Update on the City of Philadelphia's Deferred Retirement Option Plan ("DROP")

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Summary of Analysis

Philadelphia's Deferred Retirement Option Plan (DROP) was introduced in 1999. Since its inception, about 11,000 participants have enrolled in the DROP. The most common reason for introducing a DROP program is concern about the ability to retain valued older employees who are eligible to retire. When employees enroll in the DROP they continue to work for the government but effectively retire from the pension system – their pension contributions stop, they no longer accrue greater pension benefits for each additional year of work, and, while working and in the DROP, their regular pension benefits are deposited into a tax-deferred interest-bearing DROP account. Upon quitting work, the accumulated benefits in the DROP account – including interest – are paid to the employee as a lump sum. After receiving the lump sum, the DROP account for that employee is closed, and the employee begins receiving his/her regular monthly pension benefits directly from the retirement system.

This report evaluates the DROP by assessing the benefit and the costs to the City. Because keeping employees in the workforce longer was one reason City officials introduced the DROP, the benefit analysis examines the effect of the DROP on the retirement ages of city workers. The report finds that the DROP increased the retirement age by 1.7 years, on average, for all workers. For police and fire employees, the DROP increased the retirement age by 4.8 years and 5.9 years, respectively. The DROP has little effect on the retirement age for municipal workers.

For the cost analysis, the study focused on two major components: the change in the present value of employees' expected lifetime pension benefits due to a change in their retirement age and the cost related to the interest credited to the DROP accounts. When calculating the present value of lifetime pension benefits, the choice of the discount rate is key. This report uses two different approaches for selecting the discount rate: the expected return on plan assets, as plan sponsors might do, and the risk-free rate, as is customary for academics.[1] For the expected-return approach, pension costs are estimated using discount rates of 7.7 percent – to reflect the Philadelphia Municipal Retirement System's (MRS) current assumed return assumption –and 6 percent – based on the 20-year annualized return for MRS as of 2016.[2] For the risk-free-rate approach, costs are estimated using a 3 percent rate – based on the yield on 30-year U.S. Treasury bonds – as a proxy for the long-term riskless rate.

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[1] Standard financial theory stipulates that future streams of payment should be discounted at a rate that reflects their risk. In the case of state and local pension plans, the risk is the uncertainty about whether benefit payments will be made. Since pension benefits are protected under most state laws, the payments are, as a practical matter, guaranteed. As such, most economists contend that the appropriate discount factor is a riskless rate. However, for the practical matter of pension funding, the costs of the plan are related to how well the investments perform. As such, for funding purposes, most plan sponsors use the long-term assumed return on their investments to discount future benefits.

[2] See Table A2 in Appendix I for a history of investment returns for the Philadelphia MRS. A 6 percent long-term return is within the range of return expectations for many major financial firms (see Table A3 in Appendix I). It is also the rate recently used by JP Morgan to estimate pension costs for major cities and counties (Cembalest, 2017).

The total estimated cost of the DROP since its 1999 introduction is $277.2 million when using a discount rate of 7.7 percent; $252.6 million when using a 6 percent rate; and $236.9 million when using 3 percent. The portion of the total DROP cost that has been incurred since 2009 is $41.0 million when discounted at 7.7 percent; $42.1 million at 6 percent; and $62.2 million at the risk-free rate.

Looking forward, two issues complicate any extrapolation of future drop costs based on the results of this analysis. First, while the 2012 legislation reduced the portion of DROP costs related to the interest rate credited on the DROP accounts, it is still too early to know whether the 2012 legislation will impact DROP enrollment or how the DROP affects the retirement age – both of which would affect the overall costs and benefit of the DROP going forward. Second, the small, albeit growing number of retirees covered under Plan 87 (the defined benefit plan for employees hired after July 1, 1988) face different plan design incentives than the majority of existing retirees who are covered under Plan 67 (the defined benefit plan for employees hired before July 1, 1988). For this reason, the results of this report – which relies on the sample of existing retirees – may not be representative of the impact that the DROP will have on retirement ages in the future. It is likely, given the later retirement ages defined under Plan 87 relative to Plan 67 (the defined benefit plan for those hired prior to 1988), that the DROP will have a smaller impact on retirement ages for members of Plan 87.

Data and Methodology

The Data

The City has provided the Center for Retirement Research (CRR) with administrative data from 1991-2015 on the basic demographic characteristics, salaries, estimated pension benefits, education, and retirement for individual City employees. In any given year, the data contain approximately 70-80 percent of the total active members in the system. Table 1 provides basic descriptive statistics on the characteristics of employees in the sample for three selected years: 1991 (the first year of data), 2000 (the year after introduction of the DROP), and 2015 (the most recent year of data). Some general workforce trends can be observed, including the increasing share of women, non-white employees, and those with more than a high-school education. These trends generally mirror changes in the U.S. labor force.

Table 1. *Description of Administrative Data Sample*

Year	1991	2000	2015
Number of active members in MRS	30,251	30,621	29,735
Number of employees in sample	24,221	24,862	22,069
Characteristic (% of sample)			
Female	28.8 %	35.4 %	38.4 %
Married	52.6	43.1	30.5
High School/GED or less	42.5	43.6	39.4
College or more	26.5	33.9	30.4
No data	31.0	22.5	30.2
Blue collar	58.0	61.0	61.3
White collar	25.9	34.9	38.6
Unknown	16.1	4.1	0.1
White	52.3	48.8	42.8
Black	44.3	45.7	48.1
Hispanic/Latino	2.2	3.5	5.3
Asian/Native	0.4	0.8	2.4
Unknown	0.8	1.2	1.3
Age	42.3	42.8	45.9
Years of service	13.0	12.6	14.4
Salary	$ 53,981	$ 54,288	$ 58,020

Note: Dollar amounts are in 2016 dollars.
Source: Authors' calculations based on the City of Philadelphia's administrative data (1991-2015).

The Methodology

This report separately evaluates both the benefit and costs of the Philadelphia DROP from inception in 1999 to 2015. The study centers on a regression that estimates when those who retired after the DROP's introduction would have retired if there were no DROP. To assess the benefit of the DROP, the analysis uses the regression results to gauge the effectiveness of the DROP in keeping employees in the workforce longer. For the costs, the analysis builds on the regression to estimate the change in employees' present value of lifetime pension benefits (PVB) due to a change in the retirement age. It also estimates costs related to the DROP interest rate. This report values all pension costs under three discount rates that reflect two different approaches. The first approach is to discount costs using the assumed return. Under this approach, the report values costs using a 7.7 percent discount rate to reflect MRS' current assumed return assumption and a 6 percent rate based on the 20-year annualized return for MRS as of 2016.[3] The second approach is to value pension costs using the risk-free rate. This approach uses a 3 percent rate based on the yield of the 30-year Treasury as a proxy for the long-term riskless rate.

To generate credible results on the impact of the DROP, the regression analysis requires a large sample of retirees before and after the DROP who are subject to the same plan benefits (i.e. early and normal retirement age, benefit multiplier, and reductions for early retirement). As of 2015, the majority of retirees before and after the DROP were members of Plan 67 – the plan for employees hired prior to July 1, 1988. Members of Plan 87 – the plan for employees hired after July 1, 1988 – made up only 1 percent of those who retired prior to the introduction of the DROP, and only 15 percent of those who retired afterward. Due to the low numbers of retirees before and after the DROP, the regression analysis excludes members of Plan 87. Due to their small number, excluding them does not affect the results. Going forward, as the members of Plan 87 represent a larger share of DROP retirees, they will have to be accounted for. However, the small number of Plan 87 members who retired before the DROP was introduced presents a major challenge to accurately estimating the impact of DROP on the retirement ages of Plan 87 members.

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[3] See Table A2 in Appendix I for a history of investment returns for the Philadelphia MRS. A 6 percent long-term return is within the range of return expectations for many major financial firms (see Table A3 in Appendix I). It is also the rate recently used by JP Morgan to estimate pension costs for major cities and counties (Cembalest, 2017).

Brief Background on the Philadelphia Municipal Retirement System and the DROP

In the 1990s, state and local pension plans started introducing deferred retirement option plans to retain valued older workers who were being induced to retire by the financial incentives in their defined benefit plans. In 1999, Philadelphia introduced the DROP, in part, to help keep workers on the job longer. As shown in Table 2, the normal retirement ages for municipal employees are 55 and 60 for those hired before and after 1988, respectively. For police and fire, the normal retirement ages are even younger – 45 and 50 for those hired before and after 1988, respectively.[4]

Table 2. *Retirement Eligibility for the Philadelphia Municipal Retirement System (MRS), 2016*

Hire date	Plan 67 (hired pre-1988)		Plan 87 (hired post-1988)	
Employee type	Municipal	Police and Fire	Municipal	Police and Fire
Normal retirement age	55	45	60	50
Early retirement age	50	40	52	40
Required years of credited service	10	10	10	10

Source: 2016 Actuarial Valuation for the Philadelphia Municipal Retirement System.

Rules of Philadelphia's DROP

Employees who have reached the normal retirement age with at least 10 years of credited service are eligible to enroll in the DROP. Once an employee enrolls, they continue to work for the government but effectively retire from the pension system – their pension contributions stop, and they no longer accrue greater pension benefits for each additional year of work. While working and enrolled in the DROP, the employee's regular pension benefits are deposited into a tax-deferred interest-bearing DROP account. The DROP interest rate is determined by the Board of Pensions and Retirement and was historically set at 4.5 percent, but as of 2012, it is equal to the lesser of the 1-year Treasury rate or one-half the pension board's interest rate.[5] Upon quitting work, the accumulated benefits in the DROP account – including interest – are paid to the employee as a lump sum. After receiving the lump sum, the DROP account for that employee is closed, and the employee begins receiving his/her regular monthly pension benefits directly from the retirement system. The decision to enroll in the DROP is voluntary, but irrevocable, meaning that employees cannot decide to re-enter the pension plan and accrue further benefits. Participation in the DROP is limited to a maximum of four years from the enrollment date, although under special circumstances the employee can apply for a 1-year extension.

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[4] Elected officials are also offered a plan, but this small group is excluded from this study.
[5] The DROP interest rate was 4.5 percent between 1999-2012 and set to 0.1312%, 0.2322% and 0.3227% in 2013, 2014, and 2015, respectively. All employees who were already participating, or eligible to participate, in the DROP when the legislation was passed were grandfathered-in at the 4.5 percent rate.

Who Uses the DROP?

The administrative data provided by the City also contain information on employees' participation in the DROP and their retirement dates. Since the DROP's introduction, the majority of workers have used the program. This pattern is evident in Table 3, which shows the number of retirements of City employees by year. The first column shows all retirements since 1999, and the second shows retirement through the DROP. The third column shows the proportion of all retirees who used the DROP. Unsurprisingly, in the first few years after the DROP was introduced, there were very few retirements through the DROP, as most enrollees tend to stay in the DROP for the maximum 4-year period (the average is 3.3 years). But, once the program had matured, about 80 percent of all retirements were through the DROP. Over the entire period that the DROP has been available, 71.4 percent of the retirees used it.

Table 3. *Retirements With and Without the DROP*

Year	All retirements	Retirements w/ DROP benefits	DROP retirements as a percent of all retirements
1999	615		0.0%
2000	360	40	11.1
2001	343	119	34.7
2002	429	223	52.0
2003	547	370	67.6
2004	1,104	932	84.4
2005	780	649	83.2
2006	861	731	84.9
2007	1,093	935	85.5
2008	698	545	78.1
2009	593	459	77.4
2010	546	425	77.8
2011	492	398	80.9
2012	542	427	78.8
2013	819	698	85.2
2014	606	492	81.2
2015	578	413	71.5
Total	11,006	7,856	71.4

Note: Data are limited to those employees for whom complete usable records are available.
Source: Authors' calculations based on the City of Philadelphia's administrative data (1991-2015).

Table 4 looks at the characteristics of those who have retired with and without the DROP since 2000. The data exclude early retirees because they were not able to enroll in the DROP when they retired (as they had not reached the normal retirement age under the plan). Overall, the two groups are quite similar. Those who retired with the DROP were somewhat more likely to be college educated, in white-collar positions, and white. They also tended to be older, have more tenure, and have somewhat higher salaries than those retiring without the DROP. All of the

demographic differences between the two groups are statistically significant due to the large sample size, but the differences in age and tenure are most meaningful for this analysis and suggest that those using the DROP are staying in the workforce longer.

Table 4. *Characteristics of DROP-Eligible Retirees with and without the DROP*

| Characteristic	Breakdown of those who:			
	Retired w/ the DROP		Retired w/o the DROP	
Number of retirees	7,280		1,951	
Female	31.2	%	29.8	%
Married	58.4		56.4	
High School/GED or less	41.6		41.3	
College or more	31.8		26.0	*
No data	26.6		32.7	*
Blue collar	56.9		62.6	*
White collar	36.9		27.9	*
Unknown	6.3		9.4	
White	57.2		52.8	*
Black	39.9		43.9	*
Hispanic/Latino	1.8		2.3	
Asian/Native American/Multiracial/Other	0.5		0.2	*
Age	59.5		56.5	*
Years of service	30.4		24.6	*
Salary	$61,124		$56,935	*

Note: The data are limited to retirees of Plan 67 and exclude early retirees because they were not able to enroll in the DROP when they retired (as they had not reached the normal retirement age). Dollar amounts are nominal. The asterisk denotes that the difference between the two groups is statistically significant at the 5 percent level.
Source: Authors' calculations based on the City of Philadelphia's administrative data (1991-2015).

Assessing the Benefit of the DROP

The most common reason that employers introduce a DROP is a concern about the ability to retain valued older employees, who are eligible to retire.[6] A brief review of news articles following the introduction of the DROP in Philadelphia suggests that a primary goal was to retain employees.[7] So, the main measure of success should be whether DROP participants actually work longer than they otherwise would.

Figures 1, 2, and 3 show the distribution of retirement ages for municipal, police, and fire employees who retired before and after the DROP was introduced. The figures are limited to employees in the pre-1988 plans (Plan 67), so they all have the same early and normal retirement ages.[8] In Figure 1, retirement for municipal employees spiked at age 55 in the years before the DROP was introduced (prior to 1999), which corresponds to the normal retirement age for municipal workers hired prior to 1988 (Plan 67). After the DROP was introduced, retirements began to spike four years later (the maximum allowable DROP participation period) at age 59. While the shift in the retirement spike is large, the average retirement age for municipal employees increased only slightly from age 59.1 to 59.6.

Figure 1. *Distribution of Plan 67 Municipal Employees by Retirement Age, Before and After 1999*
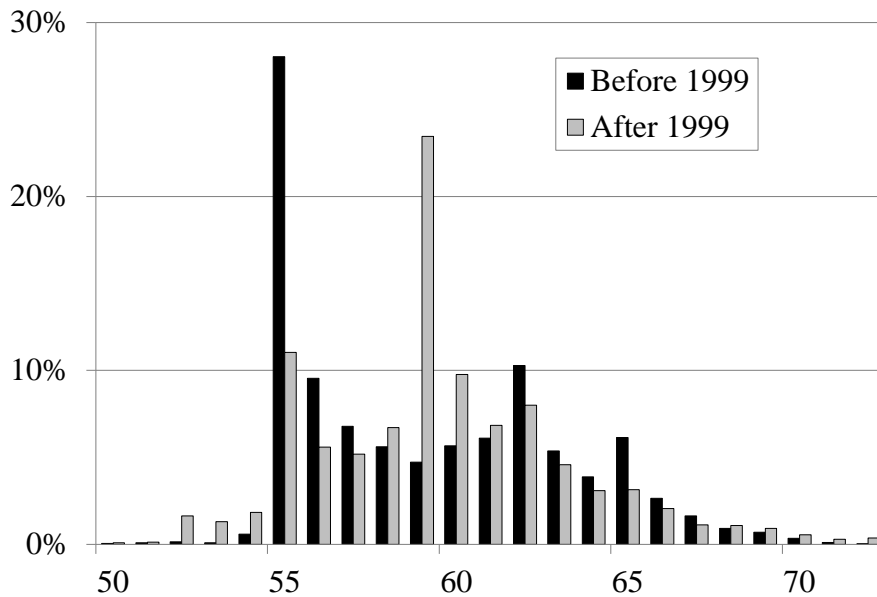
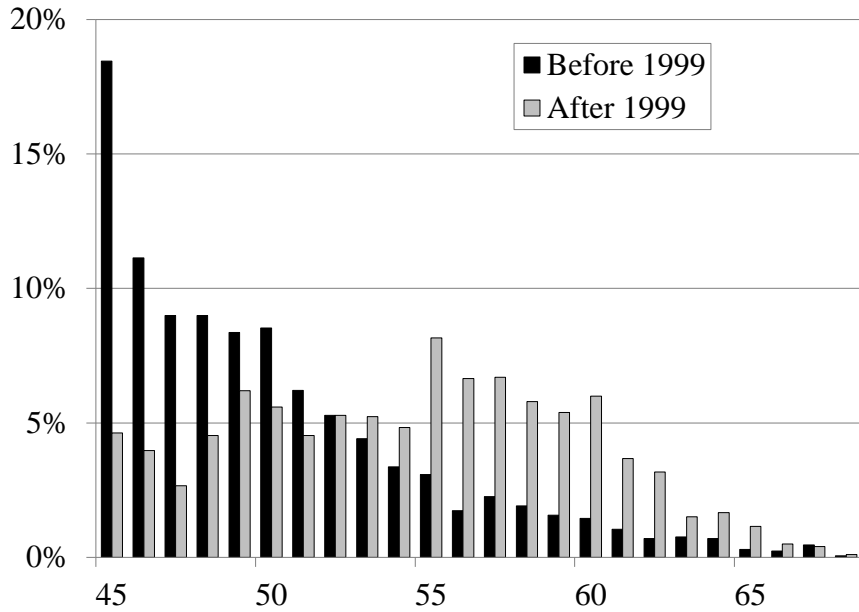*Source:* Authors' calculations based on the City of Philadelphia's administrative data (1991-2015).

Clear retirement spikes before and after the DROP, for police and fire only, are less obvious (see Figures 2 and 3). But, average retirement ages have shifted later, dramatically, for both groups – from 50 to 54 for police and 51 to 57 for fire.

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[6] See deferred retirement option plans ("DROP" Plans). Posted on benefitsattorney.com on October 13, 1998 by Carol V. Calhoun.
[7] See, for example, Philadelphia Inquirer, 2003, "Deferred-Retirement Program Opposed by Street Lives On."
[8] The vast majority of municipal workers who have retired to-date are members of Plan 67.

Figure 2. *Distribution of Plan 67 Police Employees by Retirement Age, Before and After 1999*

Source: Authors' calculations based on the City of Philadelphia's administrative data (1991-2015).

Figure 3. *Distribution of Plan 67 Fire Employees by Retirement Age, Before and After 1999*
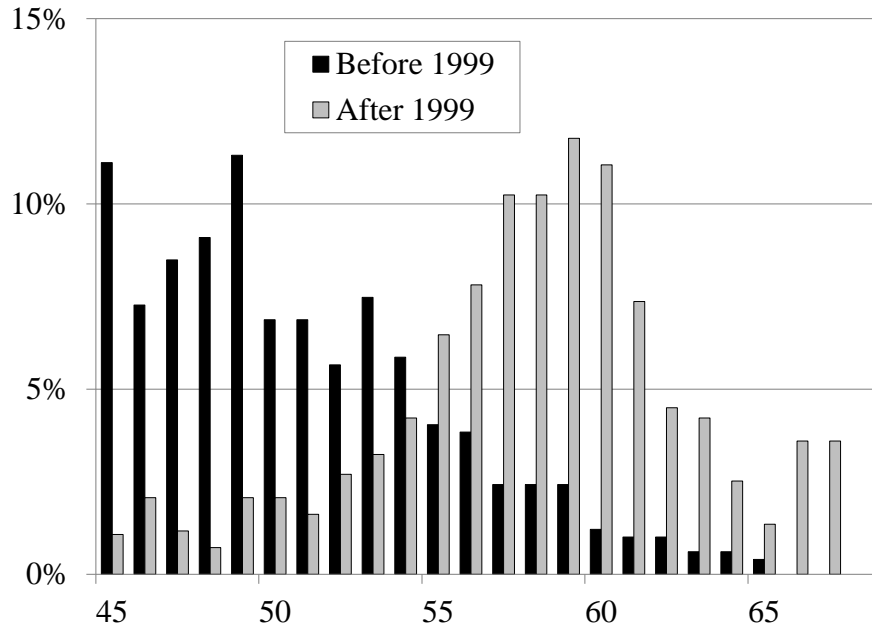
Source: Authors' calculations based on the City of Philadelphia's administrative data (1991-2015).

A plot of the average retirement age over time illustrates the immediate impact of the DROP (see Figure 4). During the five years immediately after the DROP's introduction, the average retirement age increased by almost 3 years. After that, the retirement age continued to increase, although more gradually.

Figure 4. *Average Retirement Age for Retirees of Plan 67 Plans, 1991-2015*

Source: Authors' calculations based on the City of Philadelphia's administrative data (1991-2015).

While the dramatic shift in retirement age from 1999 to 2005 is likely due to the DROP, the reason for the continued increase in the retirement age after 2005 is less clear. One possibility is that it reflects the well-documented trend toward later retirement ages in the United States generally. To investigate this possibility, Figure 5 compares the shift in the average retirement age for MRS members to the shift in the retirement age within the Commonwealth of Pennsylvania in general. The figure shows that, prior to the introduction of the DROP, the increase in the average retirement age for MRS members was more or less in line with the average for all workers in the Commonwealth. However, from 2004 and thereafter, the average retirement age for MRS has increased more dramatically than the average for the Commonwealth. This pattern suggests that some of the increase in retirement age after 2004 may also be attributable to the DROP.

Figure 5. *Increase in Retirement Age Before and After DROP, in Years*

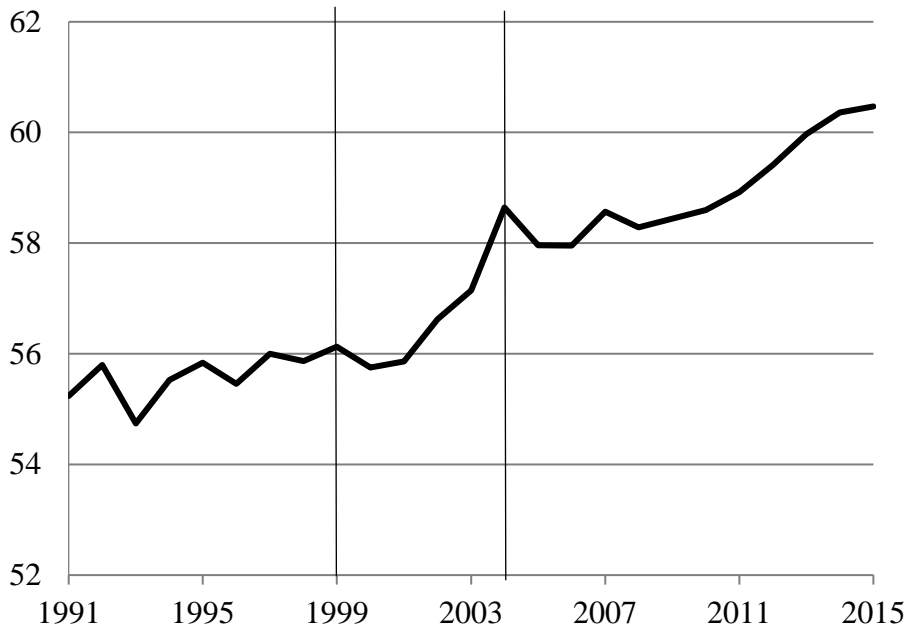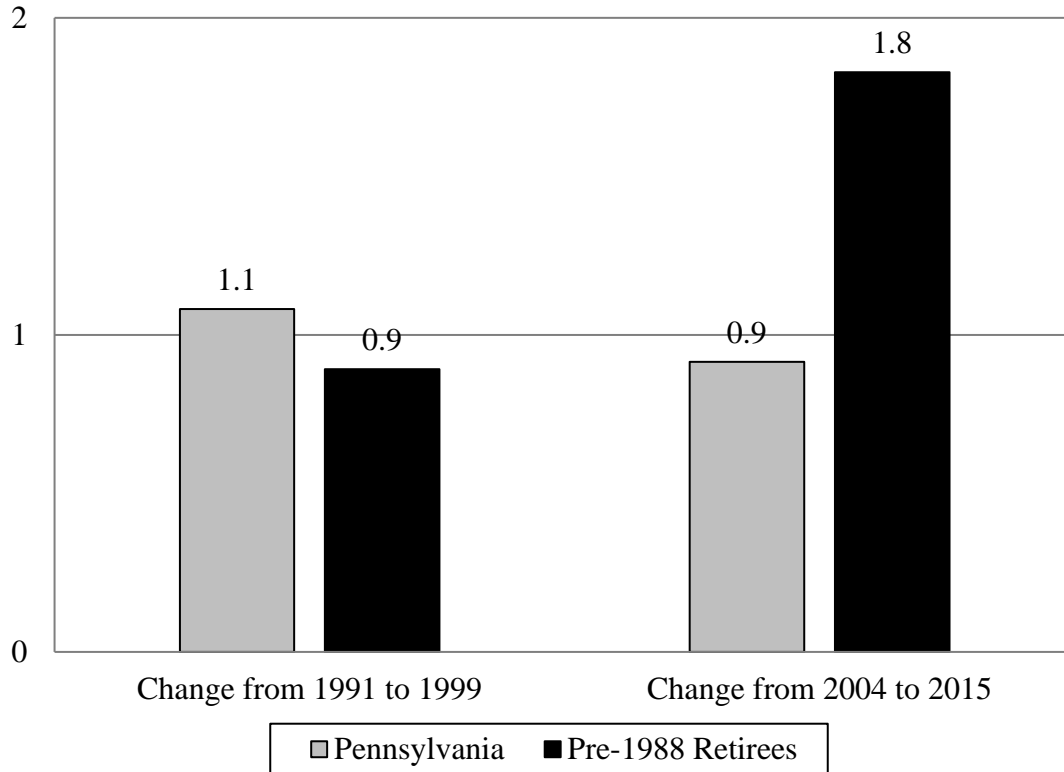*Source:* Authors' calculations based on the City of Philadelphia's administrative data (1991-2015) and the U.S. Census Bureau's *Current Population Survey* (1991-2015).

Estimating the Impact of DROP on Retirement

The descriptive statistics presented above strongly suggest that the DROP and later retirement are related. But further analysis is needed to know what retirement would have been if DROP had not been available. To this end, a regression analysis is used to compare the retirement ages of similar employees who retired before and after the DROP was introduced.

The regression equation is as follows:

$$Age\ at\ Retirement_i = \alpha_0 + \alpha_1 Post1999_i + X'\beta + \varepsilon_i$$

where the dependent variable is the age at retirement, and the key independent variable is $Post1999_i$, an indicator for whether the worker retired after 1999 and had access to the DROP program. A positive coefficient on $Post1999_i$ would suggest that the DROP program increased the age of retirement by α_1 years. Vector X includes worker characteristics, such as gender, education, race, and ethnicity. The regression also includes a flag to control for each plan member group – municipal, police, and fire – because Plan 67 sets different retirement incentives for each group.[9] Finally, the equation also includes a variable for the average age of retirement

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[9] The analysis is limited to members of Plan 67. Although including Plan 87 retirees in the regression had minimal impact on the results, they were excluded due to the low numbers of retirees both before and after the DROP.

across the Commonwealth to account for the impact that the general increase in retirement age in the state has had on the retirement age of MRS members.[10]

Figure 6 shows the key results from the regression estimate for all workers, and separately for the police, fire and municipal plans (see Table A1 in Appendix I for full results). The key takeaway is that the DROP increased the retirement age in all the regressions. Across all plan members, retirees who were eligible for the DROP had a retirement age that was 1.7 years later than those who were not eligible. Among members in the police plan, DROP eligibility was associated with a 4.8-year increase in the retirement age. For fire, the increase was 5.9 years. Eligibility for the DROP was not associated with much change in the retirement age for municipal workers (0.2 years). This result is not surprising, given that the average retirement ages for municipal workers before and after the DROP was introduced were very similar, and relatively high.

Figure 6. *Change in Retirement Age Associated with DROP Eligibility*
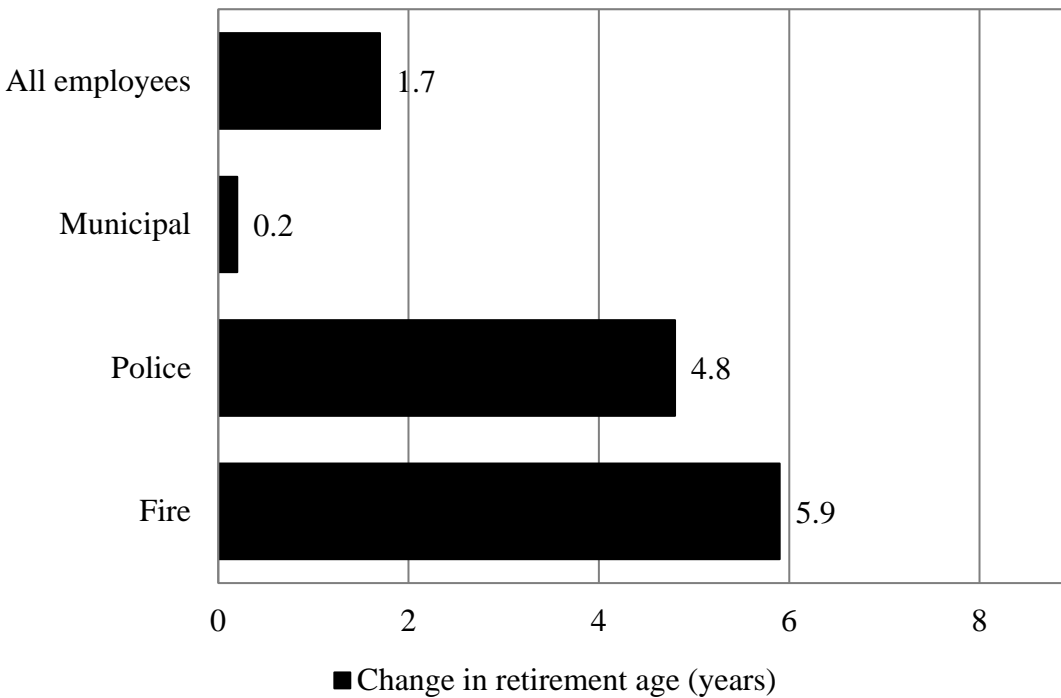
Note: The analysis is limited to members of Plan 67. Although including Plan 87 retirees in the regression had minimal impact on the estimates, they were excluded due to the low numbers of retirees both before and after the DROP.
Source: Authors' calculations based on the City of Philadelphia's administrative data (1991-2015).

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[10] Separate average retirement ages are used for males and females.

Assessing the Costs of the DROP

The main benefit of the DROP is keeping employees on the job longer. But the DROP may involve costs as well. The three mechanisms through which the DROP could impose costs on the City are through: changes to total payrolls if employees continue working longer, changes to the lifetime pension benefits promised to employees, and the interest credited to the DROP accounts.

Payrolls

To estimate the impact of the DROP on payrolls, it is important to define the City's human resource (HR) strategy when an employee retires. Two strategies are defined below; the DROP has different implications for each.[11]

> *HR Strategy 1:* The City maintains the size of its workforce and fills the position left open by retired employees through standard promotion methods – moving employees up the hierarchical chain of command and hiring new employees at the bottom of the chain.
>
> *Impact of the DROP:* Under this scenario, retirement would have no impact on wages because the City fills the open positions by promoting employees and paying the same salary to those who are promoted. Because retirement adds no costs, delaying retirement through the DROP is also costless in terms of wages.
>
> *HR Strategy 2:* The City chooses to shrink the workforce, leaving some positions unfilled as employees retire. For this scenario, the delayed retirement resulting from the DROP can lead to significant cost.
>
> *Impact of the DROP:* If the City does not replace a worker who leaves, retirement would result in a smaller workforce and lower total payroll. So, under this strategy, the delayed retirement due to the DROP is costly in terms of payrolls.

Given the historical steadiness of the workforce since the DROP, it is unlikely that the second strategy – shrinking the workforce – has been the primary approach for the City. Therefore, the cost analysis assumes that the City intends to fill vacancies left open due to retirements.

Present Value of Lifetime Pension Benefits (PVB)

Appropriately assessing the PVB costs of the DROP involves understanding two things. The first is the difference between a claiming age and a retirement age. The claiming date is the date at which annual pension benefits are calculated and begin being paid. The retirement age is when the employee leaves the workforce. Of course, for most plans without a DROP, the claiming date is equal to the retirement date. But when a DROP is available and the employee enrolls, the claiming date is the DROP enrollment date because monthly benefits are based on the age, tenure, and salary at enrollment, and benefits are paid (first to the DROP account and

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[11] See Appendix II for a simpler example of the impact of DROP on payrolls under the two HR strategies.

then directly to the employee when the DROP ends) from that date until the employee passes away.

There is also the notion of an optimal claiming age. An employee's PVB is a function of the level of benefits to be paid each year in retirement and the number of years the benefits are expected to be paid. The typical worker experiences increases in the PVB as they move through their career. However, as the employee nears retirement age, the incremental increase in the annual benefit – due to the higher salary and tenure that result from one more year of work – no longer compensate for the decrease in the expected number of benefit payments in retirement. At a certain age, lifetime pension benefits begin to decline. This pivotal age – the peak of the lifetime pension benefit – is referred to as the optimal claiming age.

On average, members of the Philadelphia MRS have retired after their optimal age (see Table 5). Prior to the DROP, members retired 2.3 years after their optimal age. Since the DROP was introduced, DROP participants have enrolled in the DROP about 2.3 years after their optimal age and then retired 3.4 years after they enrolled – about 5.7 years after they optimal age. Even those who did not enroll in DROP retired about 2.5 years after their optimal age. All this is to say that members of the Philadelphia MRS, regardless of the time period or DROP participation, generally claim benefits after their optimal retirement ages.

Table 5. *Age Relative to Optimal Claiming Age for those Retiring Before and After DROP was Introduced*

	Pre-1999	Post-1999		
		DROP Retirees		Non-DROP Retirees
Plan Type	Retirement	DROP Enrollment	Retirement	Retirement
All	2.29	2.27	5.68	2.54
Municipal	2.81	0.67	4.03	2.28
Police	1.83	4.76	8.30	3.67
Fire	3.24	7.64	11.31	4.82

Note: Optimal claiming age estimated under a 7.7 percent discount rate.
Source: Authors' calculations based on the City of Philadelphia's administrative data (1991-2015).

However, to accurately measure PVB costs due to DROP, one must compare the *actual* claiming ages for DROP participants to what their claiming ages would have been in the absence of DROP. Based on our retirement age equation, we estimate that – in the absence of DROP – participants would have retired about 1.7 years earlier than they retired with the DROP. Given that DROP participants generally retire about 3.4 years after enrolling in the DROP, shifting their retirement age back 1.7 years results in a retirement age that is still about 1.7 years after DROP enrollment. In short, DROP participants enroll in the DROP earlier than they would have retired if there were no DROP. Additionally, the PVB at DROP enrollment is greater than the PVB if they retired without DROP because the DROP enrollment is closer to the optimal claiming age.

An example might help clarify. Consider an employee with an optimal claiming age of 60, who enrolled in the DROP two years later, at age 62, and then retired at age 65 (about three years after enrolling in the DROP). Now assume that he would have retired at age 63 in the absence of DROP (about 2 years before he retired under DROP). The DROP has shifted the employee's retirement age from 63 to 65. To measure the impact of this shift on pension benefits, focus on

the claiming age, not the retirement age. The claiming age under the DROP (simultaneous with their DROP enrollment at age 62) is *closer* to the optimal age than the claiming age in the absence of DROP (63); therefore, the DROP has increased the lifetime value of benefits.

The DROP Interest Rate

Two approaches can be used to measure the potential cost associated with the interest rate credited to the DROP account. The first approach, used by most academics, is to compare the DROP interest rate to the riskless rate. To the extent that the DROP rate is above the riskless rate, it is a burden to the City. For the majority of the DROP's existence, the City has been crediting a guaranteed 4.5 percent interest rate on the DROP account. However, the City passed legislation in 2012 reducing the interest credit to the lesser of the 1-year Treasury rate or one-half the pension board's interest rate, effectively unburdening the City of the cost of the guarantee (see Figure 7).[12]

Figure 7. *The DROP Interest Rate Compared to the 1-year Treasury Yield, 1999-2016*
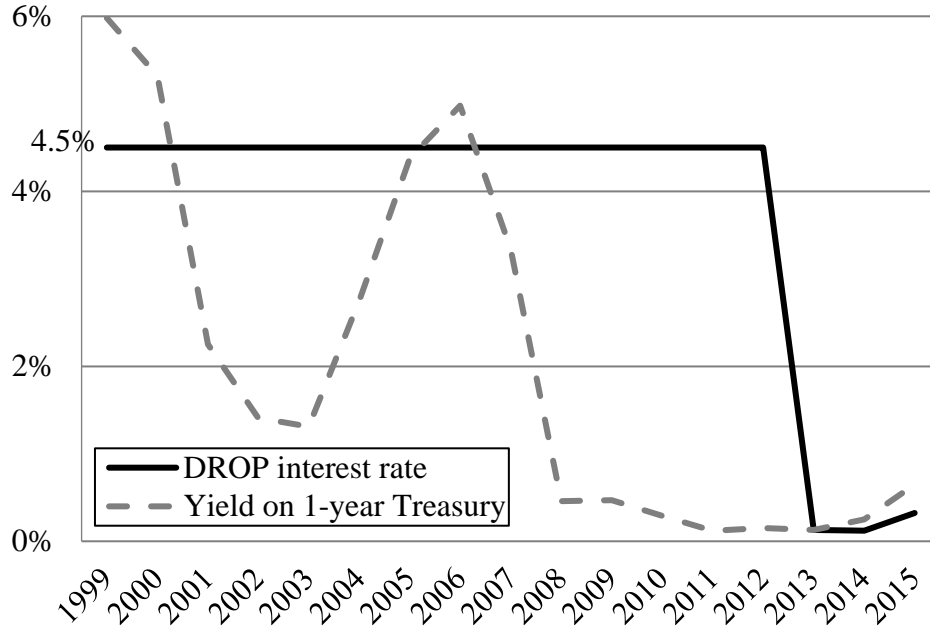
Sources: Authors' illustration; and St. Louis Federal Reserve (1999-2016).

Another approach is to compare the interest credited to the DROP account to the expected return on the DROP balance. Benefits deposited to the notional DROP account are, in practice, simply held in the pension trust fund until the employee retires. As such, benefits deposited in the DROP account realize the same returns as the pension fund. When the employee retires, a lump sum equal to the benefits plus DROP interest is transferred out of the pension fund to the employee. To the extent that the pension fund returns are greater than the guaranteed DROP interest, the plan will earn money on benefits held over the DROP period. However, if pension returns are less than the guaranteed DROP interest rate, the plan will realize a cost. Figure 8

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[12] All employees who were already participating, or eligible to participate, in the DROP when the legislation was passed were grandfathered-in at the 4.5 percent rate.

compares the 3-year (the average number of years participants remain in the DROP) annualized return of the pension fund to the guaranteed interest rate. Historically, the results have been mixed. In some years the fund has outperformed the guaranteed interest rate and in others it has not.[13]

Figure 8. *The DROP Interest Rate Compared to the 3-year Pension Fund Return, 1999-2016*
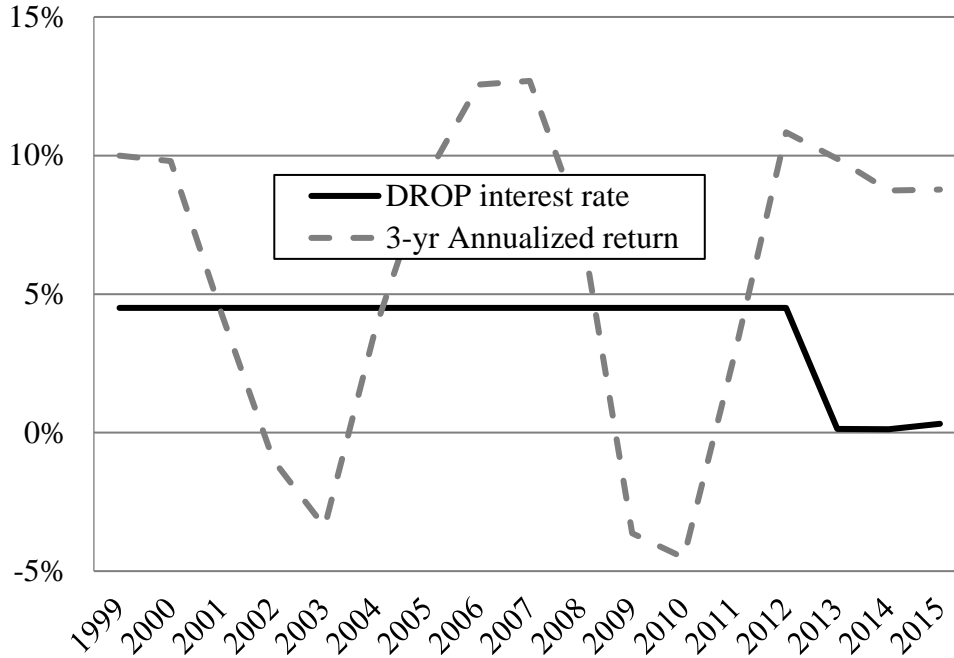
Sources: Authors' illustration; and comprehensive annual financial reports for the Philadelphia Municipal Retirement System (2001-2016).

Estimating the Costs of DROP

Assuming that the City will fill most positions vacated by retirees, the effects of the DROP on wage costs are likely minimal. Thus, for this analysis, we focus on the two remaining components of the cost: the change in PVB and the DROP interest paid. The analysis will present the costs incurred since introduction of the DROP, as well as those incurred since 2009.

Costs Related to the Change in PVB

Three steps are needed to estimate the PVB costs for the DROP. First, the regression estimating the impact of the DROP on the retirement age is used to determine when DROP retirees would have retired (and claimed benefits) in the absence of the DROP, referred to as the *counterfactual* benefit claiming date. Table 6 shows the average difference between the actual DROP enrollment date and the estimated counterfactual retirement. The table omits those who retired with DROP prior to 2003 because they are atypical of the average DROP retiree – they remained in the DROP for only one or two years while most remain in the DROP for the maximum four

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[13] See Table A2 in Appendix I for a history of investment returns for the Philadelphia MRS.

years. After 2004, DROP participants claimed benefits between 1.3 and 1.7 years earlier than they would have if there was no DROP.

Table 6. *Estimated Change in Claiming Age Due to the DROP*

Year	Number of Years	DROP Retirees
2004	-1.4	931
2005	-1.3	648
2006	-1.5	731
2007	-1.6	935
2008	-1.6	545
2009	-1.4	459
2010	-1.4	424
2011	-1.3	396
2012	-1.5	427
2013	-1.7	698
2014	-1.7	492
2015	-1.7	412

Source: Authors' calculations based on the City of Philadelphia's administrative data (1991-2015).

Second, a PVB is calculated at the retiree's DROP enrollment date – the *factual* benefit claiming date – and at the retiree's *counterfactual* claiming date, estimated using the regression. When calculating the PVB, the choice of discount rate is key. This analysis estimates the PVB in two ways. The first approach – used by most academics – discounts future benefit payments using a risk-free rate, which, for the purposes of this analysis, is based on the yield of the 30-year Treasury bond (currently approximately 3 percent). The second approach, used by most public plan actuaries and plan sponsors, uses the expected rate of return as the discount rate. For the Philadelphia Municipal Retirement System, we use 6 percent and 7.7 percent for the expected return and discount rate.

Finally, the difference between the PVB at the *counterfactual* date and at the *factual* date is calculated, accounting for the cumulative employee contributions made between the two dates. This difference is the PVB cost of the DROP for the retiree. Given that members generally claim after their optimal ages, earlier claiming under the DROP should result in greater PVB cost. Table 7 shows the average PVB cost (accounting for employee contributions) each year for DROP retirees, using a 3 percent, 6 percent, and 7.7 percent rate, as well as the number of DROP retirees in each year.[14] Since its introduction, the average PVB cost for the DROP has been positive and trending up – from about $23,000 in 2004 to about $47,000 in 2015, when using the 7.7 percent rate.

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[14] The number of DROP enrollees differs slightly from the number in Table 3 because cost calculations were feasible only for people for whom we had complete salary information.

Table 7. *Average Change in PVB for Those Retiring Under the DROP, by Year of Retirement*

	Average Change in PVB			DROP Retirees
Year	7.7% Discount Rate	6% Discount Rate	3.0% Discount Rate	
2004	$23,135	$16,187	$717	931
2005	$20,912	$14,135	-$1,093	648
2006	$25,806	$18,239	$1,216	731
2007	$29,152	$21,833	$5,561	935
2008	$31,892	$24,120	$6,817	545
2009	$25,644	$18,633	$3,035	459
2010	$27,025	$19,317	$2,212	424
2011	$28,554	$22,023	$7,652	396
2012	$41,924	$34,653	$18,892	427
2013	$53,006	$44,350	$25,664	698
2014	$47,407	$39,882	$23,685	492
2015	$47,095	$38,307	$19,362	412

Source: Authors' calculations based on the City of Philadelphia's administrative data (1991-2015).

Costs Related to the DROP Interest Rate

As noted, the DROP interest rate was 4.5 percent from program inception in 1999 until 2012. In 2012, the interest rate was reduced to the lesser of the 1-year Treasury rate or one-half the pension board's interest rate for those who enrolled in the DROP after 2012. For this analysis, the cost is defined as the "net interest" on the DROP account – the difference between the interest credited to the DROP account by the plan and the *expected* return on the account (the analysis does not incorporate the realized historical returns). As in the PVB cost analysis, this analysis will be performed under two approaches. Under the academic approach, the discount rate equals 3 percent (based on the 30-year Treasury rate), and the expected annual return on the DROP account is equal to the 1-year Treasury rate. For the alternative approach, used by plan sponsors, both the discount rate and the annual return equal the actuarially assumed return – either 6 percent or 7.7 percent.

Estimating the cost of the DROP net interest requires three steps. First, the annual benefit is calculated at the point of DROP enrollment (using the pension benefit formula and the employee's age, tenure, and salary). Second, the DROP balance at retirement is estimated by "depositing" the annual benefit to the DROP account each year and increasing the account balance by the expected investment return for the pension fund. Growing the balance by the expected investment return reflects the fact that, during the DROP period, DROP benefits are held within the pension fund and invested similarly. Third, at retirement, the sum of the "deposited" annual benefit payments plus the DROP interest credit is paid out to the DROP participant. If the DROP balance at retirement (benefits + investment return) is greater than the payout (benefits + DROP interest), the extra funds are considered a gain for the pension system because the pension system has earned more in investment returns than it promised to pay out to the employee in DROP interest. On the other hand, if the DROP balance is less than the payout, the pension system has incurred a cost and must use some of its pension funds to make up the difference.

Table 8 shows the average net interest per DROP participant (the difference between the credited DROP interest and the expected investment return), by retirement year. When using the expected rates of return, the cost impact of the net interest paid is negative over the entire period, reflecting a gain to the pension system – the plan realizes 6 percent or 7.7 percent on the account, but only pays 4.5 percent (the Treasury rate if after 2012) to the DROP participant. Under the academic approach, using a return equal to the 1-year Treasury rate, the net interest paid is positive during the period.[15] The cost difference between the two scenarios highlights a key feature of the DROP – a portion of the overall DROP cost depends on the actual investment return earned on benefits deposited in the DROP account, relative to the interest credit promised to participants.

Table 8. *Average Cost of DROP Interest Credit, by Retirement Year*

	Average DROP interest			
Year	Plan Sponsor (7.7% discount rate and 7.7% return)	Plan Sponsor (6% discount rate and 6% return)	Academic Approach (3% discount rate and 1-yr Treasury return)	DROP Retirees
2004	-$11,573	-$5,542	$8,692	931
2005	-$11,187	-$5,363	$7,586	648
2006	-$12,108	-$5,799	$4,349	731
2007	-$12,303	-$5,907	$1,518	935
2008	-$13,115	-$6,283	$3,267	545
2009	-$12,285	-$5,883	$7,527	459
2010	-$13,315	-$6,377	$12,717	424
2011	-$12,151	-$5,818	$15,095	396
2012	-$14,388	-$6,891	$20,226	427
2013	-$16,705	-$8,008	$24,629	698
2014	-$15,186	-$7,326	$22,427	492
2015	-$16,554	-$8,109	$23,716	412

Source: Authors' calculations based on the City of Philadelphia's administrative data (1991-2015).

Overall Costs of the DROP

This section focuses on the total cost of the DROP for the plan as whole.[16] The results are reported in Table 9. Since the introduction of the DROP, the total cost is $277.2 million when discounted at 7.7 percent; $252.6 when discounted at 6 percent; and $236.9 million when discounted at 3 percent. Since 2009, the costs are $41.0 million, $42.1 million and $62.2 million, when valued at 7.7 percent, 6 percent and 3 percent, respectively.

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[15] For the academic approach, the net interest paid remains greater than zero after 2012 because many of those who retired in 2012-2015 enrolled in DROP prior to 2012 and were grandfathered-in at the 4.5 percent interest rate. The net interest paid, under the academic approach, will drop to zero in 2016 when all DROP retirees will have enrolled in DROP in 2012 or later.

[16] Due to missing data, about 3,000 of the 11,000 DROP retirees were excluded in the analysis of average costs. To estimate the total costs for the plan, the averages were applied to all DROP retirees.

While the DROP has been costly to the City, the impact of DROP interest on costs depends upon the approach taken. Using the plan sponsor approach, the DROP interest has actually saved the City money because the assumed return – either 6 percent or 7.7 percent – exceeds the guaranteed interest paid on the DROP account. Using the academic approach, the DROP interest adds costs because the risk-free return on the DROP account falls short of the 4.5 percent interest rate paid on the DROP account for most of the DROP's existence, to date. In practice, if the realized return on the DROP account balance is greater than the 1-year Treasury rate paid on the account, the DROP interest should continue to counter the other costs of the DROP going forward.

Table 9. *Cost of the DROP for the Philadelphia Municipal Retirement System, in Millions*

	7.7% Discount Rate		6% Discount Rate		3.0% Discount Rate	
Cost Type	Since 1999	Since 2009	Since 1999	Since 2009	Since 1999	Since 2009
Change to Lifetime Benefits	$494.4	$63.3	$345.9	$52.8	$106.4	$30.8
DROP interest	-$217.2	-$22.3	-$93.3	-$10.7	$130.5	$31.4
Total	$277.2	$41.0	$252.6	$42.1	$236.9	$62.2

Source: Authors' calculations based on the City of Philadelphia's administrative data (1991-2015).
Note: Dollars amounts are in 2015 dollars.

Conclusion

The City of Philadelphia's DROP was introduced in 1999 in part to retain employees who are eligible to retire. This analysis finds that the DROP program increases the age of retirement by 1.7 years, on average. Fire and police employees increase their retirement age by 5.9 and 4.8 years, respectively. But, interestingly, the retirement age for municipal workers increased by only two months. This outcome is likely because municipal workers' average retirement age before the introduction of DROP was close to 60, which is already five years after their normal retirement age, and so they had little scope for increasing their retirement age. Nonetheless, on the whole, the DROP has achieved the goal of delaying retirement for otherwise eligible employees.

But introducing a DROP has costs. Two major costs are the change in lifetime benefits resulting from a change in the retirement age and the cost of the interest credited to the DROP account. The total DROP cost incurred since 1999 is $277.2 million when valued using the expected rate of return of 7.7 percent; $252.6 million when using the 6 percent rate of return; and $236.9 million when valued using the risk-free rate. Since 2009, the DROP cost has amounted to $41.0 million (expected return of 7.7 percent); $42.1 million (expected return of 6 percent); and $62.2 million (risk free rate). While these amounts may be significant in absolute terms, they are a small percentage of the nearly $11 billion in total liabilities for the Philadelphia MRS.

Looking forward, two issues complicate any extrapolation of future drop costs based on the results of this analysis. First, while the 2012 legislation reduced the portion of DROP costs related to the interest rate credited on the DROP accounts, it is still too early to know whether the

2012 legislation will impact DROP enrollment or how the DROP affects the retirement age – both of which would affect the overall costs and benefit of the DROP going forward. Second, the small, albeit growing number of retirees covered under Plan 87 (the defined benefit plan for employees hired after July 1, 1988), face different plan design incentives than the majority of existing retirees who are covered under Plan 67 (the defined benefit plan for employees hired before after July 1, 1988). For this reason, the results of this report – which relies on the sample of existing retirees – may not be representative of the impact that the DROP will have on retirement ages in the future. It is likely, given the later retirement ages defined under Plan 87 relative to Plan 67, that the DROP will have a smaller impact on retirement ages – and costs – for members of Plan 87.

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Table A1. *Estimated Change in Retirement Age Associated with DROP Eligibility, Controlling for Individual and Plan Characteristics*

Dependent Variable:	Age at Retirement							
	All Employees (1)		Police (2)		Fire (3)		Municipal (4)	
Eligible for DROP	1.7	***	4.8	***	5.9	***	0.2	*
	(0.1)		(0.2)		(0.3)		(0.1)	
Female	1.4	***	1.0	***	-4.7	***	1.2	***
	(0.1)		(0.3)		(0.6)		(0.1)	
Married	0.0		-0.7	***	0.8	***	0.1	
	(0.1)		(0.2)		(0.3)		(0.1)	
Education (Omitted: High School or Less)								
College or More	-0.3	***	-0.9	***	-0.5	*	-0.2	*
	(0.1)		(0.3)		(0.3)		(0.1)	
No Data	0.2	*	2.8	***	-1.2	**	-0.2	*
	(0.1)		(0.2)		(0.5)		(0.1)	
Black	-0.9	***	1.1	***	-1.0	***	-1.3	***
	(0.1)		(0.2)		(0.3)		(0.1)	
Hispanic/Latino	-1.1	***	1.3	**	-1.8		-1.6	***
	(0.3)		(0.6)		(1.4)		(0.3)	
Asian/Native American/Multiracial/Other	1.3	**	2.6		-2.9	*	1.5	**
	(0.6)		(2.3)		(1.7)		(0.6)	
Race/ethnicity Missing	1.0	*	0.3		-0.9		1.3	**
	(0.5)		(1.4)		(2.8)		(0.5)	
Constant	21.1		-14.3		6.0		41.4	
	(2.7)		(6.4)		(9.2)		(3.0)	
Persons	15,315		3,709		1,608		9,998	
R-Squared	0.4		0.2		0.3		0.1	

Notes: Coefficients are significant at the 1 percent level (***), 5 percent level (**), or 10 percent level (*). All regressions include controls for the average retirement age in the state by gender. Model (1) also includes indicators for specific pension plans. The analysis is limited to members of Plan 67.

Table A2. *Investment Performance for Philadelphia Municipal Retirement System (MRS), 1985-2016*

Fiscal Year	1-yr Return	Rolling 3-yr Return	Rolling 5-yr Return	Rolling 10-yr Return	Rolling 15-yr Return	Rolling 20-yr Return	Rolling 30-yr Return
1985	16.1%						
1986	23.1%						
1987	10.7%	16.5%					
1988	1.0%	11.2%					
1989	13.6%	8.3%	12.7%				
1990	9.1%	7.8%	11.3%				
1991	4.3%	8.9%	7.6%				
1992	10.0%	7.8%	7.5%				
1993	12.8%	9.0%	9.9%				
1994	1.6%	8.0%	7.5%	10.0%			
1995	11.7%	8.6%	8.0%	9.6%			
1996	15.1%	9.3%	10.1%	8.9%			
1997	18.3%	15.0%	11.8%	9.6%			
1998	14.3%	15.9%	12.0%	11.0%			
1999	10.0%	14.1%	13.8%	10.6%	11.3%		
2000	9.6%	11.3%	13.4%	10.7%	10.9%		
2001	-6.0%	4.3%	8.9%	9.5%	8.9%		
2002	-5.8%	-1.0%	4.1%	7.8%	7.7%		
2003	1.8%	-3.4%	1.7%	6.7%	7.8%		
2004	16.6%	3.8%	2.9%	8.2%	8.0%	9.1%	
2005	9.9%	9.3%	2.9%	8.0%	8.0%	8.8%	
2006	11.3%	12.6%	6.5%	7.7%	8.5%	8.3%	
2007	17.0%	12.7%	11.2%	7.6%	8.9%	8.6%	
2008	-4.5%	7.5%	9.8%	5.6%	7.7%	8.3%	
2009	-19.9%	-3.6%	1.8%	2.3%	6.0%	6.4%	
2010	13.8%	-4.5%	2.5%	2.7%	6.2%	6.6%	
2011	19.4%	2.9%	4.0%	5.2%	6.4%	7.4%	
2012	0.2%	10.8%	0.8%	5.9%	5.3%	6.9%	
2013	10.9%	9.9%	3.9%	6.8%	5.1%	6.8%	
2014	15.7%	8.7%	11.8%	6.7%	5.4%	7.5%	8.3%
2015	0.3%	8.8%	9.0%	5.7%	4.8%	6.9%	7.8%
2016	-3.1%	4.0%	4.6%	4.3%	5.0%	6.0%	6.9%

Source: 1-yr returns from CAFRs and Actuarial Valuations for Philadelphia MRS. Rolling multi-year returns are Author's calculations based on the 1-yr return.

Table A3. *Expected Nominal Returns for U.S. Equities*

Firm	Average Annual Real Returns (%)	Horizon
McKinsey	Slow growth scenario: 6.0 – 6.5 Growth recovery scenario: 8.0 – 9.0	20 years (2016 – 2035)
Goldman Sachs	4.7-5.5%	5 years (2016 – 2020)
Vanguard[1]	7%	10 years (2015 to 2024)
JP Morgan	7%	10- to 15-years
GMO	-0.1%	7 years (2015 – 2022)
Morningstar[2]	6-7%	Next few decades
Charles Schwab	6.3%	10 years (2015 - 2024)

[1] Bogel and Nolan (2015). Bogel is founder and former chairman of the Vanguard. Authors are affiliated with Vanguard's Bogle Financial Markets Research Center.
[2] Josh Peters, Morningstar Director of Equity-Income Strategy.

Appendix II

Table A4 is a simple illustration of the potential impact of DROP on the total payroll of a government entity under two basic strategies for replacing retired employees. The first strategy is to maintain the size of the workforce by filling positions left open by retired employees through standard promotion methods – moving employees up the chain of command and also hiring new employees for the newly open entry-level positions. The second strategy is to let the workforce shrink by attrition as older employees retire – moving employees up the hierarchical chain of command, but leaving vacant the newly open entry-level positions.

Table A4. *Example of the Impact of DROP on Payrolls if the City Replaces Retirees*

Employee #	Period 1	Period 2			
		Replace Retired Employees		Shrink by Attrition	
		w/o DROP	w/ DROP	w/o DROP	w/ DROP
1	$100		$105		$105
2	$80	$105	$85	$105	$85
3	$70	$85	$75	$85	$75
4	$50	$75	$55	$75	$55
5	$40	$55	$45	$55	$45
6		$45			
Total Payroll	$340	$365	$365	$320	$365

Source: Author's calculations.

In period 1, the government agency has five employees. Employees are ranked by their positions in the government agency with employee #1 being the most senior. We assume that the agency has a set wage for each position and that wages increase 5 dollars each year to reflect CPI increases. In period 1, the total payroll for the employer is $340 and the salary of the most senior employee (employee #1) is $100.

If the agency's plan is to replace retired employees, the total payroll in period 2 is the same with and without the DROP. Without the DROP, when employee #1 retires, employee #2 is promoted to employee #1's position and is paid the set wage of that position (including the 5 dollars increase for CPI). Similarly, all the lower ranking employees are promoted. Finally, employee #6 is hired to fill in the newly open entry-level position. Under this scenario, the total payroll in period 2 is $365. With the DROP, employee #1 continues to work rather than retiring and receives the $5 CPI increase. Because employee #1 did not retire, the other employees are not promoted and simply receive the CPI increase to their wages. Under this scenario, total payroll is also $365 in period 2. As such, the DROP has no impact on total payroll if the agency plans to replace retirees.

Under the second strategy – allowing the workforce to shrink by attrition – total payroll in period 2 differs with and without the DROP. Without DROP, when employee #1 retires, the promotion chain is executed, but unlike in the first strategy, employee #6 is not hired to fill in the newly open entry-level position. Because the workforce shrinks to four employees, total payroll under

this scenario is only $320. With the DROP, employee #1 continues to work, keeping the workforce at five employees. Because employee #1 did not retire, the other employees are not promoted and simply receive a CPI increase to their wages. Total payroll under this scenario is $365. So, if the agency plans to allow the workforce to shrink by attrition, the DROP can be costly because it keeps workers on the payroll longer.