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 use higher interest rates at which to discount future actuarial liabilities. An increase in the level of political competition by one standard deviation leads to a decline in the actuarial funded ratio of about 7–10 percent, an increase in the annual average retirement benefits of about $470–620 per retiree, and an increase in the interest rate for discounting actuarial liabilities of about 5 basis points. Instrumental Variable (IV) estimates generated using demographic characteristics of the population as instruments corroborate these findings.

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

JEL codes: H75, J45

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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. The size and funding of public-sector pension plans are, however, issues affecting states and municipalities throughout the country.

Under defined benefit 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, often large gaps 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.[1] This amounts to about 340% of the $1.3 trillion raised in taxes in 2011 by these same state and local governments.[2]

The aggregate level of unfunded pension liabilities, however, conceals considerable heterogeneity across plans. The theoretical explanations that have been proposed in the literature for the existence of pension plan underfunding 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), the desire to smooth taxes across periods to minimize deadweight losses (Epple and Schipper, 1981), and 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.

This paper offers an alternative explanation for the existence of the underfunding that can also account for the wide variation in the funding levels and 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

[1] 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.

[2] http://www2.census.gov/govs/local/summary_report.pdf–Accessed 09/30/2013.

workers in the private sector. A higher degree of political competition will therefore be associated with a decline in the funding 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, more than three times the number offered by any other state in the U.S.[3] 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 covered employee 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. Using the point estimates across various specifications, 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 $2,300–3,200.[4]

In a different set of analyses using data from 2003 to 2009, I find that municipalities in Pennsylvania that are politically competitive offer more generous benefits and use a higher interest rate at which to discount future 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 actuarial 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

[3]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.

[4]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 conversely, go up from 42.8 percent (leaning Republican) to 50 percent (most competitive).

descent have a higher Republican vote share, whereas municipalities with large Irish-American, Italian-American, and black populations, have a higher Democratic vote share. Instrumental Variable (IV) estimates of the effect of political competition using variation in these demographic characteristics corroborate the earlier findings. A one standard deviation increase in the intensity of political competition results in a 14–32 percent decline in the funded ratio and a corresponding increase of $7,620–13,610 in the size of unfunded liabilities per active member, an increase in the generosity of the annual pension of about $880–1,380 per retiree, and an increase in the interest rate used for discounting future liabilities of about 17–24 basis points.

Given that defined contribution pension plans are seen as less susceptible to political influence, I also examine the effects of political competition on the generosity of such plans.[5] In contrast to the results obtained earlier with defined benefit pension plans, which suggest that an increase in political competition is associated with a decline in the funding level and an increase in the generosity and interest rate, I find that political competition has no effect on the generosity of defined contribution plans. These results are obtained, both in an OLS and in an IV set-up, in which I instrument for the level of political competition exploiting the variation in demographic characteristics described above.

The paper proceeds in six 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 provides the empirical specifications. In Section 4, I present results, focusing on three key elements for defined benefit plans: the level of funding, the generosity of benefits, and the choice of interest rate for discounting actuarial liabilities. I also present the null results on defined contribution plans. Section 5 offers some discussion regarding the theoretical model and the internal and external validity of the results. Section 6 concludes.

2 Theoretical Model

This paper focuses on the role of political competition in explaining the variation in funding status of public-sector pension plans. It builds on an idea presented in Epple and Schipper (1981) who conjecture that increased political competition may pressure 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. In this section, I analytically investigate the

[5] "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)

validity and significance of this conjecture in a stylized model that includes two groups of voters – workers in the public sector and workers in the private sector. 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 fully, in order to avoid raising taxes on workers in the private sector. The two key assumptions made for obtaining predictions of the effects of political competition on the funding status of pension plans are that (i) politicians care about voter welfare in addition to winning elections (e.g. Ujhelyi, 2013), 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, 2013). The model then predicts that an increase in political competition will be associated with a decline in the funding status of pension plans.[6]

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.[7] 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 hence, sub-optimal intertemporal allocation of consumption. The parties, in turn, decide on their electoral platform involving a choice of the lump-sum tax 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

[6]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 appropriately adjusting savings level (a Ricardian equivalence type result).

[7]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.

as voters consider the platforms announced by the two parties and cast their votes.[8] Finally, the party winning the election implements its announced platform and voters make private economic choices in the light of the policy chosen.[9] The next sub-sections 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.

I assume that the government is constrained to running a balanced budget as far as the current compensation of public-sector workers is concerned and that the only tax instrument available to the government is a lump-sum tax.[10] It inherits a pension fund at the start of period 1 that is balanced, i.e. has enough assets to cover all liabilities and is constrained to leaving a pension fund that is 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 (2013), 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. In support of their claim, they mention that state employee salaries are publicly disclosed every year whereas no such database exists for the

[8] I assume full turnout in the model and do not consider abstentions.

[9] 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.

[10] Although the latter seems like a restrictive assumption, the model does not hinge on that. 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.

accruing pensions of currently employed civil servants.[11] 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, in a competitive political environment, politicians can use this lack of information on the part of private-sector workers 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:

$$U^P(c_1^P, c_2^P) = u(c_1^P) + \beta u(c_2^P), \tag{2.1}$$

where β is a discount factor reflecting the weight placed on future consumption. 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:

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

where the "per" subscript denotes perceived (rather than realized) utility and $E(\mathrm{T}_2|\mathrm{T}_1)$ 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

$$\beta = {}^1\!/_{(1+r)} \tag{2.3}$$

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 me to obtain a closed-form solution for the level of savings and offers additional insights into the problem. 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:

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

Based on the assumption that private-sector workers do not know the 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

[11] 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. Similar data from Georgia are available at: www.open.georgia.gov.

workers cannot correctly anticipate what the level of taxes in period 2 would be in order to have the pension plan be fully 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:

$$s^P = W^P/(2+r). \tag{2.5}$$

With that, I can express the utility perceived by private-sector workers, U^P_{per}, following the announcement of period 1 taxes, T_1 as:

$$U^P_{per} = u(W^P - s^P - T_1) + \frac{1}{(1+r)} * u(s^P * (1+r) - T_1) = \frac{(2+r)}{(1+r)} * u(W^P * \frac{(1+r)}{(2+r)} - T_1). \tag{2.6}$$

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:

$$T_1 = N^G * (W^G + a * \frac{B^G}{(1+r)}) \tag{2.7}$$

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.[12] Substituting in (2.6), we see that:

$$U^P_{per} = \frac{(2+r)}{(1+r)} * u(W^P * \frac{(1+r)}{(2+r)} - N^G(W^G + a * \frac{B^G}{(1+r)})). \tag{2.8}$$

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 optimization problem for private-sector workers, with two important differences. First, public-sector workers have access to a second source of income during retirement, besides their own personal savings, namely a government-provided pension. Second, unlike workers in the private sector, who are uninformed of the level of benefits in the public sector, public-sector workers are aware of the level of benefits

[12]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: $(2 * N^P + 2 * N^G) = 1$.

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 formal derivation for this intuition is provided in the Appendix A.1.

2.2 The political model[13]

2.2.1 Parties

The two parties in the model differ on a dimension that is unrelated to their stance on economic issues, that I label as "ideology." Ideology is not amenable to change at will during an election campaign and is assumed to be invariant over time.[14] 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.

Arulampalam et al. (2009) in studying transfers from the federal government to state governments in India posit that the federal government is interested in maximizing total welfare accruing from grants in addition to reaping electoral gains from targeted transfers to aligned and swing state governments. In a similar vein, Ujhelyi (2013) in studying the policy impact of civil service regulations implemented at the state level in the U.S. during the 20^{th} century, also assumes that politicians care about social welfare in addition to private benefits.

For these reasons, 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

[13] The political model draws on the model of electoral competition laid out in Persson and Tabellini (2002).

[14] 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.

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 appear to be favorable to voters at first sight (and hence popular with them), those policies may harm them in the long run. For example, taking on very 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

All voters, irrespective of the sector they are employed in, vote based on a combination of economic and ideological considerations. U^{ij}_{per} and U^{ij}_{act} capture the economic well-being of voter i belonging to group j as perceived by the voter prior to voting (and prior to the actual implementation of policies) and the utility as realized by the voter after the actual implementation of policies respectively, $j \epsilon \{P, G\}$. I let U^{iP}_{per} and U^{iP}_{act} differ for private-sector workers because although economic well-being for private-sector workers depends on the level of taxes chosen in periods 1 *and* 2, under the assumptions made in 2.1.1, decisions regarding savings for period 2 are made before the level of taxes in period 2 is known. This same argument does not apply for public-sector workers however, who correctly anticipate the level of taxes in period 2.

I let v^{ij}_{per} and v^{ij}_{act} 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 the combination of economic and ideological considerations that voters value. v^{iP}_{per} and v^{iP}_{act} are likely different from each other, whereas v^{iG}_{per} and v^{iG}_{act} are the same. Based on the timing of the model, voting behavior for both group of workers depends on v^{ij}_{per}, whereas actual realized voter well-being depends on v^{ij}_{act}.

Finally, let p^k denote the probability that politician from party k wins when the level of period 1 taxes announced are T^k_1 and T^{-k}_1 respectively, $k \, \epsilon \{L, R\}$.[15] 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^k_1 and the level of funding chosen, a^k. Let E denote the ego rents for politicians from coming to office.[16] Thus, I express V^k, the utility of politician from party k, $k \epsilon \{L, R\}$ as:

[15] -k denotes the other party. For example, $p^R = p^R(T^R_1, T^{-R}_1)$. Alternatively, $p^R = p^R(T^R_1, T^L_1)$.

[16] For simplicity, I let the ego rents, E be the same for politicians of both parties.

$$V^k = p^k(a^k, a^{-k}) * [E + \sum_j N^j U^j_{act}(a^k)] + (1 - p^k(a^k, a^{-k})) * \sum_j N^j U^j_{act}(a^{-k}) \tag{2.9}$$

where $U^j_{act}(a^k)$ ($U^j_{act}(a^{-k})$) is the ex-post economic utility realized for voters belonging to group j when a^k (a^{-k}) is the level of pension plan funding that is chosen. More simply, V^k is given by:[17]

$$V^k = p^k(a^k, a^{-k}) * [E + \sum_j N^j (U^j_{act}(a^k) - U^j_{act}(a^{-k}))] + \sum_j N^j U^j_{act}(a^{-k}) \tag{2.10}$$

I express the perceived utility of voters based on the policy chosen as: $v^{ij}_{per}(a^k) = \kappa^j U^j_{per}(a^k) + (\sigma^{ij} + \theta) * D^L$, where D^L takes a value of unity if party L wins the election and zero otherwise. Here σ^{ij} is an individual-specific parameter and θ 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 σ^{ij} is (in absolute value). I assume that $\sigma^{ij} \sim U[-\frac{1}{2m^j}, \frac{1}{2m^j}]$. This suggests that 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 κ^j reflects a higher weight placed by members of group j on economic well-being relative to ideology. Lastly, θ 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 θ is unknown to the parties when they announce their platforms, making the election outcome uncertain. We might think of θ 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 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 and, 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

[17] 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 $[E + \sum_j N^j (U^j_{act}(a^k) - U^j_{act}(a^{-k}))] > 0$ for all possible choices of a^k and a^{-k}, $k \epsilon \{L, R\}$.

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, i.e. in equilibrium, $a^L = a^R$.[18]

2.3.2 Comparative Statics

The goal of this sub-section is to 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 κ^j. Groups with a higher value of κ^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 $\frac{\partial a^k}{\partial \kappa^j}$,$j\ \epsilon\{P,G\}$and $k\ \epsilon\{L,R\}$. 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. Thus the prediction that an increase in political competition would be associated with a decline in pension plan funding levels.

(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, $j\ \epsilon\{P,G\}$. An increase in the density $m^P(m^G)$ corresponds to a higher fraction of workers from the private (public) sector having preferences that are "moderate."[19] This can be seen more readily in case σ^{ij} had a smooth unimodal distribution.[20] In that case, a shift of the mass in the distribution towards the middle would raise the probability distribution function, g_σ 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. 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

[18] Furthermore, under the set of conditions laid out in the Appendix in (A.3), I can show that both parties choose to fund the pension plan less than fully, i.e. $0 < a^L = a^R < 1$.

[19] Recall that voter bias towards party L is given by: $\sigma^{ij} \sim U[-\frac{1}{2m^j}, \frac{1}{2m^j}]$.

[20] The assumption that σ^{ij} is distributed uniformly is made for analytical convenience.

proxied by an increase in the density m^P, we would anticipate 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 a higher level of political competition will be associated with a more generous benefit (recall that benefit levels were taken as exogenous), we can see that if the pension plan is not funded fully, then politicians would prefer compensating their employees in the form of benefits, which needs to be paid several years in the future, rather 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 annual required contribution to the pension fund.

3 Empirical analysis

3.1 Data Sources

I turn now to empirically examine the key 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. Most general purpose local governments in Pennsylvania establish separate pension plans for their police and non-uniformed employees.[21] The advantages of using municipal data to test the hypothesis are the large number of comparable cases that share the same national and state-level political context (e.g. state income 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

[21] Larger municipalities can offer multiple plans for the same class of employees (e.g. non-uniformed personnel). They will also often have a separate pension plan for their firefighters. Teachers are covered under a separate state-wide system, the Pennsylvania Public School Employees Retirement System (PSERS) that is not a part of this analysis.

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 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). 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.

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,[22] Attorney General, Auditor General, and Treasurer.[23] 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[24] 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 Besley, Persson, and Sturm (2010) (henceforth BPS);

[22] 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.

[23] As Besley, Persson, and Sturm (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.

[24] Defined as Votes cast for Democrats/ (Votes cast for Democrats + Votes cast for Republicans).

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.[25]

The use of data on races for national and state offices to generate measures of competitiveness at the local level is driven primarily by data limitations. However, an advantage to using this data is that the endogeneity bias inherent in using measures of competitiveness based on votes cast in local elections is reduced. Had I used measures of political competitiveness that are based on votes cast in local elections and introduced them in the regressions, the implicit assumption would have been that the intensity of political competition is uncorrelated with other factors which might affect the fiscal health or generosity of the pension plan. This may be untrue. For example, consider a city that is hit hard by an economic crisis. In its attempt to balance the budget, the incumbent government may end up raising taxes or cutting public services, as well as skipping the actuarially required contribution to the city's pension plan(s). The consequence of unpopular tax hikes and/or service cuts made might be that the incumbent officials lose in the next election cycle. In such a case, the city would have experienced a change in its level of political competition, as per the measure of competition I construct and one would see a concomitant change in the level of political competition and a decline in the funding status of the pension plan(s).[26] However, it would be wrong to conclude on this basis alone that the two are causally related. The underlying factor driving the change in political competition and the decline in funding status of the pension plan(s) would be the city's poor fiscal condition. By constructing measures of competition at the local level that are based on races to national and state-level offices, it may be possible to reduce the importance of this potential omitted variable bias.

In terms of the control variables, 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. In the second specification, 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 aged 75 or older, and lastly, 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

[25] 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.

[26] Whether political competition goes down or goes up depends on the initial starting level of political competition and the extent of the swing.

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 to allow for the possibility that 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 percent of pension costs paid by the state. The first of the two controls 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 the state of 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 the pension costs of municipalities. State 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 the state aid available does not defray the full pension costs, the amount of aid distributed per eligible employee is based on the total amount of money available for distribution and the total number of employee units across all municipalities.[27] The relative generosity of the aid available only for defraying pension costs (but not wages) has made municipal officials more willing to grant increased pension benefits and enhance them in lieu of other forms of compensation (PERC Actuarial Report, 2011). I control for the percentage of pension costs borne by the state as one might expect unfunded liabilities to be be smaller in municipalities where a greater share of the pension costs are borne by the state.

Although the variation in the amount available as 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. Thus, introducing the percentage of pension costs borne by the state directly as a control could be problematic because of endogeneity issues. In order to alleviate this concern, I instrument the percentage of pension costs reimbursed by the state with the weighted

[27]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.

average percentage of pension costs borne by the state in all *other* municipalities located within the same county as the municipality in question.[28] This data on pension aid received by each municipality over the period 1985 and 1990–2011 has been obtained through filing a Right-to-Know request with the Auditor General's office which is responsible for disbursal of pension 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.[29] 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:

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

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.

[28] 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.

[29] I note that the summary statistics for the actuarial funded ratio and unfunded liabilities per active member are based on numbers as reported by the municipalities themselves and are based on discounting 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 (as of September 2013), 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, would cause the median actuarial funded ratio to decline from 103.05 to 79.13.

- PC_{md} is a measure of political competition in the municipality m averaged over decade d;
- D_{md} is the average Democratic vote share for all state-wide races in 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, λ_m are municipal fixed effects and γ_d are decade fixed effects.

The choice of control variables is influenced by the prior literature (Eaton and Nofsinger, 2008; Coggburn and Kearney, 2009; Munnell et al., 2010) and the availability of data. I include municipal fixed effects across all specifications and all municipal and plan-level factors that are invariant over time (such as age of the pension plan) would be absorbed in these fixed effects. I cluster standard errors at the county level all throughout the paper 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, λ_c in the following specification. I also replace decade fixed effects with year fixed effects, γ_t. Thus, the specification used is modified as:

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

In addition to the differences noted above between (3.1) and (3.2), I lag the political variables by an year because elections to national and state offices are held in even-numbered years whereas the data on pensions is for the 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, available from reports of the Pennsylvania DCED

(for example, Township versus Borough versus City).[30] 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 5-year American Community Survey (ACS) to obtain necessary data on the control variables.[31]

4 Results

In this section, I present the results of analyzing the fiscal health of pension plans operated by the various municipalities within Pennsylvania as judged on a number of dimensions. I present my results in six sub-sections: the first deals with the actuarial funded ratio and the level of unfunded liabilities, the second deals with the generosity of benefits, the third with the interest rates used for discounting future actuarial liabilities, and the fourth goes back and takes another look at the actuarial funded ratio. All of these sub-sections focus on defined benefit plans, in contrast to the fifth sub-section which considers the effects of political competition on the generosity of defined contribution plans. The final sub-section summarizes the results of the prior sub-sections.

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. Before presenting the evidence from the regressions, I present a graphical representation of the data. Consistent with the spirit of the subsequent regressions that involve municipal fixed effects, I calculate the *change* in funded ratio for all defined benefit plans between the first decade of the sample (including the years 1985–1989) and the third (and last) decade of the sample (including the years 2001–2009). I also calculate the change in the intensity of political competition over these two different decades and split municipalities into terciles based on the *change* in the intensity of political competition. Finally, I plot the median change in actuarial funded ratio for municipalities in each of the three terciles. Results are presented in Figure 1 below and suggest that, as the level of political competition goes up for a given municipality, the

[30] 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.

[31] 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.

funding status of its pension plans deteriorates.

[Figure 1 about here.]

4.1.1 OLS Estimates on the Effects of Political Competition on Funded Ratio and Size of Unfunded Liabilities

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 tenure structure, 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 the political competition variable suggest that a higher level of political competition is associated with a statistically significant decline in the actuarial funded ratio. To provide a sense of magnitude of these effects, note that if the level of political competition were to increase by one standard deviation,[32] the funded ratio for the average pension plan would decline by about 7–8 percent. To take a more extreme example, an increase in political competition from the lowest level observed among all municipalities within Pennsylvania to the highest level observed would translate to a decrease in the funded ratio of about 40–43%, depending on the specification used.[33]

The conclusions from columns (1) through (3) of Table 2 are mirrored in columns (4) through (6) with unfunded liabilities per active member as the dependent variable. They suggest that an

[32] 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).

[33] The level of political competition observed varies from -0.40066 (Yeadon Borough, Delaware County) to -0.00019 (Highspire Borough, Dauphin County). The difference is 0.40047, and 0.40047 * 98.9 (from column (3)) = 39.6 and 0.40047 * 108.1 (from column (1)) = 43.3. Those two numbers establish the possible range of variation in the actuarially funded ratio.

increase in the level of political competition is associated with an increase in the level of unfunded liabilities per active plan member. In terms of magnitude, a one standard deviation increase in the level of political competition corresponds to an increase in the level of unfunded liabilities per active member of about $2,300–2,600. Expressed differently, an increase in political competition from the lowest level observed in the data to the highest level observed would be associated with an increase in the level of unfunded liabilities per active member of approximately $13,100–14,700. To put those numbers in context, the average level of unfunded liabilities per active member for plans which are less than fully funded is about $11,000.

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. In the same vein, Riley (1971) states:

> The fact that the winning candidates in state X usually get 55% of the vote could mean that the state has a more or less permanent minority of 45% of the electorate or that the state's party identifiers are rather evenly split and there is a highly volatile set of 'independent voters' swinging from one side to the other.

Motivated by these considerations, 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.

4.1.2 IV Estimates on the Effects of Political Competition on Funded Ratio and Size of Unfunded Liabilities

Although the use of national and state election results to generate measures of political competition at the local level reduces the endogeneity concerns that would have applied had I used data on local elections in constructing these measures, 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 adopt an Instrumental Variables (IV) approach and look for instruments which can predict variation in the intensity of political competition at the municipal level. In constructing these estimates, I draw on the literature referenced in Beyond the Melting Pot (Glazer and Moynihan, 1963) and subsequent discussions that emphasize the role of ethnicity and its influence on political behavior. In the context of Pennsylvania politics, ethnicity appears to play a significant role, akin to the role it has played in New York politics that motivated the original observations of the authors:

> It is striking that in 1963, almost forty years after mass immigration from Europe to this country ended, the ethnic pattern is still so strong in New York City. It is true we can point to specific causes that have served to maintain the pattern. But we know it was not created by the great new migrations of Southern Negroes and Puerto Ricans into the city; nor by the "new" immigration, which added the great new communities of East European Jews and Italians to the city; it was not even created by the great migration of Irish and Germans in the 1840's. Even in the 1830's, while the migration from Europe was still mild, and still consisted for the most part of English-speaking groups, one still finds in the politics of New York State, and of the city, the strong impress of group differentiation. In a fascinating study of the politics of the Jacksonian period in New York State, Lee Benson concludes: "At least since the 1820's, when manhood suffrage became widespread, ethnic and religious differences have tended to be relatively the most widespread sources of political difference." [Lee Benson, The Concept of Jacksonian Democracy, Princeton, New Jersey, 1961, p. 165]
>
> There were ways of making distinctions among Welshmen and Englishmen, Yorkers and New Englanders, long before people speaking strange tongues and practicing strange religions came upon the scene. The group-forming characteristics of American social life – more concretely, the general expectation among those of new and old groups that group membership is significant and formative for opinion and behavior – are as old as the city. The tendency is fixed deep in American life generally... (Glazer and Moynihan, 1963).

In the spirit of the above discussion, I explore 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. Although the nature in which ancestry data gets reported has changed somewhat over time, 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 using data from the 1980, 1990, and 2000 Censuses.[34] Of these six different groups, I find that for any given decade, (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 (2) of Irish ancestry or (3) of Italian ancestry have a higher Democratic vote share. (4) In addition, municipalities where a higher fraction of households are headed by blacks, also have a higher Democratic vote share. I

[34]The 1980 Census was the first census in which individuals were asked to report their ancestry.

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 is presented in Figure 2 for the 2000s decade.

[Figure 2 about here.]

The instruments, however, perform poorly when it comes to predicting variation in the intensity of political competition at the municipal level. 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 descent 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.

Results using these 6 different IVs (the 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 Table 4. In Panel A of Table 4, the measure of political competition used is the one proposed by BPS (2010), whereas in Panel B of Table 4, the alternative measure of political competition, viz. the standard deviation of vote share is used. As in earlier tables, columns (1) through (3) of both panels consider the effect of variation in political competition on the actuarial funded ratio, whereas columns (4) through (6) examine the effect of this variation on the size of unfunded liabilities per active member. In the interest of brevity, only the coefficients on political competition and average Democratic vote share are included in the table. Full results are available from the author.

[Table 4 about here.]

As we can see, political competition continues to have a negative and statistically significant effect on the actuarial funded ratio, whereas it continues to have a positive and statistically significant effect on the size of unfunded liabilities per active member, irrespective of which measure of political competition is used. Comparing the coefficients in the first row of Table 2 with those in the first row of Panel A of Table 4, we see that the IV estimates of the effects of political competition, using the measure defined by BPS (2010), are considerably larger than the OLS estimates.

We arrive at the same conclusion when comparing the coefficients in the first row of Table 3 with those in the first row of Panel B of Table 4 when the standard deviation of Democratic vote share is used as the measure. A one standard deviation increase in the level of political competition is now associated with a larger decline in the actuarial funded ratio of about 14–16 percent using the first measure, and about 31–32 percent when using the second measure. The corresponding increase in the size of unfunded liabilities per active member is about $7,600–8,600 and $12,000–13,600 respectively using the two measures.

4.1.3 Robustness Checks on the Effects of Political Competition on Funded Ratio and Size of Unfunded Liabilities

In order to examine the robustness of the results that political competition is associated with a decline in actuarial funded ratio and an increase in the size of unfunded liabilities, I conduct a number of robustness checks in Table 5. Panel A of Table 5 presents the robustness checks with actuarial funded ratio as the dependent variable, while Panel B presents the checks with unfunded liabilities per member as the dependent variable. OLS estimates are presented in columns (1) through (3) and IV estimates are presented in columns (4) through (6) of both panels. In the interest of brevity, I report 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 and are available from the author.

(a) *Robustness Check (RC) 1: Long differences:* The data used thus far encompasses three decades. In order to examine if long-run shifts in the intensity of political competition have the same effect as those found using data over all three decades, I estimate regressions using data from only the first decade (including the years 1985–1989) and the last decade of the sample (including the years 2001–2009). 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.

(b) *RC2: 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 different weights to plans based on their size, I re-estimate the regressions with weights

assigned to each observation based on the number of active members in the plan.[35] The results are similar to what I had before suggesting that the effects of political competition are not driven by or limited to small plans but are present across plans of varying sizes.

(c) *RC3: Not controlling for average Democratic vote share:* In the regressions estimated thus far, I have included the average vote share for Democrats as a control variable. 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.

(d) *RC4: Using average vote share based on Presidential elections:* The approach of using votes cast for elections held to national and state offices to construct measures of political competition, while motivated by data limitations, is also less likely to be contaminated with reverse causality. Nevertheless, it could still be argued that voters consider the performance of their local government officials in casting their votes for officials elected to state-level offices, such as the Governor or the Auditor General.[36] Voters are, however, least likely to consider the performance of their local government 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 and endogeneity that might be associated with using data on elections to all national and state-level offices. Therefore in this robustness check, I construct a measure of political competition based solely on votes cast in the Presidential elections and introduce that in the regressions to find that the coefficients on political competition are similar to their previous values.

(e) *RC5: Using a different operationalization of the measure of political competition:* The primary measure of political competition used in the paper uses the definition laid out by BPS (2010) as $PC_{md} = -|D_{md} - 0.5|$. In addition to using the standard deviation of Democratic vote share as a measure of political competition in Tables 3 and 4, an alternative approach

[35] 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).

[36] 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).

in terms of operationalizing political competition is to introduce the average Democratic vote share and the average Democratic vote share squared in the same specification. If political competition tends to decrease (increase) the funded ratio (level of unfunded liabilities), then I 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 5 about here.]

Overall the results presented in Tables 2 through 5 offer robust evidence that political competition plays a significant role in influencing the health of public-sector pension plans. In particular, 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.

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.[37]

Before moving to the regressions, I first present a graphical representation of the data. In order to construct the figure, I split municipalities into terciles based on their level of political competition for the year 2009. I plot the median annual pension received by retirees for the three terciles into which municipalities have been split along with the median level of political competition in each of these three terciles.

[Figure 3 about here.]

The figure suggests that as the level of political competition in a municipality goes up, the plans it offers tend to be more generous in their average retirement benefits.

[37] Under DROP, employees accumulate their monthly service retirement benefit in an interest-bearing account while continuing to be employed by their employer.

4.2.1 OLS Estimates on the Effects of Political Competition on the Generosity of Benefits

The pattern in which the regression results are presented in the next five tables (Table 6–Table 10) 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 effects.[38] 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 6 about here.]

As the coefficients on political competition from the first row of Table 6 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%. An increase in the level of political competition from the lowest to the highest level observed in the data would be associated with an increase in the average annual pension received of about $2,800–3,700 per retiree or 18–24%.[39]

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

[38] Additional regressions that involve municipal fixed effects, in a long difference setting, support the conclusions of this section and are available from the author on request.

[39] For the years 2003–2009, the level of political competition observed varies from -0.4426 (Yeadon Borough, Delaware County – least competitive) to -0.0000 (Rockledge Borough, Montgomery County – most competitive). The difference is 0.4426. 0.4426 * 6.282 (from column (3)) = $2,780 and 0.4426 * 8.289 (from column (1)) = $3,668. Those two numbers establish the possible range of variation in the increase in annual pension received by retirees. Given that the mean annual retirement benefit available to retirees is $15,360, the corresponding range in percent terms is 18–24%.

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.[40]

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 strongly 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. These estimates are in the same spirit as those which suggest that cities with collective bargaining spend about 20 percent more per capita on health benefits for policemen and firefighters compared to cities where such departments are not similarly organized (Anzia and Moe, 2012).

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

4.2.2 IV Estimates on the Effects of Political Competition on the Generosity of Benefits

In addition to the OLS estimates presented above, I also obtain estimates using the IVs that had been introduced earlier: (1) percentage ancestry German, (2) percentage ancestry Irish, (3) percentage ancestry Italian, (4) percentage households headed by a black, and the two interaction terms, (5) the product of percentage ancestry German and percentage ancestry Irish and (6) the product of percentage ancestry German and percentage ancestry Italian. The IV estimates are presented in Table 7 with the absolute level of benefits as the dependent variable in columns (1) through (4) without controlling for wages and the log of benefits as the dependent variable in columns (5) through (8) controlling for the log of wages.

[40] 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 on the difference between the log of benefits and the log of wages, I continue to find economically and statistically significant effects of political competition.

[Table 7 about here.]

In columns (1) through (4) when I consider variation in the absolute level of benefits, the effects of political competition continue to be statistically significant and estimates are about twice as large as those obtained earlier using OLS. A one standard deviation increase in the intensity of political competition is associated with an increase in the average annual pension received of about $880–1,380 per retiree, or 5.8–9.0% relative to its mean value. In columns (5) through (8) in which I introduce the log of benefits as the dependent variable and control for the log of wages, the effects of political competition fall short of statistical significance though, in this case as well, the IV estimates are somewhat larger than the corresponding OLS estimates and range from 5.1–5.9%.

The effects of the other control variables, including unionization are generally similar to those that were reported in the OLS specifications. 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 now 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.

4.2.3 Robustness Checks on the Effects of Political Competition on the Generosity of Benefits

To examine the robustness of the findings with regards to the generosity of the plans, I present a set of robustness checks, similar to those presented previously in Table 5. The only difference between the robustness checks undertaken in Table 5 versus those undertaken in Table 8 is that in the first robustness check of Table 8, instead of estimating long differences (based on considering data from the first and the last decades as in Table 5), I estimate regressions using only one year of data (2009). The rationale for this robustness check is as follows: 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. On the other hand, 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.[41]

[Table 8 about here.]

The robustness checks support the conclusions shown in Tables 6 and 7. The results are robust to concerns regarding sampling, concerns regarding the disproportionate influence of small

[41] 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.

plans on the estimates, minor changes in specification, endogeneity concerns regarding the use of national and state-level races to construct measures of local political competition, and alternative operationalizations of political competition.

4.3 Results on interest rates

Finally, I examine variation in the interest rate chosen to discount future actuarial liabilities. 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. 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 (Healey, Hess, and Nicholson, 2012).

The Government Accounting Standards Board (GASB)'s current standards on Accounting for Pensions by State and Local Governmental Employers recommend that "the appropriate interest rate is the rate of return on plan investments that was assumed in determining the annual required contribution for the current year" (GASB27, pp. 97). Employers have used this guideline to discount their future liabilities at a rate similar to the expected rate of return on pension fund assets. Currently, the interest rate assumed by state defined benefit public pension plans country-wide average around 8 percent[42] whereas the average for the municipal pension plans considered in this paper is about 7 percent. However, given the minimal risk involved in pension obligations, assuming a discount rate of 7 or 8 percent seems out of line with the professional judgment of economists who would recommend a considerably lower discount rate (see for example, Brown and Wilcox, 2009 and Rauh and Novy-Marx, 2011).

In any event, the choice of interest rate is a crucial assumption made by the plan sponsor. Prior research (Chaney, Copley, and Stone, 2002 and Giertz and Papke, 2007) finds evidence that, in the case of state pension plans, states in fiscal stress are strategic in selecting higher interest rates to obscure underfunding and reduce their plan contributions. Given the importance of interest rates in arriving at a measure of actuarial liabilities, I examine whether politically competitive municipalities are more likely to use a higher interest rate in order to mask the true magnitude of the promises that have been made from the general public and/ or financial market participants involved in dealing in municipal securities. Figure 4 offers a glimpse of the data and foreshadows the regressions that follow.

[Figure 4 about here.]

[42] Congressional Budget Office (2011) and author calculations from the Pension Plan Database.

4.3.1 OLS & IV Estimates on the Effects of Political Competition on Interest Rates

Results with the interest rate used to discount future liabilities as the dependent variable are presented in Table 9. For conciseness, both OLS and IV estimates are included in the same table, with OLS estimates in the first four columns and IV estimates in the last four.

[Table 9 about here.]

The results in Table 9 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. IV estimates are considerably larger than the OLS estimates and suggest that a one standard deviation increase in the level of political competition is associated with an increase in the interest rate of about 17–24 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.

4.3.2 Robustness Checks on the Effects of Political Competition on Interest Rates

To examine the robustness of the findings with regards to the generosity of the plans, I present a set of robustness checks, identical to those presented previously in Table 8.

[Table 10 about here.]

The results of the robustness checks generally support the conclusions reached at in Table 9. The notable differences pertain to RC2, when I use a weighted regression with the number of active members as weights and RC3, when the average Democratic vote share is excluded. The coefficients are statistically insignificant for RC2 in the OLS specification and for RC3 in the IV specification suggesting that small plans may have a disproportionate influence in the unweighted regressions and that the effects of political competition may be sensitive to the inclusion of controls for partisan tendencies of the population. 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.

4.4 Calibrating all reported funded ratios to a common interest rate

Thus far in this paper, I have used the actuarial funded ratios as provided by municipalities themselves in calculating the effects of political competition. The implicit assumption I make in these estimations is that the interest rate used by municipalities in discounting their actuarial liabilities are uncorrelated to their underlying levels of political competition. Tables 9 and 10 suggest that this is not the case; instead, it appears that municipalities that are more competitive choose higher interest rates. That finding further strengthens the conclusions arrived at previously with respect to the effects of political competition on actuarial funded ratios and suggests that the estimates presented thus far may 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 funded ratios on the basis of 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 (Rauh and Novy-Marx, 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.[43] 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 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 (Rauh and Novy-Marx, 2011) to 15 years (Waring 2004a, 2004b). Second, lacking data on interest rates for each year for which the data on funded 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, I also discount them back to an interest rate corresponding to the nominal yield on zero-coupon Treasury bonds of similar duration. Based on current market conditions (as of September 2013) 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 11 presents the

[43] For example, data on the benefit factor which captures the added benefit available for an additional year of service or data on the nature of COLA adjustments in these plans are unavailable in these datasets.

results for 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 11 about here.]

As we can see, the coefficients on political competition continue to be negative and statistically significant in each of the panels, under both OLS and IV estimation techniques. 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.

4.5 Placebo regressions estimated using Defined Contribution Plans

As a final check on the results obtained thus far, I use data on all defined contribution (DC) plans, available for 2003–2009 and examine the effects of political competition on the generosity of these plans.[44] Anecdotal evidence suggests that political influences are less influential in affecting the parameters for a defined contribution plan compared to a defined benefit plan.[45] For example, a report prepared by the Florida TaxWatch 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.

[44]The model does not have any predictions on the effects of political competition on the generosity of defined contribution plans. Workers from the public and private sectors would have opposing preferences over it and 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.

[45]The decision of whether to offer a DB or a DC plan is, in itself, endogeneous. 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.

In Table 12, I therefore examine the variation in the employer contribution rate for all defined contribution plans from Pennsylvania for the period 2003–2009. I choose to focus on the employer contribution rate because for defined contribution plans, it is not meaningful to talk of funded ratios or unfunded liabilities (as the plans are fully funded by design) or the average pension benefit received by a retiree on retirement (as that depends on the pattern of withdrawal from one's retirement account). The employer contribution rate to the defined contribution plan is, however, a meaningful plan parameter for such plans 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.

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. I first estimate the effects of political competition on the employer contribution rate using data for all years and for all plans, thereby hewing exactly to specification (3.2). Subsequent rows replicate the robustness checks that were conducted earlier on defined benefit plans with each row of the table corresponding to a different robustness check. OLS estimates are presented in columns (1) through (4) and IV estimates are presented in columns (5) through (8).

[Table 12 about here.]

As the coefficients on political competition suggest, defined contribution plans appear less susceptible to political influence than defined benefit 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 defined benefit plans.[46] This null result likely follows from the fact that with defined contribution 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 therefore less willing to make the plans more generous and risk alienating voters in the private sector.

4.6 Summary

I summarize the results of the previous analyses using data from Pennsylvania's municipal pension plans in Table 13. 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 13 about here.]

[46] 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.

As we can see, the hypothesized relationship between the intensity of political competition and funding status of defined benefit pension plans is borne out in the data. In addition, the evidence suggests that political competition affects the generosity of the defined benefit pension plan and the interest rate used for discounting future actuarial liabilities. These results are consistent with the predictions of the model. In contrast to defined benefit pension plans, political competition has no effect on the generosity of defined contribution plans.

5 Discussion

5.1 Discussion regarding the theoretical model

My model captures a very simple mechanism through which political competition may harm economic well-being. To the extent that politicians care about voter welfare, a high level of political competition may stand in the way of the government implementing policies that have long-run payoffs but involve short-term sacrifices. 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.[47] Jean-Claude Junker, 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 entirely by considerations of self-interest rather than by altruism. Politicians generally own residences in the jurisdictions that they govern[48] and may therefore desire to reduce the level of unfunded liabilities simply to avoid unfunded liabilities from being capitalized into the value of their housing stock. Politicians might also care about pension funding because of concerns about employment opportunities after their tenure in office. A politician may have fewer opportunities, either at other levels of government or in the private-sector, to the extent that voters associate his tenure in office with an underfunded pension plan and subsequent tax hikes to pay for those

[47] I note that this intuition is similar (but not identical) to the model in Acemoglu and Robinson (2006), in which more political competition intensifies political instability and diminishes the incentives to implement growth-enhancing reforms rather than seeking short-term rents.

[48] A residency requirement is common within local governments in Pennsylvania. For example, the Second Class Township code specifies: "Supervisors shall reside in the township from which elected and shall have resided in that township continuously for at least one year before their election." (http://www.psats.org/subpage.php?pageid=secondclasstownshipcode–Accessed 04/04/2013.) The Borough code for Pennsylvania also has a similar provision for local council members. (http://boroughs.org/jcp/program_guide_to_borough_government.pdf–Accessed 04/04/2013.)

shortfalls. Regardless of politicians' motives, it seems plausible that politicians would like to fund the pension plan when in office, in addition to maximizing their chances of winning.

Another key assumption of the model is that workers in the private sector are unaware of benefits that are offered in the public sector. One could alternatively assume that only a fraction of voters in the private sector are unaware 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.[49]

The assumption that private-sector workers misperceive the level of taxes in period 2 is inextricably 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, it seems likely that private-sector workers would erroneously estimate the level of taxes that they would be subject to in the second period of the model.

Besides the friction introduced in terms of private-sector workers lacking information on the level of public-sector retirement benefits, I have not introduced any additional frictions. In the presence of additional frictions, a politician would have a stronger incentive to fully fund the pension plan in period 1 even if he attaches no weight to voter welfare, but is purely guided by self-interest.

5.2 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 very limited data available for local races and races to national and state-level offices held during the same approximate period of time. 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.[50] The correlation coefficient for the Democratic vote shares in the 1980s

[49] 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.

[50] 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

for local and all concurrent national and state races is 0.7011, ($p < 0.001$) suggesting that the measures of Democratic support across the two different data sources are strongly correlated with each other. A similar calculation using composition of municipal councils reveals a correlation coefficient between the average Democratic vote share for all national and state races held in 2008 and the share of council seats held by Democrats in 2009 (as a fraction of the seats held by either Democrats or Republicans), of 0.6525 ($p < 0.001$). Both of 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 funding status 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 the absolute tax burden per capita, 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 in the form of taxes and a higher share from non-tax sources such as transfers, charges, and miscellaneous items. In addition, political competition also affects the mix of taxes used by municipalities. About 90 percent of all tax revenue raised by municipal governments in Pennsylvania comes from one of two sources: the property tax and an "earned income tax," which is generally limited to a rate of 1.5 percent and excludes capital income from the tax base. I find that the share of taxes that comes from property taxes is lower in politically competitive municipalities and correspondingly, the share of taxes that comes from the earned income taxes is higher in such municipalities suggesting that politically competitive municipalities use sources of revenue that are less salient to taxpayers.[51] 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 the variation in funding levels of local pension plans is not unique to Pennsylvania. For Florida, a state with over 300 retirement systems, the 25^{th} and 75^{th} percentile of the actuarial funded ratio were 65 percent and 89 percent respectively in 2011, illustrating a considerable degree of variation in the funded

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 this data was not recorded or archived electronically.

[51] Discussions regarding the high salience of the property tax relative to other taxes is offered in Cabral and Hoxby (2013). In addition to the reasons proposed therein, the lower salience of the earned income tax relative to the property tax in this context stems from the fact that the state of Pennsylvania limits how high the earned income tax rate can be for all municipalities (barring home-rule municipalities), whereas the property tax rate is determined exclusively by local officials.

ratio of those plans as well.[52] In addition, preliminary work conducted using data on state defined benefit pension plans support the conclusions reached in this paper. Using data on 85 defined benefit public-sector pension plans from the Wisconsin Legislative Council for 1989 to 2009 and a measure of political competition, 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.[53] The coefficients capturing the effect of political competition on the actuarial funded ratio of these plans are similar in magnitude to those reported here.[54]

6 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 too high. 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. In addition, politically competitive municipalities are also likely to offer more generous retirement benefits and to strategically use higher interest rates for discounting these future liabilities, arguably to make them appear smaller than they are in reality. Each of these findings is robust to instrumenting for the level of political competition using 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 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

[52] Author calculations using the 2011 Annual Report of the Florida Local Government Retirement Systems.

[53] 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).

[54] All of these additional results are available on request.

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 demonstrating 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. Although this idea was developed in the specific context of public-sector pension plans, the notion that political competition promotes behavior oriented towards the short-term, at the cost of 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.

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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	(11,049)	(1,004)	42,160	(126,390)	68,054
Average annual pension	In dollars	15,362	13,885	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	100
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	13.40	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	11.97	4.66	21.54	0	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***	-100.0***	-98.90***	37.04***	32.84**	32.75**
	(36.95)	(34.73)	(34.42)	(13.38)	(12.65)	(12.86)
Average vote share	105.6***	100.1**	103.2**	18.67	26.81*	25.49
of Democrats	(38.97)	(39.06)	(40.12)	(12.69)	(14.56)	(15.57)
Employee-group dummies:						
Plan for non-uniformed	-33.19***	-33.03***	-33.01***	2.996	2.983	2.984
personnel	(5.564)	(5.562)	(5.559)	(3.551)	(3.562)	(3.562)
Plan for policemen	34.94***	35.02***	35.00***	-26.05***	-26.05***	-26.05***
	(7.322)	(7.294)	(7.297)	(5.283)	(5.283)	(5.281)
Municipality-level controls:						
Percentage of households		-0.884	-0.873		0.295	0.296
that are owner-occupied		(0.751)	(0.750)		(0.207)	(0.208)
Percentage of the population		1.018	0.988		0.552	0.556
aged 75 or older		(1.240)	(1.260)		(0.526)	(0.523)
Unemployment rate		1.544**	1.539**		-0.445	-0.444
		(0.767)	(0.765)		(0.321)	(0.322)
Fraction of tax revenues			14.74			0.444
spent on debt service			(10.97)			(4.816)
Percentage of pension			0.0846			-0.0265
costs paid by the state			(0.270)			(0.0849)
Constant	91.58***	144.0***	136.9**	-3.279	-28.80*	-26.89
	(17.94)	(53.41)	(63.98)	(8.652)	(16.44)	(19.84)
Observations	5130	5130	5130	5130	5130	5130
R^2	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***	-368.3***	-368.3**	126.2***	121.8***	121.2***
	(130.3)	(131.7)	(139.0)	(35.28)	(35.71)	(36.51)
Average vote share	152.4***	147.4***	149.1***	3.066	11.13	10.44
of Democrats	(43.72)	(47.59)	(45.30)	(13.13)	(16.27)	(16.52)
Employee-group dummies:						
Plan for non-uniformed	-32.98***	-32.87***	-32.85***	2.924	2.930	2.930
personnel	(5.589)	(5.589)	(5.586)	(3.532)	(3.547)	(3.547)
Plan for policemen	35.10***	35.14***	35.12***	-26.11***	-26.09***	-26.09***
	(7.352)	(7.318)	(7.320)	(5.277)	(5.277)	(5.276)
Municipality-level controls:						
Percentage of households		-1.119	-1.103		0.372*	0.372*
that are owner-occupied		(0.752)	(0.750)		(0.213)	(0.213)
Percentage of the population		0.926	0.903		0.582	0.585
aged 75 or older		(1.282)	(1.301)		(0.534)	(0.533)
Unemployment rate		1.440*	1.437*		-0.411	-0.410
		(0.778)	(0.774)		(0.320)	(0.320)
Fraction of tax revenues			16.71			-0.207
spent on debt service			(11.59)			(4.851)
Percentage of pension			0.0537			-0.0163
costs paid by the state			(0.253)			(0.0813)
Constant	111.3***	180.2***	174.9***	-10.03	-40.69**	-39.46*
	(16.75)	(54.43)	(64.45)	(7.043)	(16.65)	(19.95)
Observations	5130	5130	5130	5130	5130	5130
R^2	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 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 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***	-197.1***	-204.7***	119.8***	106.4***	106.3***
	(76.51)	(73.34)	(73.22)	(27.47)	(23.94)	(23.48)
Average vote share	63.53	62.05	70.71	44.32	58.38**	58.47*
of Democrats	(46.71)	(46.21)	(51.00)	(27.91)	(28.54)	(30.17)
Observations	5043	5043	5043	4999	4999	4999
R^2	0.21	0.21	0.21	0.18	0.18	0.18
First-stage F-stat of excluded	44.55 &	43.00 &	44.56 &	44.40 &	43.51 &	44.65 &
instruments	18.93	22.82	20.25	17.65	21.60	19.10
Hansen-J statistic	5.610	4.623	4.718	7.868	7.855	7.872
Associated p-value	0.2302	0.3282	0.3175	0.0965	0.0970	0.0964
Panel B: Measure of political competition: Standard deviation of Democratic vote share						
Political Competition	-1176.8***	-1180.7***	-1204.7***	520.2***	458.9***	457.0***
	(258.3)	(272.3)	(279.6)	(114.6)	(96.95)	(95.44)
Average vote share	358.6***	358.4***	360.8***	-25.63	-11.41	-10.15
of Democrats	(61.60)	(66.73)	(65.56)	(21.37)	(23.07)	(25.61)
Observations	5043	5043	5043	4999	4999	4999
R^2	0.19	0.19	0.19	0.16	0.17	0.17
First-stage F-stat of excluded	10.85 &	13.79 &	13.81 &	11.38 &	14.53 &	14.08 &
instruments	18.93	22.82	20.25	17.65	21.60	19.10
Hansen-J statistic	1.422	1.514	1.399	5.423	4.927	5.311
Associated p-value	0.8403	0.8242	0.8444	0.2466	0.2948	0.2568
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 5: Robustness Checks for the Effect of Political Competition on Actuarial Funded Ratio and Unfunded Liabilities per Active Employee

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Robustness check for the actuarial funded ratio						
	OLS			IV		
Base Specification	-108.1***	-100.0***	-98.90***	-226.0***	-197.1***	-204.7***
	(36.95)	(34.73)	(34.42)	(76.51)	(73.34)	(73.22)
RC1: Long differences	-108.7***	-94.85**	-90.80**	-161.7*	-120.9	-122.4
	(40.38)	(36.61)	(35.38)	(95.80)	(95.70)	(95.50)
RC2: Weighting regression by	-159.1***	-126.0***	-124.0***	-306.5***	-236.3***	-201.5***
number of active members	(42.07)	(41.63)	(42.74)	(37.16)	(38.86)	(42.81)
RC3: Not controlling for average	-87.65**	-80.61**	-80.21**	-283.0***	-238.6***	-246.3***
Democratic vote share	(35.67)	(34.01)	(33.39)	(45.29)	(45.51)	(47.17)
RC4: Using average vote share	-98.41***	-93.02***	-93.45***	-184.3***	-164.2***	-167.2***
based on Presidential elections	(25.16)	(24.51)	(24.18)	(57.55)	(56.28)	(57.80)
RC5: Including average vote share for Democrats and average vote share squared						
(i) Coefficient on the linear term	-393.1**	-380.1**	-375.9**	-830.1***	-714.9**	-737.6**
	(187.0)	(180.9)	(187.8)	(313.5)	(300.9)	(305.6)
(ii) Coefficient on the squared	493.0***	477.3**	476.6**	868.4***	756.0***	783.2***
term	(184.8)	(180.0)	(180.6)	(281.1)	(269.9)	(268.8)
Panel B: Robustness check for the unfunded liabilities per active member						
Base Specification	37.04***	32.84**	32.75**	119.8***	106.4***	106.3***
	(13.38)	(12.65)	(12.86)	(27.47)	(23.94)	(23.48)
RC1: Long differences	46.32***	39.91***	39.82***	110.0***	99.89***	100.4***
	(14.57)	(13.49)	(13.90)	(30.92)	(26.77)	(25.06)
RC2: Weighting regression by	93.06*	69.14	76.65*	115.1*	90.22	123.3**
number of active members	(51.44)	(49.77)	(45.75)	(67.15)	(74.16)	(54.05)
RC3: Not controlling for average	39.77***	37.01***	36.44***	115.9***	108.8***	109.2***
Democratic vote share	(12.85)	(12.28)	(12.70)	(27.68)	(24.79)	(24.33)
RC4: Using average vote share	25.19**	22.05**	22.24**	94.08***	84.00***	85.17***
based on Presidential elections	(10.28)	(9.742)	(9.866)	(21.35)	(18.76)	(17.96)
RC5: Including average vote share for Democrats and average vote share squared						
(i) Coefficient on the linear term	190.8***	184.5***	183.1***	471.4***	434.7***	435.0***
	(55.56)	(53.43)	(55.29)	(111.3)	(89.30)	(86.51)
(ii) Coefficient on the squared	-170.0***	-156.2***	-156.2***	-411.6***	-365.9***	-365.3***
term	(59.64)	(57.44)	(58.28)	(96.52)	(79.06)	(77.20)
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 Panel A, the actuarial funded ratio is defined as the percent of pension liabilities funded. The dependent variable in Panel B, 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. $PC_{md} = -|0.5 - D_{md}|$. For complete notes regarding municipal demographic and fiscal controls included, along with the list of IVs, please refer to notes following Table 4. 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 6: 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				Dependent variable: Log of annual pension per retiree			
Political Competition	8.289***	6.778**	6.282**	6.325**	0.513***	0.474**	0.423**	0.424**
	(2.645)	(2.625)	(2.539)	(2.551)	(0.182)	(0.186)	(0.180)	(0.181)
Average vote share of Democrats	3.787	-1.659	0.195	0.159	0.777***	0.482***	0.281	0.283
	(3.170)	(2.952)	(2.565)	(2.566)	(0.187)	(0.168)	(0.190)	(0.192)
Log of wages					1.116***	0.966***	0.934***	0.932***
					(0.0971)	(0.102)	(0.105)	(0.106)
Employee-group dummies:								
Plan for non-uniformed personnel	-11.46***	-10.16***	-9.565***	-9.546***	-0.566***	-0.554***	-0.496***	-0.497***
	(0.755)	(0.835)	(0.832)	(0.833)	(0.0475)	(0.0507)	(0.0493)	(0.0497)
Plan for policemen	0.972	1.854***	2.541***	2.572***	-0.0339	0.0174	0.0951**	0.0952**
	(0.698)	(0.664)	(0.669)	(0.666)	(0.0400)	(0.0409)	(0.0433)	(0.0433)
Plan-specific controls:								
Fraction of employees organized		4.911***	4.190***	4.138***		0.268***	0.201***	0.199***
under collective bargaining		(0.554)	(0.674)	(0.682)		(0.0419)	(0.0448)	(0.0448)
Coverage in Social Security		-0.761	-0.760	-0.754		-0.0252	-0.00752	-0.00735
(0 = No, 1 = Yes)		(0.510)	(0.543)	(0.544)		(0.0321)	(0.0361)	(0.0362)
Municipal-level controls								
Percentage of households			-0.0338	-0.0322			-0.00477*	-0.00471*
that are owner-occupied			(0.0342)	(0.0337)			(0.00243)	(0.00243)
Percentage of the population			-0.0101	-0.00755			0.00589	0.00586
aged 75 or older			(0.0692)	(0.0679)			(0.00649)	(0.00647)
Unemployment rate			-0.191**	-0.190**			-0.00714	-0.00722
			(0.0774)	(0.0772)			(0.00595)	(0.00590)
Fraction of tax revenues				0.903*				0.0408
spent on debt service				(0.486)				(0.0460)
Percentage of pension costs				0.0212				-0.000
paid by the state				(0.0160)				(0.0012)
Constant	17.68***	18.04***	21.40***	19.58***	-2.602**	-0.979	-0.196	-0.151
	(2.092)	(1.934)	(2.477)	(2.967)	(1.027)	(1.067)	(1.161)	(1.182)
Observations	5157	5157	5157	5157	5157	5157	5157	5157
R^2	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 all columns but (1) and (5). 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 7: 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**	13.07	12.12*	11.85*	0.793	0.686	0.786	0.759
	(8.954)	(8.173)	(7.283)	(7.201)	(0.626)	(0.607)	(0.589)	(0.581)
Average vote share of Democrats	13.17**	4.068	4.661	4.533	1.058**	0.652	0.466	0.451
	(6.529)	(6.224)	(6.927)	(6.850)	(0.448)	(0.477)	(0.554)	(0.552)
Log of wages					1.105***	0.962***	0.903***	0.904***
					(0.0987)	(0.0956)	(0.0998)	(0.101)
Employee-group dummies:								
Plan for non-uniformed personnel	-10.64***	-9.666***	-9.312***	-9.291***	-0.541***	-0.536***	-0.500***	-0.500***
	(0.782)	(0.743)	(0.764)	(0.764)	(0.0452)	(0.0413)	(0.0421)	(0.0425)
Plan for policemen	1.598**	2.214***	2.558***	2.589***	-0.0200	0.0214	0.0874**	0.0867**
	(0.660)	(0.578)	(0.612)	(0.610)	(0.0392)	(0.0350)	(0.0359)	(0.0359)
Plan-specific controls:								
Fraction of employees organized		4.570***	3.933***	3.910***		0.257***	0.199***	0.198***
under collective bargaining		(0.595)	(0.528)	(0.537)		(0.0593)	(0.0505)	(0.0506)
Coverage in Social Security		-0.753	-0.943**	-0.928*		-0.0282	-0.0187	-0.0183
(0 = No, 1 = Yes)		(0.515)	(0.473)	(0.475)		(0.0332)	(0.0315)	(0.0317)
Municipal-level controls								
Percentage of households			-0.0483	-0.0469			-0.00542**	-0.00540**
that are owner-occupied			(0.0319)	(0.0317)			(0.00257)	(0.00258)
Percentage of the			-0.00556	-0.00565			0.00421	0.00406
population aged 75 or older			(0.0577)	(0.0575)			(0.00599)	(0.00597)
Unemployment rate			-0.187**	-0.188**			-0.0100*	-0.0102*
			(0.0934)	(0.0938)			(0.00576)	(0.00579)
Fraction of tax revenues				0.887*				0.0394
spent on debt service				(0.459)				(0.0457)
Percentage of pension costs				0.0180				-0.000537
paid by the state				(0.0142)				(0.00111)
Observations	5157	5157	5157	5157	5157	5157	5157	5157
R^2	0.46	0.49	0.51	0.51	0.47	0.48	0.49	0.49
First-stage F-statistic of excluded	197.48 &	180.10 &	71.44 &	71.01 &	181.00 &	164.91 &	68.49&	68.45 &
instruments	59.29	77.29	66.51	70.17	56.51	73.45	60.01	63.55
Hansen-J statistic	3.115	2.040	1.369	1.470	2.246	1.836	1.381	1.460
Associated p-value	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 all columns but (1) and (5). 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 4. 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 8: 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				IV			
Base Specification	8.289***	6.778**	6.282**	6.325**	18.46**	13.07	12.12*	11.85*
	(2.645)	(2.625)	(2.539)	(2.551)	(8.954)	(8.173)	(7.283)	(7.201)
RC1: Using data for 2009 only	10.76***	7.901***	8.956***	9.136***	17.83**	12.72*	8.875	7.863
	(2.635)	(2.904)	(2.750)	(2.879)	(8.037)	(7.593)	(9.381)	(9.764)
RC2: Weighting regression by	8.213***	6.594**	7.252*	7.085*	17.32*	10.36	9.731	9.782
number of retirees	(2.986)	(3.019)	(3.731)	(3.565)	(9.236)	(7.640)	(7.234)	(6.833)
RC3: Not controlling for average	6.162	7.664**	6.206**	6.264**	2.276	8.074***	7.801***	7.656***
Democratic vote share	(3.695)	(3.566)	(2.872)	(2.878)	(3.131)	(2.289)	(2.566)	(2.567)
RC4: Using average vote share	5.549***	3.942**	4.001**	4.031**	15.10*	9.797	9.982	9.778
based on Presidential elections	(1.849)	(1.897)	(1.953)	(1.968)	(7.886)	(7.153)	(6.555)	(6.482)
RC5: Including average vote share for Democrats and average vote share squared								
(i) Coefficient on the linear term	33.36***	21.78**	23.34***	22.92***	62.69**	38.37	41.01	40.23
	(7.497)	(8.212)	(8.479)	(8.522)	(31.78)	(28.34)	(28.28)	(28.17)
(ii) Coefficient on the squared	-29.19***	-23.18***	-22.71***	-22.37***	-50.13**	-35.00	-35.91*	-35.22*
term	(6.924)	(7.599)	(7.638)	(7.648)	(25.51)	(22.57)	(21.34)	(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. For complete notes regarding municipal fiscal controls included, along with the list of IVs, please refer to notes following Table 4. County and year fixed effects are included in all specifications, except in RC1 where the estimation involves only one year of data. The dependent variables 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: Effect of Political Competition on the Interest Rate chosen to Discount Actuarial Liabilities

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable: Interest rate used by plan sponsors for discounting actuarial liabilities (in percent)								
	OLS				IV			
Political Competition	0.875***	0.753***	0.664***	0.665***	3.276***	2.768***	2.401***	2.358***
	(0.248)	(0.241)	(0.247)	(0.248)	(0.846)	(0.827)	(0.806)	(0.811)
Average vote share of	1.772***	1.145***	0.816***	0.813***	3.708***	2.926***	2.973***	2.946***
Democrats	(0.292)	(0.260)	(0.301)	(0.301)	(0.612)	(0.618)	(0.720)	(0.721)
Employee-group dummies:								
Plan for non-uniformed	-0.456***	-0.298***	-0.183***	-0.183***	-0.271***	-0.182***	-0.0911	-0.0914
personnel	(0.0745)	(0.0702)	(0.0642)	(0.0638)	(0.0768)	(0.0693)	(0.0574)	(0.0573)
Plan for policemen	-0.163**	-0.0493	0.0754	0.0753	-0.0152	0.0447	0.151***	0.151***
	(0.0762)	(0.0706)	(0.0624)	(0.0621)	(0.0730)	(0.0657)	(0.0521)	(0.0521)
Plan-specific controls:								
Fraction of employees organized		0.549***	0.421***	0.416***		0.383***	0.306***	0.304***
under collective bargaining		(0.0691)	(0.0724)	(0.0732)		(0.0683)	(0.0642)	(0.0662)
Coverage in Social Security		-0.128***	-0.0817**	-0.0807**		-0.0999**	-0.0821**	-0.0800**
(0 = No, 1 = Yes)		(0.0437)	(0.0395)	(0.0394)		(0.0431)	(0.0384)	(0.0382)
Municipal-level controls								
Percentage of households			-0.00440	-0.00427			0.0000787	0.000134
that are owner-occupied			(0.00284)	(0.00286)			(0.00330)	(0.00337)
Percentage of the population			0.00326	0.00328			0.00171	0.00206
aged 75 or older			(0.00711)	(0.00706)			(0.00656)	(0.00644)
Unemployment rate			-0.0257***	-0.0257***			-0.0365***	-0.0360***
			(0.00649)	(0.00658)			(0.00868)	(0.00883)
Fraction of tax revenues				0.0869				0.0993
spent on debt service				(0.0707)				(0.0652)
Percentage of pension costs				0.00186				0.00131
paid by the state				(0.00143)				(0.00173)
Constant	6.573***	6.678***	7.260***	7.102***				
	(0.162)	(0.156)	(0.329)	(0.328)				
Observations	6882	6882	6882	6882	6882	6882	6882	6882
R^2	0.27	0.31	0.33	0.33	0.035	0.11	0.14	0.14
First-stage F-stat of excluded					164.14 &	160.01 &	68.41 &	68.94 &
instruments					55.37	61.10	45.62	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 all columns but (1) and (5). 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 4. 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 10: 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				IV			
Base Specification	0.875***	0.753***	0.664***	0.665***	3.283***	2.693***	2.662***	2.653***
	(0.248)	(0.241)	(0.247)	(0.248)	(0.583)	(0.524)	(0.517)	(0.518)
RC1: Using data for 2009 only	0.992***	0.806**	0.750**	0.751*	2.663***	2.295***	3.225**	3.252**
	(0.355)	(0.348)	(0.371)	(0.380)	(0.808)	(0.795)	(1.281)	(1.300)
RC2: Weighting regression by	0.135	-0.00260	-0.0388	-0.0469	3.545**	2.675*	2.141*	2.037
number of active members	(0.696)	(0.652)	(0.516)	(0.500)	(1.542)	(1.463)	(1.267)	(1.274)
RC3: Not controlling for average	0.0375	0.241	0.396*	0.399*	-1.055**	-0.511	-0.00331	-0.00966
Democratic vote share	(0.319)	(0.244)	(0.233)	(0.235)	(0.507)	(0.398)	(0.457)	(0.470)
RC4: Using average vote share	0.948***	0.820***	0.710**	0.713**	2.872***	2.392***	2.055***	2.004***
based on Presidential elections	(0.270)	(0.254)	(0.269)	(0.270)	(0.694)	(0.704)	(0.679)	(0.683)
RC5: Including average vote share for Democrats and average vote share squared								
(i) Coefficient on the linear term	5.293***	4.110***	3.405***	3.367***	13.76***	11.12***	9.698***	9.536***
	(1.223)	(1.187)	(1.243)	(1.257)	(3.431)	(3.329)	(3.201)	(3.203)
(ii) Coefficient on the squared	-3.455***	-2.911***	-2.540**	-2.508**	-9.820***	-8.020***	-6.596***	-6.470**
term	(0.963)	(0.944)	(0.999)	(1.016)	(2.785)	(2.676)	(2.536)	(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 RC1 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 11: 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**	-92.00**	-91.04**	-253.4***	-212.2**	-215.9**
	(39.12)	(36.63)	(36.84)	(94.25)	(88.39)	(88.27)
Duration of liabilities assumed = 15 yrs	-100.3**	-91.39**	-90.42**	-253.3***	-212.5**	-216.0**
	(39.03)	(36.56)	(36.78)	(94.86)	(88.89)	(88.78)
Panel A2: Normalizing all liabilities using a 3.5% interest rate						
Duration of liabilities assumed = 13 yrs	-65.53**	-59.71**	-59.08**	-164.5***	-137.7**	-140.1**
	(25.39)	(23.77)	(23.91)	(61.17)	(57.36)	(57.29)
Duration of liabilities assumed = 15 yrs	-60.87**	-55.49**	-54.91**	-153.8***	-129.0**	-131.1**
	(23.70)	(22.20)	(22.33)	(57.60)	(53.97)	(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***	-388.3***	-385.6***	-1346.9***	-1340.0***	-1364.3***
	(130.4)	(132.8)	(140.3)	(321.6)	(339.8)	(344.6)
Duration of liabilities assumed = 15 yrs	-393.4***	-387.5***	-384.8***	-1352.8***	-1346.5***	-1371.0***
	(130.6)	(133.0)	(140.5)	(325.5)	(343.5)	(348.3)
Panel B2: Normalizing all liabilities using a 3.5% interest rate						
Duration of liabilities assumed = 13 yrs	-255.8***	-252.0***	-250.3***	-874.1***	-869.7***	-885.4***
	(84.60)	(86.17)	(91.04)	(208.7)	(220.5)	(223.6)
Duration of liabilities assumed = 15 yrs	-238.9***	-235.3***	-233.7***	-821.5***	-817.6***	-832.5***
	(79.31)	(80.78)	(85.32)	(197.6)	(208.6)	(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. $PC_{md} = -|0.5 - D_{md}|$. 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 4. 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.

Table 12: 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	1.018	0.987	1.302	1.272	4.733	4.718	6.846	6.749
	(2.592)	(2.593)	(2.518)	(2.506)	(9.449)	(9.572)	(10.49)	(10.47)
RC1: Using data for 2009 only	-1.470	-1.437	-1.177	-1.133	3.500	3.769	6.191	6.478
	(3.438)	(3.489)	(3.633)	(3.606)	(9.194)	(9.289)	(10.47)	(10.57)
RC2: Weighting regression by	3.762	3.735	3.346	3.344	6.816	10.78	14.06	14.28
number of active members	(2.624)	(2.683)	(2.802)	(2.812)	(10.47)	(9.679)	(10.66)	(10.66)
RC3: Not controlling for average	1.227	1.178	1.436	1.403	1.131	-0.0798	0.548	0.659
Democratic vote share	(2.580)	(2.569)	(2.580)	(2.564)	(6.348)	(6.358)	(6.448)	(6.459)
RC4: Using average vote share	-0.938	-0.978	-0.184	-0.245	3.147	3.113	5.076	4.973
based on Presidential elections	(3.076)	(3.065)	(3.056)	(3.057)	(7.476)	(7.537)	(8.398)	(8.398)
RC5: Including average vote share for Democrats and average vote share squared								
(i) Coefficient on the linear term	-2.236	-2.260	-2.518	-2.611	18.15	18.03	29.65	29.01
	(9.654)	(9.785)	(9.551)	(9.527)	(27.76)	(28.13)	(32.29)	(32.47)
(ii) Coefficient on the squared	-1.372	-1.264	-2.295	-2.183	-16.02	-15.23	-24.67	-24.15
term	(9.409)	(9.391)	(9.187)	(9.162)	(24.98)	(25.21)	(27.95)	(28.08)
Employee group dummies	✔	✔	✔	✔	✔	✔	✔	✔
Plan-specific controls		✔	✔	✔		✔	✔	✔
Municipal demographic controls			✔	✔			✔	✔
Municipal fiscal controls				✔				✔

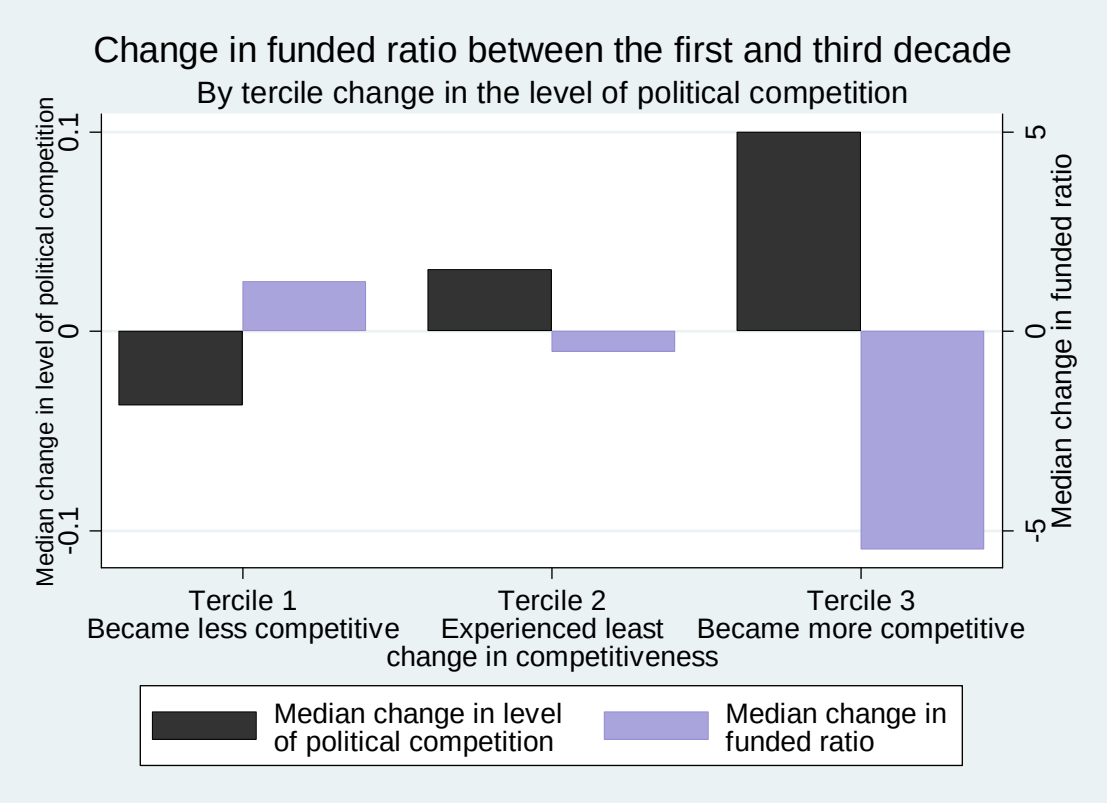
Regressions estimated on all municipal defined contribution pension plans from Pennsylvania for the period 2003–2009. The dependent variable is the employer contribution rate to the defined contribution plan, expressed as a percentage of payroll. The measure of political competition used is that defined 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. For complete notes regarding municipal fiscal controls included, along with the list of IVs, please refer to notes following Table 4. 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 RC1 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 13: Summary of all Results

	Mean of dependent variable	Units	Direction of change	1 standard deviation increase OLS estimates	IV estimates
Panel A: Effect of political competition using data for the period 1985–2009					
Panel A1: Defining political competition as the absolute deviation of Democratic vote share from 50%					
Actuarial funded ratio	133.46	Percent	Decrease	7.1–7.8	14.1–16.2
Unfunded liabilities per active member	(11,038)	Dollars	Increase	2,349–2,656	7,623–8,592
Panel A2: Defining political competition as the standard deviation of Democratic vote share					
Actuarial funded ratio	133.46	Percent	Decrease	9.6–9.8	30.8–31.5
Unfunded liabilities per active member	(11,038)	Dollars	Increase	3,172–3,302	11,959–13,612
Panel B: Effect of political competition using data for the period 2003–2009					
Defining political competition as the absolute deviation of Democratic vote share from 50%					
Annual pension benefit per retiree	15,362	Dollars	Increase	468–618	884–1,376
		Percent	Increase	3.0–4.0	5.1–5.9
Interest rate for discounting actuarial liabilities	698	Basis points	Increase	4.9–6.4	17.4–24.1
Employer contribution rate of defined contribution plans	5.69	Percent	No effect	–	–

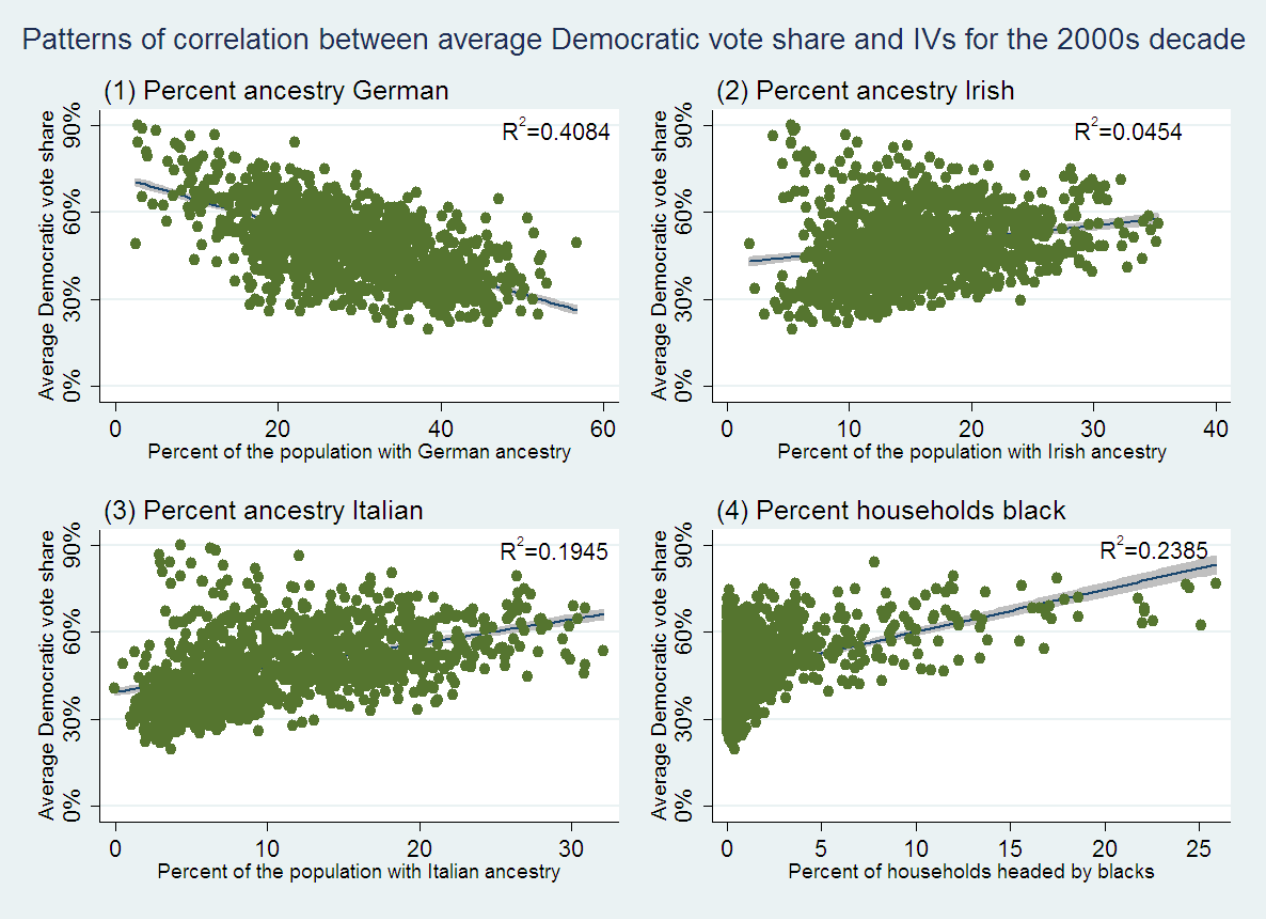
Results in Panel A are based on regressions estimated on all municipal defined benefit pension plans from Pennsylvania for the period 1985–2009. Actuarial funded ratio is defined as the percent of pension liabilities funded. Unfunded liabilities per active member is defined as (Actuarial Liabilities - 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 the first three rows of Panel B are based on regressions estimated on all municipal defined benefit pension plans from Pennsylvania for the period 2003–2009. Annual pension benefit per retiree is 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 in the last row of Panel B involving employer contribution rate of defined contribution plans are based on regressions estimated for all municipal defined contribution pension plans from Pennsylvania for the period 2003–2009. The dependent variable is defined as the employer's contribution to the plan, expressed as a percentage of payroll. The measure of political competition used in Panel B is that defined in BPS (2010), viz. $PC_{md} = -|0.5 - D_{md}|$.

Figure 1: Change in the Median Funded Ratio of Defined Benefit Pension Plans between the First (1980s) and Third (2000s) Decade, Split by Terciles in the Change of Political Competition



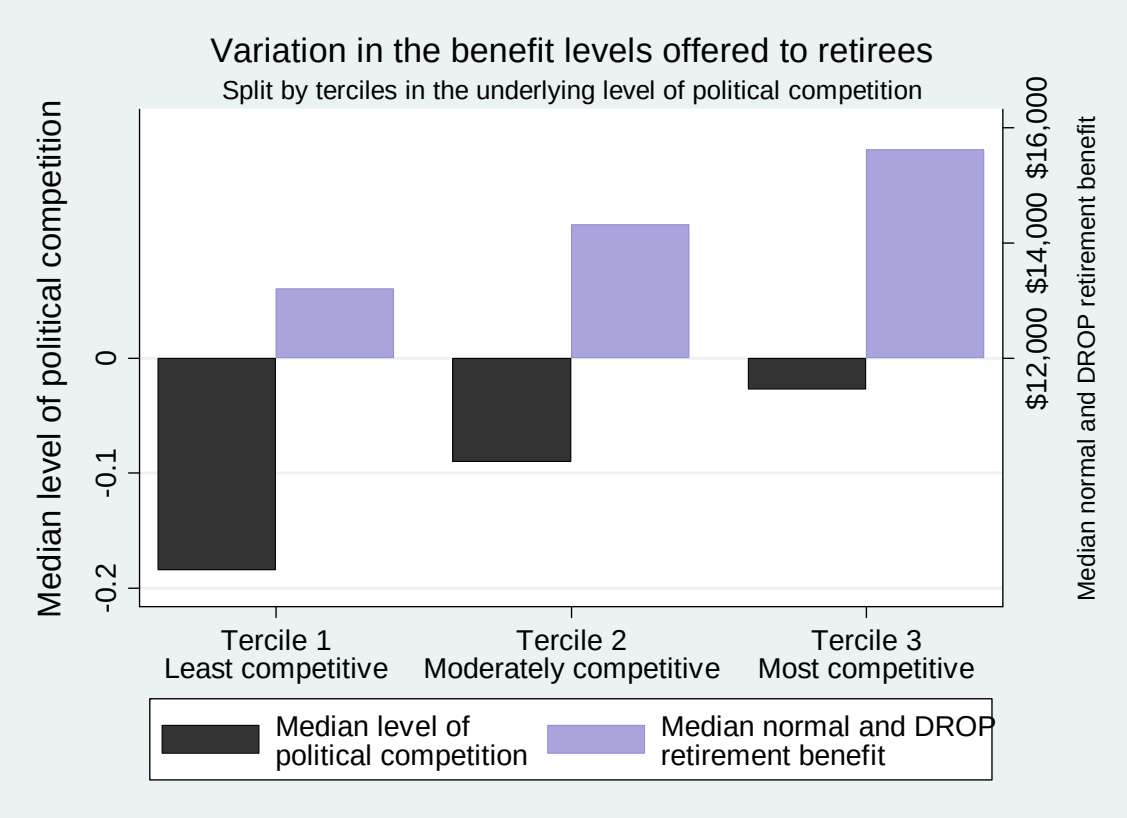
Data on actuarial funded ratio of municipal defined benefit pension plans are available from biennial reports of the Pennsylvania Public Employee Retirement Commission (PERC). This variable has been winsorized at the 2.5 and 97.5% levels. Data on Democratic vote share has been constructed using results of all national and state-level elections held in Pennsylvania during the period 1980–1989 for the first (1980s) decade and 2000–2009 for the last (2000s) decade. Election results are available from successive issues of the Pennsylvania Manual. Political competition is defined as the absolute difference of the Democratic vote share from 50% following Besley, Persson, and Sturm (2010). All municipalities are split into terciles based on their level of *change* in political competition between the first (1980s) and third (2000s) decade. The median change in the level of political competition for municipalities in each of these three terciles is plotted in the figure, along with the median change in funded ratio for municipalities in these three terciles.

Figure 2: 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



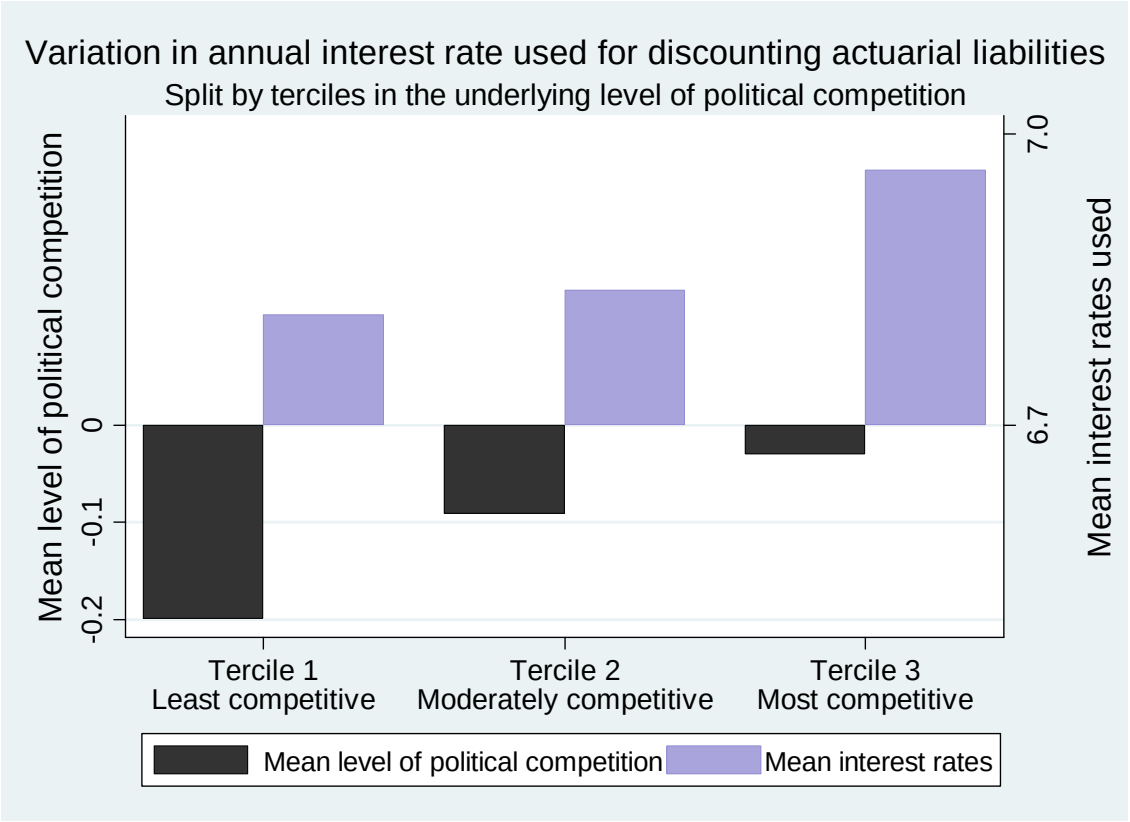
All variables were constructed using the 2000 Census. The dependent variable, average Democratic vote share, was constructed using results of all national and state-level elections held in Pennsylvania in even-numbered years between 2000–2009 and were available from successive issues of the Pennsylvania 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 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.

Figure 3: Variation in the Median Annual Pension Received by Retirees, Split by Terciles in the Level of Political Competition



The data on retirement benefits were provided by the Pennsylvania Public Employee Retirement Commission (PERC). The annual retirement benefit used in constructing the graph is a weighted average of the normal and DROP retirement benefits available to retirees (DROP – Deferred Retirement Option Plan). The data has been winsorized at the 2.5 and 97.5% levels. The graph uses data for the year 2009 only. Data on average Democratic vote share has been constructed using results of all national and state-level elections held in Pennsylvania in the prior year, 2008 and were available from Volume 119 of the Pennsylvania Manual. Political competition is defined as the absolute deviation of the Democratic vote share from 50 percent, following Besley, Persson, and Sturm (2010). Municipalities are split into terciles based on their level of political competition in 2008. The median level of political competition for municipalities in each of these three terciles is plotted in the figure, along with the median pension benefit for municipalities in these three terciles.

Figure 4: Variation in the Mean Interest Rate used for Discounting Actuarial Liabilities, Split by Terciles in the Level of Political Competition



The data on interest rates used for discounting actuarial liabilities were provided by the Pennsylvania Public Employee Retirement Commission (PERC). The data has been winsorized at the 2.5 and 97.5% levels. The graph uses data for the year 2009 only. Data on Democratic vote share has been constructed using results of all national and state-level elections held in Pennsylvania in the prior year, 2008 and were available from Volume 119 of the Pennsylvania Manual. Political competition is defined as the absolute deviation of the Democratic vote share from 50 percent, following Besley, Persson, and Sturm (2010). Municipalities are split into terciles based on their level of political competition in 2008. The mean level of political competition for municipalities in each of these three terciles is plotted in the figure, along with the mean interest rate for municipalities in these three terciles.

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:

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

where T_1 is given by

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

Public-sector workers know each of the three elements that go into determining the government's revenue requirements: N^G, W^G, and B^G and they also learn of the platforms announced by the parties.[55] Thus, using the above equation, they would be able to correctly infer the level of funding being chosen for the pension plan in period 1. But 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, they would also be able to exactly predict the level of taxes that would be imposed in period 2 using the budget balance equation for period 2:

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

Thus, if $a < 1$ (corresponding to less than full funding of pension benefits earned in period 1 in period 1 itself), then a public-sector worker can correctly anticipate the extent to which taxes would have to go up in period 2 to meet the shortfall in the pension fund. As a result, a public-sector worker can adjust her savings behavior accordingly to account for the increase in the level of taxes in period 2.

With the assumption of a logarithmic utility function, the solution to the optimization problem is:

$$s^G = (W^G - B^G - T_1 + T_2)/(2+r). \tag{A.4}$$

For a public-sector worker as there is no difference between the utility that she perceives after she has made her savings decision but before time has elapsed and the utility actually realized by her

[55] They also know the discount rate, r as I assume that $\beta = {}^1/_{(1+r)}$.

after time has elapsed and tax levels in both periods have been fixed, her utility can be expressed as:

$$U^G_{per} = U^G_{act} = \frac{(2+r)}{(1+r)} * [u(\frac{(1+r)}{(2+r)}W^G + \frac{1}{(2+r)}B^G - \frac{(1+r)}{(2+r)}T_1 - \frac{1}{(2+r)}T_2)]. \tag{A.5}$$

I note from the budget balance equations (A.2) and (A.3) that:

$$\frac{(1+r)}{(2+r)}T_1 + \frac{1}{(2+r)}T_2 = N^G * (W^G + \frac{B^G}{(1+r)}). \tag{A.6}$$

As we can see, the overall present value of the tax burden when considered across two periods does *not* depend on a, the level of funding of the pension plan that is chosen in period 1. It simply depends on the size of the public sector workforce, and the net present value of their compensation. Substituting in (A.5), we can see that the well-being (either perceived or actual) of public-sector workers does not depend on the level of funding chosen in the pension plan, a and therefore, 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:
$\kappa^j U^j_{per}(a^L) + (\sigma^{ij} + \theta) < \kappa^j U^j_{per}(a^R)$.
$\Rightarrow$She will vote for party R iff: $\sigma^{ij} < \kappa^j(U^j_{per}(a^R) - U^j_{per}(a^L)) - \theta$.
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:

$$\sigma^j \equiv \kappa^j(U^j_{per}(a^R) - U^j_{per}(a^L)) - \theta. \tag{A.7}$$

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 σ^{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 σ^j in equation (A.7) and the assumption that $\theta \sim U[-\frac{1}{2h}, \frac{1}{2h}]$, p^R is given by:

$$p^R = \frac{1}{2} + h[\sum j \frac{N^j}{N} \frac{m^j}{m} \kappa^j (U^j_{per}(a^R) - U^j_{per}(a^L))] \tag{A.8}$$

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:

$$V^R = p^R(a^R, a^L) * [E + \sum_j N^j (U^j_{act}(a^R) - U^j_{act}(a^L))] + \sum_j N^j U^j_{act}(a^L) \tag{A.9}$$

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

$$\frac{\partial p^R}{\partial a^R} * [E + \sum_j N^j (U^j_{act}(a^R) - U^j_{act}(a^L))] + p^R * \sum_j N^j U'^j_{act}(a^R) = 0. \tag{A.10}$$

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.8) and $\frac{\partial p^R}{\partial a^R} = h \sum_j \frac{N^j}{N} \frac{m^j}{m} \kappa^j (U'^j_{per}(a^R))$.[56] 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 would also consider 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 in this case 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. I note that the best response function is symmetric for both parties L and R and does not involve any variables which are party-specific.[57] Thus, in Nash equilibrium, the parties set identical policy platforms:

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

[56] Prime is used to denote a derivative.

[57] 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 $a^R \epsilon\ (0,1)$. 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:

$$\frac{\partial p^R(0, a^L)}{\partial a^R} * [E + N^P(U^P_{act}(0) - U^P_{act}(a^L))] + p^R(0, a^L) * N^P U'^P_{act}(0) > 0 \tag{A.11}$$

and the second condition requires that:

$$\frac{\partial p^R(1, a^L)}{\partial a^R} * [E + N^P(U^P_{act}(1) - U^P_{act}(a^L))] + p^R(1, a^L) * N^P U'^P_{act}(1) < 0. \tag{A.12}$$

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.11) 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 overwhelm the marginal cost to the politician of increasing funding levels at that point. Condition (A.12) 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 they are 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 $\frac{\partial V^R}{\partial a^R} = 0$.[58] 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 will correspond to a maximum for V^R. In that case, politicians from both parties would choose to partially fund the pension plan.

[58] This can also be proven by showing that each of the four terms in the expansion of $\frac{\partial^2 V^R}{\partial a^{R2}}$ is negative.

A.4 Proof of Comparative Statics Results

Let

$$F \equiv \frac{\partial p^R}{\partial a^R} * [E + \sum_j N^j (U^j_{act}(a^R) - U^j_{act}(a^L))] + p^R * \sum_j N^j U^{'j}_{act}(a^R) \tag{A.13}$$

Or,

$$F \equiv h * [\sum_j \frac{N^j}{N} \frac{m^j}{m} \kappa^j (U^{'j}_{per}(a^R))] * [E + \sum_j N^j (U^j_{act}(a^R) - U^j_{act}(a^L))] + (\frac{1}{2} + h[\sum_j \frac{N^j}{N} \frac{m^j}{m} \kappa^j (U^j_{per}(a^R) - U^j_{per}(a^L))]) * \sum_j N^j U^{'j}_{act}(a^R) \tag{A.14}$$

Proof of Result 1

Using the implicit function theorem,

$$\frac{\partial a^k}{\partial \kappa^j} = -\frac{\partial F / \partial \kappa^j}{\partial F / \partial a^k} \tag{A.15}$$

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

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

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

$$\partial F / \partial \kappa^j = h * [\frac{N^j}{N} \frac{m^j}{m} (U^{'j}_{per}(a^R))] * E \tag{A.16}$$

Given that $U^{'P}_{per}(a^R) < 0$, $\partial F / \partial \kappa^P < 0$. For obtaining $\partial F / \partial a^R$, I use the form of F suggested by (A.13).

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

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

$$\partial F / \partial a^R = \partial^2 p^R / \partial a^{R2} * E + 2 * \partial p^R / \partial a^R * \sum_j N^j U^{'j}_{act}(a^R) + p^R * \sum_j N^j U^{''j}_{act}(a^R) \tag{A.17}$$

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

$$\partial F/\partial a^R = h\sum_j \frac{N^j}{N}\frac{m^j}{m}\kappa^j(U''^j_{per}(a^R))*E+2*h\sum_j \frac{N^j}{N}\frac{m^j}{m}\kappa^j(U'^j_{per}(a^R))*\sum_j N^j U'^j_{act}(a^R)+p^R*\sum_j N^j U''^j_{act}(a^R) \tag{A.18}$$

Given the concavity of U, both the first and the last terms are negative. In the second term, $U'^P_{per}(a^R)$ and $U'^P_{act}(a^R)$ are of opposite signs with $U'^P_{per}(a^R) < 0$ and $U'^P_{act}(a^R) > 0$. 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 (A.15), $\partial a^R/\partial \kappa^P < 0$. QED.
As $U'^G_{per}(a^R) = 0$, using (A.15) and (A.16), $\partial a^R/\partial \kappa^G = 0$. QED.

Proof of Result 2

Using the implicit function theorem,

$$\frac{\partial a^k}{\partial m^j} = -\frac{\partial F/\partial m^j}{\partial F/\partial a^k} \tag{A.19}$$

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:

$$\frac{\partial F}{\partial m^j} = h\kappa^j\frac{\partial U^j_{per}(a^R)}{\partial a^R} * E * \frac{(Nm * N^j - N^j m^j * N^j)}{(Nm)^2} = h\kappa^j\frac{\partial U^j_{per}(a^R)}{\partial a^R} * E * \frac{N^P N^G m^{-j}}{(Nm)^2} \tag{A.20}$$

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.19), $\frac{\partial a^R}{\partial m^P} < 0$. QED.
As $U'^G_{per}(a^R) = 0$, using (A.19) and (A.20), $\partial a^R/\partial m^G = 0$. QED.