves and winsorized similarly, is 52 percent or about 50 percent larger.

## References

- Brown, Jeffrey R., and David W. Wilcox.** 2009. “Discounting State and Local Pension Liabilities.” *American Economic Review Papers & Proceedings*. 99(2): 538-542.
- Novy-Marx, Robert and Joshua Rauh.** 2011. “Public Pension Promises: How Big Are They and What Are They Worth?” *Journal of Finance*. 66(4): 1211–1249.
- Waring, M. Barton.** 2004a. “Liability-Relative Investing.” *Journal of Portfolio Management*. 30(4): 8–20.
- 2004b. “Liability-Relative Investing II.” *Journal of Portfolio Management*. 31(1): 40–53.

Table 1: Robustness Checks for the Effect of Political Competition on Annual Pension Received by Retirees

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: Annual pension received per retiree (in \$1,000 dollars)								
OLS								
Base Specification	8.289*** (2.645)	6.778** (2.625)	6.282** (2.539)	6.325** (2.551)	18.46** (8.954)	13.07 (8.173)	12.12* (7.283)	11.85* (7.201)
RC1: Not controlling for average Democratic vote share	6.162 (3.695)	7.664** (3.566)	6.206** (2.872)	6.264** (2.878)	2.276 (3.131)	8.074*** (2.289)	7.801*** (2.566)	7.656*** (2.567)
RC2: Using average vote share based on Presidential elections	5.549*** (1.849)	3.942** (1.897)	4.001** (1.953)	4.031** (1.968)	15.10* (7.886)	9.797 (7.153)	9.982 (6.555)	9.778 (6.482)
RC3: Using data for 2009 only	10.76*** (2.635)	7.901*** (2.904)	8.956*** (2.750)	9.136*** (2.879)	17.83** (8.037)	12.72* (7.593)	13.32** (6.671)	12.06* (6.409)
RC4: Weighting regression by number of retirees	8.213*** (2.986)	6.594** (3.019)	7.252* (3.731)	7.085* (3.565)	17.32* (9.236)	10.36 (7.640)	9.731 (7.234)	9.782 (6.833)
RC5: Including average vote share for Democrats and average vote share squared								
(i) Coefficient on the linear term	33.36*** (7.497)	21.78** (8.212)	23.34*** (8.479)	22.92*** (8.522)	62.69** (31.78)	38.37 (28.34)	41.01 (28.28)	40.23 (28.17)
(ii) Coefficient on the squared term	-29.19*** (6.924)	-23.18*** (7.599)	-22.71*** (7.638)	-22.37*** (7.648)	-50.13** (25.51)	-35.00 (22.57)	-35.91* (21.34)	-35.22* (21.26)
Employee group dummies	✓	✓	✓	✓	✓	✓	✓	✓
Plan-specific controls		✓	✓	✓		✓	✓	✓
Municipal demographic controls			✓	✓			✓	✓
Municipal fiscal controls				✓				✓

Regressions estimated on all municipal defined benefit pension plans from Pennsylvania for the period 2003–2009. The dependent variable is the annual average benefit received by all retirees (including Deferred Retirement Option Plan (DROP) beneficiaries but excluding disability, surviving spousal, and surviving child beneficiaries). It has been rescaled by dividing by \$1,000. The measure of political competition used is that defined by BPS (2010), viz.  $PC_{md} = -|0.5 - D_{md}|$ . Plan-specific controls included are the fraction of employees organized under collective bargaining and coverage under Social Security. Municipal demographic controls included are the percentage of households that are owner-occupied, percentage of the population aged 75 or older, and local unemployment rate. Municipal fiscal controls included are the fraction of tax revenues spent on debt service and percentage of pension costs paid by the state, instrumented by the weighted average percentage of pension costs paid by the state in all other municipalities within that same county in that year. The IVs included are: the percentage of the population (i) of German ancestry, (ii) of Irish ancestry, (iii) of Italian ancestry, (iv) percentage of households headed by Blacks and the product of (v) percentage ancestry German and percentage ancestry Irish and (vi) percentage ancestry German and percentage ancestry Italian. The dependent variables and all control variables have been winsorized at the 2.5% and 97.5% levels. County and year fixed effects are included in all specifications, except in RC3 where the estimation involves only one year of data (2009). Robust standard errors are clustered at the county level and are in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 2: Robustness Checks for the Effect of Political Competition on Interest Rate Chosen to Discount Actuarial Liabilities

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: Interest rate assumed for discounting actuarial liabilities								
OLS								
Base Specification	0.875*** (0.248)	0.753*** (0.241)	0.664*** (0.247)	0.665*** (0.248)	3.276*** (0.846)	2.768*** (0.827)	2.401*** (0.806)	2.358*** (0.811)
RC1: Not controlling for average Democratic vote share	0.0375 (0.319)	0.241 (0.244)	0.396* (0.233)	0.399* (0.235)	-1.055** (0.507)	-0.511 (0.398)	-0.00331 (0.457)	-0.00966 (0.470)
RC2: Using average vote share based on Presidential elections	0.948*** (0.270)	0.820*** (0.254)	0.710** (0.269)	0.713** (0.270)	2.872*** (0.694)	2.392*** (0.704)	2.055*** (0.679)	2.004*** (0.683)
RC3: Using data for 2009 only	0.992*** (0.355)	0.806** (0.348)	0.750** (0.371)	0.751* (0.380)	2.663*** (0.808)	2.295*** (0.795)	1.977*** (0.762)	1.845** (0.762)
RC4: Weighting regression by number of active members	0.135 (0.696)	-0.00260 (0.652)	-0.0388 (0.516)	-0.0469 (0.500)	3.545** (1.542)	2.675* (1.463)	2.141* (1.267)	2.037 (1.274)
RC5: Including average vote share for Democrats and average vote share squared								
(i) Coefficient on the linear term	5.293*** (1.223)	4.110*** (1.187)	3.405*** (1.243)	3.367*** (1.257)	13.76*** (3.431)	11.12*** (3.329)	9.698*** (3.201)	9.536*** (3.203)
(ii) Coefficient on the squared term	-3.455*** (0.963)	-2.911*** (0.944)	-2.540** (0.999)	-2.508** (1.016)	-9.820*** (2.785)	-8.020*** (2.676)	-6.596*** (2.536)	-6.470** (2.542)
Employee group dummies	✓	✓	✓	✓	✓	✓	✓	✓
Plan-specific controls		✓	✓	✓		✓	✓	✓
Municipal demographic controls			✓	✓			✓	✓
Municipal fiscal controls				✓				✓

Regressions estimated on all municipal defined benefit pension plans from Pennsylvania for the period 2003–2009. The dependent variable is the interest rate used for discounting long-term actuarial liabilities. The measure of political competition used is that defined by BPS (2010), viz.  $PC_{md} = -|0.5 - D_{md}|$ . Plan-specific controls included are the fraction of employees organized under collective bargaining and coverage under Social Security. Municipal demographic controls included are the percentage of households that are owner-occupied, percentage of the population aged 75 or older, and local unemployment rate. Municipal fiscal controls included are the fraction of tax revenues spent on debt service and percentage of pension costs paid by the state, instrumented by the weighted average percentage of pension costs paid by the state in all other municipalities within that same county in that year. The IVs included are: the percentage of the population (i) of German ancestry, (ii) of Irish ancestry, (iii) of Italian ancestry, (iv) percentage of households headed by Blacks and the product of (v) percentage ancestry German and percentage ancestry Irish and (vi) percentage ancestry German and percentage ancestry Italian. The dependent variables and all control variables have been winsorized at the 2.5% and 97.5% levels. County and year fixed effects are included in all specifications, except in RC3 where the estimation involves only one year of data (2009). Robust standard errors are clustered at the county level and are in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 3: Effect of Political Competition on Actuarial Funded Ratio and Unfunded Liabilities per Active Member (IV estimates)

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: Actuarial Funded Ratio			Dependent variable: Unfunded liabilities per active member		
Panel A: Measure of political competition: Absolute difference of Democratic vote share from 50%						
Political Competition	-226.0*** (76.51)	-197.1*** (73.34)	-204.7*** (73.22)	120.5*** (27.56)	106.8*** (24.01)	106.7*** (23.56)
Average Democratic vote share	63.53 (46.71)	62.05 (46.21)	70.71 (51.00)	45.09 (28.11)	59.17** (28.73)	59.25* (30.38)
Observations	5043	5043	5043	4999	4999	4999
R <sup>2</sup>	0.21	0.21	0.21	0.18	0.18	0.18
First-stage F-stat of excluded instruments	44.55 & 18.93	43.00 & 22.82	44.56 & 20.25	44.40 & 17.65	43.51 & 21.60	44.65 & 19.10
Hansen-J statistic	5.610	4.623	4.718	7.846	7.830	7.847
Associated p-value	0.2302	0.3282	0.3175	0.0974	0.0980	0.0974
Panel B: Measure of political competition: Standard deviation of Democratic vote share						
Political Competition	-1176.8*** (258.3)	-1180.7*** (272.3)	-1204.7*** (279.6)	523.5*** (114.7)	461.1*** (97.12)	459.1*** (95.59)
Average Democratic vote share	358.6*** (61.60)	358.4*** (66.73)	360.8*** (65.56)	-24.97 (21.46)	-10.57 (23.18)	-9.327 (25.75)
Observations	5043	5043	5043	4999	4999	4999
R <sup>2</sup>	0.19	0.19	0.19	0.16	0.17	0.17
First-stage F-stat of excluded instruments	10.85 & 18.93	13.79 & 22.82	13.81 & 20.25	11.38 & 17.65	14.53 & 21.60	14.08 & 19.10
Hansen-J statistic	1.422	1.514	1.399	5.465	4.971	5.360
Associated p-value	0.8403	0.8242	0.8444	0.2428	0.2903	0.2523
Employee-group dummies	✓	✓	✓	✓	✓	✓
Municipal demographic controls		✓	✓		✓	✓
Municipal fiscal controls			✓			✓

Regressions estimated on all municipal defined benefit pension plans from Pennsylvania for the period 1985–2009. The dependent variable in columns (1) through (3), the actuarial funded ratio, is defined as the percent of pension liabilities funded. The dependent variable in columns (4) through (6), the unfunded liabilities per active member, is defined as (Actuarial Liabilities - Actuarial Assets)/ Number of active members in the plan. It has been rescaled by dividing by \$1,000. The measure of political competition used in panel A is that defined by BPS (2010), viz.  $PC_{md} = -|0.5 - D_{md}|$ . The measure of political competition in Panel B is the standard deviation of Democratic vote share. Municipal demographic controls included are the percentage of households that are owner-occupied, the percentage of population aged 75 or older, and the local unemployment rate. Municipal fiscal controls included are the fraction of tax revenues spent on debt service and percentage of pension costs paid by the state, instrumented by the weighted average percentage of pension costs paid by the state in all other municipalities within that same county in that decade. The IVs included are: the percentage of the population (i) of German ancestry, (ii) of Irish ancestry, (iii) of Italian ancestry, (iv) percentage of households headed by Blacks and the product of (v) percentage ancestry German and percentage ancestry Irish and (vi) percentage ancestry German and percentage ancestry Italian. The first number for the first-stage F-stat corresponds to the first-stage for the level of political competition (variously defined) and the second number corresponds to the first-stage for average Democratic vote share. The dependent variables and all control variables have been winsorized at the 2.5% and 97.5% levels. Municipality and decade fixed effects are included in all specifications. Robust standard errors are clustered at the county level and are in parentheses; \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.

Table 4: Effect of Political Competition on the Average Pension Benefit Received by Retirees (IV Estimates)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable: Annual pension per retiree		Dependent variable: Log of annual pension per retiree					
Political Competition	18.46** (8.954)	13.07 (8.173)	12.12* (7.283)	11.85* (7.201)	0.793 (0.626)	0.686 (0.607)	0.786 (0.589)	0.759 (0.581)
Average Democratic vote share	13.17** (6.529)	4.068 (6.224)	4.661 (6.927)	4.533 (6.850)	1.058** (0.448)	0.652 (0.477)	0.466 (0.554)	0.451 (0.552)
Log of wages					1.105*** (0.0987)	0.962*** (0.0956)	0.903*** (0.0998)	0.904*** (0.101)
Employee-group dummies:								
Plan for non-uniformed personnel	-10.64*** (0.782)	-9.666*** (0.743)	-9.312*** (0.764)	-9.291*** (0.764)	-0.541*** (0.0452)	-0.536*** (0.0413)	-0.500*** (0.0421)	-0.500*** (0.0425)
Plan for policemen	1.598** (0.660)	2.214*** (0.578)	2.558*** (0.612)	2.589*** (0.610)	-0.0200 (0.0392)	0.0214 (0.0350)	0.0874** (0.0359)	0.0867** (0.0359)
Plan-specific controls:								
Fraction of employees organized under collective bargaining		4.570*** (0.595)	3.933*** (0.528)	3.910*** (0.537)	0.257*** (0.0593)	0.257*** (0.0593)	0.199*** (0.0505)	0.198*** (0.0506)
Coverage in Social Security (0 = No, 1 = Yes)		-0.753 (0.515)	-0.943** (0.473)	-0.928* (0.475)	-0.0282 (0.0332)	-0.0282 (0.0332)	-0.0187 (0.0315)	-0.0183 (0.0317)
Municipal-level controls								
Percentage of households that are owner-occupied			-0.0483 (0.0319)	-0.0469 (0.0317)			-0.00542** (0.00257)	-0.00540** (0.00258)
Percentage of the population aged 75 or older			-0.00556 (0.0577)	-0.00565 (0.0575)			0.00421 (0.00599)	0.00406 (0.00597)
Unemployment rate			-0.187** (0.0934)	-0.188** (0.0938)			-0.0100* (0.00576)	-0.0102* (0.00579)
Fraction of tax revenues spent on debt service			0.887* (0.459)	0.887* (0.459)			0.0394 (0.0457)	0.0394 (0.0457)
Percentage of pension costs paid by the state			0.0180 (0.0142)	0.0180 (0.0142)			-0.000537 (0.00111)	-0.000537 (0.00111)
Observations	5157	5157	5157	5157	5157	5157	5157	5157
R <sup>2</sup>	0.46	0.49	0.51	0.51	0.47	0.48	0.49	0.49
First-stage F-statistic of excluded instruments	197.48 &	180.10 &	71.44 &	71.01 &	181.00 &	164.91 &	68.49 &	68.45 &
Hansen-J statistic	59.29	77.29	66.51	70.17	56.51	73.45	60.01	63.55
Associated p-value	3.115	2.040	1.369	1.470	2.246	1.836	1.381	1.460
	0.5388	0.7284	0.8495	0.8320	0.6907	0.7659	0.8475	0.8337

Regressions estimated on all municipal defined benefit pension plans from Pennsylvania for the period 2003–2009. The dependent variable in columns (1)–(4) is the absolute level of average benefit received by all retirees (rescaled by \$1,000 and including Deferred Retirement Option Plan (DROP) beneficiaries but excluding disability, surviving spousal, and surviving child beneficiaries) while the dependent variable in columns (5)–(8) is the log of annual average benefit. Controls for class of municipality are included in columns (3), (4), (7), and (8). The dependent variables and all control variables have been winsorized at the 2.5% and 97.5% levels. For the definition of control variables and a list of the IVs used, please refer to notes following Table 1 of the Online Appendix. County and year fixed effects are included in all specifications. Robust standard errors are clustered at the county level and are in parentheses; \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.

Table 5: Effect of Political Competition on the Interest Rate chosen to Discount Actuarial Liabilities (IV Estimates)

	(1)	(2)	(3)	(4)
Dependent Variable: Interest rate used by plan sponsors for discounting actuarial liabilities (in percent)				
Political Competition	3.276*** (0.846)	2.768*** (0.827)	2.401*** (0.806)	2.358*** (0.811)
Average Democratic vote share	3.708*** (0.612)	2.926*** (0.618)	2.973*** (0.720)	2.946*** (0.721)
Employee-group dummies:				
Plan for non-uniformed personnel	-0.271*** (0.0768)	-0.182*** (0.0693)	-0.0911 (0.0574)	-0.0914 (0.0573)
Plan for policemen	-0.0152 (0.0730)	0.0447 (0.0657)	0.151*** (0.0521)	0.151*** (0.0521)
Plan-specific controls:				
Fraction of employees organized under collective bargaining		0.383*** (0.0683)	0.306*** (0.0642)	0.304*** (0.0662)
Coverage in Social Security (0 = No, 1 = Yes)		-0.0999** (0.0431)	-0.0821** (0.0384)	-0.0800** (0.0382)
Municipal-level controls				
Percentage of households that are owner-occupied			0.0000787 (0.00330)	0.000134 (0.00337)
Percentage of the population aged 75 or older			0.00171 (0.00656)	0.00206 (0.00644)
Unemployment rate			-0.0365*** (0.00868)	-0.0360*** (0.00883)
Fraction of tax revenues spent on debt service				0.0993 (0.0652)
Percentage of pension costs paid by the state				0.00131 (0.00173)
Observations	6882	6882	6882	6882
R <sup>2</sup>	0.035	0.11	0.14	0.14
First-stage F-stat of excluded instruments	164.14 & 55.37	160.01 & 61.10	68.41 & 45.62	68.94 & 47.38
Hansen J-statistic	3.005	2.638	4.023	4.287
Associated p-value	0.5569	0.6201	0.4029	0.3685

Regressions estimated on all municipal defined benefit pension plans from Pennsylvania for the period 2003–2009. The dependent variable is the interest rate used for discounting long-term actuarial liabilities. Controls for class of municipality are included in columns (3) and (4). The dependent variables and all control variables have been winsorized at the 2.5% and 97.5% levels. For the definition of control variables and a list of the IVs used, please refer to notes following Table 2 of the Online Appendix. County and year fixed effects are included in all specifications. Robust standard errors are clustered at the county level and are in parentheses; \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.



Table 6: Effects of Political Competition on Actuarial Funded Ratio, Unfunded Liabilities per Active Member, Average Annual Pension, and Interest Rate for Municipal Authorities (IV estimates)

	(1)	(2)	(3)
Panel A1: Effect of Political Competition on Actuarial Funded Ratio			
Political Competition	76.40 (58.10)	38.25 (59.19)	41.34 (55.65)
Panel A2: Effect of Political Competition on Unfunded Liabilities Per Active Member			
Political Competition	-28.42 (45.87)	-20.22 (38.36)	-23.50 (37.92)
Panel B1: Effect of Political Competition on Average Annual Pension			
Political Competition	-9.248 (21.03)	-6.093 (15.51)	-3.945 (15.86)
Panel B2: Effect of Political Competition on Log of Average Annual Pension, controlling for Wages			
Political Competition	-1.290 (1.821)	-0.756 (1.309)	-0.833 (1.314)
Panel C: Effect of Political Competition on Interest Rate			
Political Competition	1.122 (1.759)	1.333 (1.544)	1.169 (1.518)
Average Democratic vote	✓	✓	✓
Employee group dummies	✓	✓	✓
Municipal demographic controls		✓	✓
Municipal fiscal control			✓

Regressions involving actuarial funded ratio and unfunded liabilities per active member are estimated on all defined benefit pension plans offered by municipal authorities in Pennsylvania for the period 1985–2009 and include authority and decade fixed effects. Actuarial funded ratio is defined as the percent of pension liabilities funded. Unfunded liabilities per active member is defined as (Actuarial Liabilities - Actuarial Assets)/ Number of active members in the plan. It has been rescaled by dividing by \$1,000. Regressions involving the average annual pension and interest rate are estimated on all defined benefit pension plans offered by municipal authorities in Pennsylvania for the period 2003–2009 and include county and year fixed effects. Average annual pension is the annual average benefit received by all retirees (including Deferred Retirement Option Plan (DROP) beneficiaries but excluding disability, surviving spousal, and surviving child beneficiaries). It has been rescaled by dividing by \$1,000. In Panel B2, the dependent variable is the log of the average annual pension and I control for the log of wages. Interest rate is the rate used for discounting long-term actuarial liabilities. The measure of political competition used is that defined by BPS (2010), viz.  $PC_{md} = -|0.5 - D_{md}|$ . Municipal demographic controls included are the percentage of households that are owner-occupied, percentage of the population aged 75 or older, and local unemployment rate for that municipality that enjoys a primal position in the operation of the authority. The municipal fiscal control included is the fraction of tax revenues spent on debt service for that municipality that enjoys a primal position in the operation of the authority. Municipal authorities do not receive any state aid for defraying pension costs and hence that control variable drops out of the regressions. Columns (2) and (3) in panels B1, B2, and C also include the class of municipality, fraction of employees organized under collective bargaining and coverage under Social Security as additional controls. The dependent variable and all control variables have been winsorized at the 2.5% and 97.5% levels. Robust standard errors are clustered at the county level and are in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 7: Effect of Political Competition on Actuarial Funded Ratio, Normalized to Common Interest Rates

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS			IV		
Panel A: Measure of political competition: Absolute difference of Democratic vote share from 50%						
Panel A1: Normalizing all liabilities using a 7% interest rate						
Duration of liabilities assumed = 13 yrs	-101.0** (39.12)	-92.00** (36.63)	-91.04** (36.84)	-253.4*** (94.25)	-212.2** (88.39)	-215.9** (88.27)
Duration of liabilities assumed = 15 yrs	-100.3** (39.03)	-91.39** (36.56)	-90.42** (36.78)	-253.3*** (94.86)	-212.5** (88.89)	-216.0** (88.78)
Panel A2: Normalizing all liabilities using a 3.5% interest rate						
Duration of liabilities assumed = 13 yrs	-65.53** (25.39)	-59.71** (23.77)	-59.08** (23.91)	-164.5*** (61.17)	-137.7** (57.36)	-140.1** (57.29)
Duration of liabilities assumed = 15 yrs	-60.87** (23.70)	-55.49** (22.20)	-54.91** (22.33)	-153.8*** (57.60)	-129.0** (53.97)	-131.1** (53.91)
Panel B: Measure of political competition: Standard deviation of Democratic vote share						
Panel B1: Normalizing all liabilities using a 7% interest rate						
Duration of liabilities assumed = 13 yrs	-394.2*** (130.4)	-388.3*** (132.8)	-385.6*** (140.3)	-1346.9*** (321.6)	-1340.0*** (339.8)	-1364.3*** (344.6)
Duration of liabilities assumed = 15 yrs	-393.4*** (130.6)	-387.5*** (133.0)	-384.8*** (140.5)	-1352.8*** (325.5)	-1346.5*** (343.5)	-1371.0*** (348.3)
Panel B2: Normalizing all liabilities using a 3.5% interest rate						
Duration of liabilities assumed = 13 yrs	-255.8*** (84.60)	-252.0*** (86.17)	-250.3*** (91.04)	-874.1*** (208.7)	-869.7*** (220.5)	-885.4*** (223.6)
Duration of liabilities assumed = 15 yrs	-238.9*** (79.31)	-235.3*** (80.78)	-233.7*** (85.32)	-821.5*** (197.6)	-817.6*** (208.6)	-832.5*** (211.5)
Employee group dummies	✓	✓	✓	✓	✓	✓
Municipal demographic controls		✓	✓		✓	✓
Municipal fiscal controls			✓			✓

Regressions estimated on all municipal defined benefit pension plans from Pennsylvania for the period 1985–2009. The dependent variable, the actuarial funded ratio, is defined as the percent of pension liabilities funded. The measure of political competition used in Panel A is that defined by BPS (2010), viz.  $PC_{mid} = -|0.5 - D_{mid}|$ . The measure of political competition used in Panel B is the standard deviation of Democratic vote share. The 7% discount rate used in Panels A1 and B1 corresponds to the median interest rate across all plans. The 3.5% discount rate used in Panels A2 and B2 corresponds to the nominal yield on long-term Treasury bonds of 3.5% (as of September 2013). Municipal demographic controls included are the percentage of households that are owner-occupied, percentage of the population aged 75 or older, and local unemployment rate. Municipal fiscal controls included are the fraction of tax revenues spent on debt service and percentage of pension costs paid by the state. For complete notes regarding municipal fiscal controls included, along with the list of IVs, please refer to notes following Table 3 of the Online Appendix. The dependent variable and all control variables have been winsorized at the 2.5% and 97.5% levels. Municipality and decade fixed effects are included in all specifications. Robust standard errors are clustered at the county level and are in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .