



Who Chooses Incentivized Pay Structures? Exploring the Link Between Performance and Preferences for Compensation Reform in the Teacher Labor Market*

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Abstract: In this paper we report on research examining the revealed preferences of teachers in Denver Public Schools who were given the opportunity to select between remaining on a traditional salary schedule or opting in to one of the nation's highest profile pay reform systems, Denver's Professional Compensation System for Teachers. The incentive structure creates differential earnings risk for teachers according to their experience and measured effectiveness as well as their staffing assignment and school. We find that teachers are generally responsive to the eligibility criteria, but many teachers who would have earned more under the new system chose not to participate. Survey evidence suggests that teachers' notions of fairness and confusion about the structure of the new system may have contributed to these decisions.

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1. Introduction

A chorus of education advocates, analysts, and policymakers have called for reforming the practice of rewarding teacher pay solely on the basis of degree and experience levels.¹ Teachers and teachers' associations, however, are generally skeptical about pay reforms, particularly reforms that seek to tie pay directly to students' test scores. For instance, in a recent survey, the overwhelming majority (75 percent) of teachers report that salary is an essential element to retaining effective teachers; however, only 26 percent believe that performance pay would have a large impact on student achievement, and only 16 percent believe it is an important factor in the retention of good teachers (Scholastic, 2012). Yet despite its general unpopularity among teachers, the adoption of incentive-based pay has expanded rapidly in recent years, at least in part because this reform is a centerpiece of the federal government's Teacher Incentive Fund and prioritized under the Race to the Top initiative.²

Several recent experimental studies suggest that pay for performance (PFP) has little short-term impact on the productivity of the teacher workforce as measured by student achievement on standardized tests (Springer et al., 2010; Fryer, 2011; Marsh et al., 2011; Glazerman and Seifullah, 2012), or on self-reported teacher practices (Yuan et al., 2012).³ But there is still interest in the potential that PFP may lead to greater productivity through workforce sorting, whereby teachers with certain qualities or characteristics enter and exit the profession at differing rates resulting in a new distribution of these qualities or characteristics.⁴ At present, however, there is surprisingly little known about how the presence of performance pay might influence teacher recruitment or retention, or what might lead teachers to buy into a new pay system.⁵

¹ See, for instance, The Business Roundtable (2000), Hassell (2002), Prince (2002), Committee for Economic Development (2004), Center for Teaching Quality (2007), Podgursky and Springer (2007), Gates Foundation (2010), and National Council on Teacher Quality (2011).

² The Teacher Incentive Fund allows states, districts, and nonprofits to compete for awards as high as \$60 million over five years to “develop and implement performance-based teacher and principal compensation systems in high-need schools.” (U.S. Department of Education, n.d.) The Race to the Top fund is another federal competition that provides awards to states to reform their education systems. Winners are selected on the basis of successfully satisfying several criteria, of which one major factor is tying personnel policies, such as compensation, to student achievement results.

³ An exception to this is Fryer et al. (2012) who find that teachers seem to respond to the potential *loss* of an incentive should student performance not meet particular benchmarks. There is also more evidence from international literature that performance pay has an impact on student achievement (e.g., Glewwe, Illias, and Kremer, 2003; Muralidharin and Sundararaman, 2008; Duflo, Hanna, and Ryan, 2012). For a review of studies linking pay for performance systems and student achievement, see Jackson et al. (2014).

⁴ Lazear (2000) estimates that productivity benefits of performance pay in the private sector are derived roughly equally from increased productivity of incumbent employees and workforce composition shifts associated with incentives. For a more comprehensive discussion of these labor market-sorting issues, see Lazear (2003), Lawler (2003, 2005), Bateman and Snell (2004), Eide et al. (2004), and Podgursky and Springer (2007).

⁵ For an example of one recent study that focuses on the impact on retention, see Dee and Wyckoff (2013).

As we go on to describe, the implementation of pay reform in Denver permits us to analyze what kind of teachers prefer this type of system. In particular, we focus on the factors that predict whether teachers, when given a choice between remaining in a traditional pay system or switching into an incentivized pay system that includes PFP as a significant component, would actively choose to opt in to the incentivized pay system. We examine the compensation decisions of teachers in Denver Public Schools when given the opportunity to select between the traditional salary schedule or one of the nation's highest profile pay reform systems, Denver's Professional Compensation System for Teachers, commonly referred to as "ProComp". Differences between these two pay structures result in systematic variability in the compensation that teachers can earn, which should induce different levels of voluntary opt-in among teachers presented with more or less favorable incentives. We focus on three related questions that each address aspects of sorting behavior in response to the ProComp incentive structure: 1) Does the pattern of teacher opt in suggest that teachers respond systematically to variations in the structure of ProComp's financial incentives?; 2) are more effective teachers, who are more likely to receive a PFP award, more likely to opt in?; and 3) to what extent are teacher attitudes toward ProComp associated with their decision to opt in?

We find that teachers are sensitive to eligibility for both individual- and group-based incentives when making decisions about incentive-based pay. The results on individual performance awards show that opt-in decisions are related to the incentivized performance dimension, with more effective teachers being more likely to opt in. We also find that teachers are sensitive to incidental aspects of the ProComp incentive structure, specifically implicit rewards and penalties associated with different experience levels. Teachers were also more likely to opt in (and highly unlikely to opt out) after a structural change that resulted in larger and more numerous bonuses. Finally, we find that teachers' decisions about whether to enroll are related to their understanding of the incentives as well as their assessments of the fairness and efficacy of the program. In sum, these findings suggest that teachers do respond to a range of incentives and are generally more likely to respond to those that are clearly defined and straightforward, and commensurate with their values. We conclude the paper by reflecting on how these results could be used to strengthen the self-sorting function of PFP programs.

2. Background

2.1 Individual Preferences for Compensation Structure

Several districts have experimented with PFP systems encompassing a number of different designs. Although the empirical evidence on merit pay systems suggests mixed evidence on the short-term effects on student learning, an increase in effort among incumbent teachers is only one mechanism by which PFP programs might increase student achievement. There is some evidence that teachers respond to the strength of program incentives (Fryer et al., 2012; Goodman and Turner, 2013; Imberman and Lovenheim, forthcoming). Furthermore, such programs might influence the supply of teachers in systematic ways. In this study, we focus on teachers' decisions to opt into PFP

programs and how these choices are influenced by the individual incentives embedded in the system.

Theory suggests that more productive workers will, when given the option, select performance-based pay over a fixed pay system as they would tend to benefit financially under this choice (Gibbons, 2005; Lazear, 2000). This is confirmed in experimental settings (e.g., Cadsby et al., 2007; Dohmen and Falk, 2011; Lazear, 2012), and is borne out by some labor market analysis (Lazear, 2000). But individual productivity may not be the only factor affecting an individual's pay structure preferences. Different pay schemes carry different levels of earnings risk. While individuals may have some sense of their current (relative) effectiveness, they cannot be certain about their future performance, or how it will be judged under a new performance-based system. Risk averse individuals have been found to be less likely to select performance incentives over fixed pay (Cadsby et al., 2007; Dohmen and Falk, 2011); this is highly relevant to the teaching profession given additional evidence that individuals who self-select into teaching may be generally more risk averse (Bowen et al., 2012; Dohmen and Falk, 2010). Additionally, different pay schemes may alter workplace dynamics in more or less favorable ways depending upon the type of worker and workplace setting.⁶ Lab experiments show that preferences for compensation schemes are related to preferences regarding competitiveness (Niederle and Vesterlund, 2007), sharing (Lazear et al., 2012), and peer equality (Bartling et al., 2009; Perez, 2010).

As noted previously, surveys tend to suggest little support for pay that is linked to student test scores. There are several potential explanations for this. Some evidence finds that prospective (Bowen et al., 2012) or in-service (Dohmen and Falk, 2010) teachers are more risk-averse than individuals in other occupations, as well as more inequity-averse (Perez and Muraki, 2013). To the extent a current and prospective teacher harbors nonpecuniary preferences or professional values that are inconsistent with competition and pay inequity, school systems may need to pay relatively large premiums to induce participation.⁷

While incentive pay schemes are not complex or opaque by definition, many teacher incentive programs rely on multifaceted evaluation systems that can involve both subjective evaluation and, increasingly, evaluation based on student test score growth (often based on statistically adjusted measures).⁸ Analysis of the most recent wave of the Schools and Staffing Survey (2011-12), for instance, shows that only 11 percent of school districts offer incentive pay to “reward excellence in teaching.” Incentive pay is also relatively new for most teachers, which means that they may require some time to

⁶ The general theory of incentive pay suggests that for jobs involving complex and multidimensional tasks and goals, which are often vague, employers are less likely to implement systems that link pay to measures of performance (Prendergast, 1999; Dixit, 2002).

⁷ Recent studies (e.g., Hartog and Vijverberg, 2007; Jacobs et al., 2009) show that wage levels are higher in occupations with greater wage variability. Nadler and Wiswall (2011) further demonstrate theoretically that performance pay would be more acceptable among teachers with relatively high base salaries; they find support for this in terms of the enrollment decisions of schools into a performance pay system in Minnesota.

⁸ See Neal (2011) for more details on the design of performance pay systems.

obtain the requisite information to fully understand their new pay system and form reasonable expectations regarding the tradeoffs. Therefore, teachers face not only risk but uncertainty over the likelihood of outcomes as well (Epstein, 1999).

There exist few studies that directly assess the question of whether more productive employees are more likely to opt into a PFP system. The few studies that do focus on the effect of pay reforms on employment choices suggest that performance-based pay systems result in productivity benefits associated with workforce sorting. In research conducted outside of education – including the auto glass industry, medical hospitals, and the service sector, respectively – Lazear (2000), Barro and Beaulieu (2003), and Bandiera et al. (2011) find that companies that adopt performance-based pay see improved overall employee effectiveness and are able to attract more effective workers.

Research on teachers clearly suggests that they, like individuals employed in other occupations, respond to both financial incentives and working conditions (including the characteristics of the students they teach).⁹ There are no studies that we are aware of that focus specifically on the choices of teachers who are provided with pay system options, but several studies touch on this area by examining teacher survey responses to questions about pay structure. Ballou and Podgursky (1993), Goldhaber et al. (2011), and Jacob and Springer (2008) find evidence that teacher views about performance pay are quite heterogeneous, and vary across individual characteristics, grade level, and experience. Briggs et al. (2014) argue that teachers may choose not to opt into PFP systems because they believe that the instruments used to measure their performance (often student standardized test score gains) are not reflective of their true effectiveness and effort. Muralidharan and Sundararamin (2011) investigate a PFP program in India and find a positive and statistically significant relationship between teachers' preferences for performance pay and the average gains of their students. The survey about preferences was administered *before* teachers knew about the achievement of their students, suggesting that teachers know something about their own potential for effectiveness and select a pay system that will, given their potential, benefit them. Perez and Muraki (2013) examine the relationship between teacher effectiveness and preferences for individual- and school-based performance pay among teachers in Miami-Dade County. They find that more effective teachers are more likely to prefer a bonus, either individually or school-wide, over an across the board pay increase. Similarly, teachers who work in schools assigned a better rank by the district are more likely to prefer a school-wide bonus over an across the board pay raise. Interestingly, school-level value-added was not predictive of teacher preferences for school bonuses.

2.2 *Denver's Compensation System (ProComp) and the Choices Teachers Face*

⁹ See, for instance, Chingos and West (2012), Clotfelter et al. (2008, 2011), Goldhaber et al. (2010), Hanushek et al. (2004), Imazeki (2005), Murnane and Olsen (1989, 1990), and Steinbrickner (1998) on teacher responses to salary differentials and different career opportunities; Costrell and Podgursky (2009) and DeArmond and Goldhaber (2010) on how teachers respond to incentives to retire; and Clotfelter et al. (2011), Goldhaber et al. (2010), Player (2009), Hanushek et al., (2004), and Scafidi et al. (2007) on working conditions.

ProComp Background. Denver’s Professional Compensation System for Teachers has been termed the “the nation’s most ambitious teacher pay plan linking salaries to the academic achievement of their students” (Gonring et al., 2007).¹⁰ Two aspects of ProComp warrant special attention. First, it was designed through a unique partnership between the district and the teachers’ association, Denver Classroom Teachers’ Association (DCTA), a local affiliate of the National Education Association.¹¹ Second, unlike other programs being piloted across the country at that time (e.g., in Nashville and Houston), ProComp included bonuses and salary increases for a wide diversity of teacher behaviors and achievements, extending beyond traditional performance incentives based almost exclusively on student achievement gains.

Although ProComp does include group-based and individual incentives for student growth, it also includes awards for building knowledge and skills, and for teaching in hard-to-serve schools or hard-to-staff positions.¹² Table A-1 in Appendix A presents the incentive structure that was in place for the 2005-2006 school year and that was presented to teachers initially offered the decision to opt-in to ProComp. They could earn bonuses or salary increases¹³ in four areas: (1) improving their professional *knowledge and skills*, through advanced degrees, additional training, or certification programs; (2) receiving satisfactory *professional evaluations* from their supervisor; (3) encouraging *student growth*, both on state assessments and annual student growth objectives set by individual teachers¹⁴; and (4) *market incentives* distributed to teachers

¹⁰ It began in 1999 as a four-year pilot program in Denver Public Schools, a large, high-poverty, largely-minority, urban district (Gonring et al., 2007), and was backed by Denver voters via a 2005 referendum to levy \$25 million in annual taxes; Denver Public Schools also received a \$22.6 million Teacher Incentive Fund (TIF) grant to support the program.

¹¹ Despite initial opposition from the teachers’ association – some polls prior to the formal union vote predicted that at least 4 out of 5 teachers would vote against the ProComp plan – 59 percent of DCTA members ultimately voted to approve the program (Paulson, 2009). That 59 percent of DCTA members voted to approve the ProComp system should not be mistaken to mean that 59 percent chose to participate in the program; in fact, only approximately 15 percent of eligible teachers opted into the program in the first full year of implementation.

¹² Denver’s system also differs from many other district reforms in that receipt of teacher incentives is not tournament-based, or contingent on the performance of other teachers (in the district); in other words, for most awards, teachers are given incentives based on criterion-referenced measures and all teachers within the district could theoretically earn the bonus/salary increase (or, on the contrary, no teachers could). For an explanation and examples of tournament-based PFP systems see Podgursky and Springer (2007).

¹³ The distinction between base-building salary increases and bonuses is an important one. Some incentives under ProComp provide only a one-time bonus, while others are a sustainable salary increase. In ProComp 1.0 years, permanent pay increases were awarded for completing professional development, receiving satisfactory evaluations, achieving high student growth on state standardized tests (for math and language arts teachers only), meeting both of the student growth objectives set in agreement with the principal, and earning an advanced degree (after opting in to the program). Annual one-time bonuses were awarded for working in a high needs school, filling a high needs assignment, and working at a top-performing school (in terms of student growth). This difference in incentive structure could theoretically contribute to potential increases in the desirability of certain incentives and prioritization of certain rewards by the district.

¹⁴ Student growth objectives, called SGOs in the ProComp system, are more commonly referred to in the current education reform discourse as student learning objectives, or SLOs. Note that all teachers are eligible for the SGO incentive, but only teachers in grades and subjects where the state standardized

working in high need schools or high need positions (Denver Public Schools, n.d.). The diversity of these incentives was designed by DPS and partnering organizations with the expectation that it would both improve student achievement and the quality of the teaching workforce through the retention and recruitment of high-performing teachers.

ProComp Opt-In Process & Access to Information. While the diversity of the available incentives under ProComp has been recognized as a unique aspect of the reform, it has also potentially confounded the ability of teachers to fully understand the scope of the program and requirements for each incentive. This understanding was critical, because beginning in November 2005, teachers employed by the district prior to January 1, 2006 were given opportunities to *opt in* to the new pay system. The stakes of the opt-in decision were high: Teachers opting in to the program were instructed that once they decided to enter ProComp, the choice was irreversible.¹⁵

Nevertheless, for incentives that teachers could directly control (e.g., advanced degrees) and those based on credentials and teacher context (e.g., working in a hard-to-serve school), teachers likely had highly reliable information about their expected potential to earn rewards. For these incentives, the criteria were quite concrete, and teachers were given very clear information from the district and teachers' association; during the initial opt-in window,¹⁶ both the district and DCTA provided eligible teachers with information about the potential incentives they could receive. DPS provided teachers with a "Salary Estimation Worksheet" that identified the positions/licenses and schools eligible for the high needs assignments and high needs schools incentives, respectively. It also allowed teachers to calculate their potential salary under ProComp based on the "market incentives" and the unused education credit information.¹⁷ These were the incentives with which most teachers were most familiar: the worksheet did not address the other available bonuses, including those based on student performance.

achievement test is administered are eligible for the individual performance (IP) bonus, which is known in DPS as "Exceeds Expectations."

¹⁵ Despite this, when the structure of ProComp was significantly modified in 2008, current ProComp teachers who had opted into the system were provided a one-time opportunity to "opt-out." The revised system allowed for higher earnings potential in the short run, but resulted in less variability in pay between teachers overall; ultimately, these changes are thought to have induced even more teachers to enroll. Of the teachers enrolled in ProComp at the time, only 41 teachers moved back to the single salary system.

¹⁶ Over the course of ProComp to date, teachers have had a total of eight opt-in windows over a total of six years to opt into ProComp. The first two opt-in windows were held during the 2005-2006 contract year, with the first in the fall of 2005. After those two windows, educators were provided a period of approximately six months to decide whether to join ProComp. The final opt-in window closed in June of 2011.

¹⁷ Under the single salary schedule, pay is determined by experience (pay steps) and degree level (lanes). In DPS, pay steps range from 1 to 13, and pay lanes include bachelor's degree, bachelor's +30 hours, bachelor's +60 hours, master's degree, master's +30 hours, master's +60 hours, and doctorate. Teachers opting into ProComp during the first two opt-in windows were able to increase their base salary if they had "unused" education credits. For example, a teacher with a bachelor's degree and 15 additional credits would be compensated for the additional credits if she opted into ProComp, while under the traditional salary schedule she would not be eligible for a lane change (and the corresponding pay increase) until she earned 30 additional credits.

DCTA also distributed an informational primer about ProComp and the incentives available. This primer advised teachers who had topped out on the uniform salary schedule, teachers without a Master's degree in the first few steps on the salary schedule, and teachers who possessed unused education credits to consider opting in; they also instructed teachers between step 5 and 13 to be "very careful about opting in because they are in the part of the salary schedule where their salary goes up most quickly" (DCTA, 2006). Like the official district materials, DCTA's materials downplayed the performance incentives associated with ProComp, saying explicitly that the individual teacher incentives for student growth "are not a large part of ProComp; it is anticipated that at most 30% of the teaching staff who are part of ProComp would be impacted." Although the performance incentives were largely downplayed by district and DCTA officials during the opt-in period, some have argued that the national attention garnered by ProComp has largely focused on exactly this performance element of the system (e.g., Olsen, 2007).

Potential Impact of ProComp on Earnings. In general, the new system provided the typical teacher with access to higher earning potential, but also less certainty about compensation.¹⁸ Despite this higher potential, only about fifteen percent of eligible teachers opted in to ProComp during the first opt-in window (in the fall of 2005). Over time, however, this grew substantially: By 2010, approximately 50 percent of DPS teachers who had a choice and remained in the district had opted in. It is important to note, however, that while the basic structure of ProComp remained the same during this time period, the bonuses under the ProComp system changed significantly in the 2008-09 school year. Of particular relevance to this study, many of the base-building salary increases were changed to larger one-time bonuses and the value of the market incentives bonuses increased significantly. The post-change incentive structure (ProComp 2.0) is displayed in Table A-2 in Appendix A.

Through the efforts of DPS and DCTA, it is reasonable to believe that most teachers had some access to information regarding the impact of ProComp on their earnings potential, especially as it relates to their tenure in the district at the time. **Figure 1** provides graphical representations of both the uniform salary schedule, where pay is based on the teacher's degree and teaching experience, and potential earnings under the first year of ProComp (2005-06), for teachers with (Panel A) and without (Panel B) a master's degree.¹⁹ For the uniform salary schedule (indicated by the solid black line), within each degree level, teacher salary progresses in a predictable manner: Teachers receive fixed annual pay raises until their 13th year of teaching (i.e. step 13), at which point their salaries level off. Once teachers reach this point, the only way to increase their pay on the traditional salary schedule is to move into a different salary band (i.e. changing lanes), most commonly by earning an advanced degree or completing credit

¹⁸ Those teachers hired after January 1, 2006 were required to participate in ProComp. These teachers are not included in our analysis of teacher choices.

¹⁹ All salary values are based on 2005-06 dollars. The only year-to-year difference in the dollar values for each step and lane under the single salary schedule is a cost of living adjustment, which is the same for the ProComp bonuses.

hours (e.g., moving from the BA lane to the BA+30 lane).²⁰ A teacher who has earned a master's degree starts off with a similar salary as a teacher with only a bachelor's degree, but the salaries diverge quickly between 2 and 6 years of experience. Teachers with bachelor's degrees do not begin to receive substantial salary increases until their sixth year. Despite these differences, there is no variability in teacher pay within each step and degree type on the salary schedule, and teachers are at very low risk of failing to advance from one step to the next.

[Figure 1 about here]

By opting in to ProComp, teachers forgo the opportunity to earn predictable salary increases. Instead, their current pay at opt in under the single salary schedule provides the 'base' or minimum salary and all future pay increases derive from earning rewards, which consist of a combination of one-time bonuses and permanent salary increases. Teacher salaries under ProComp are best construed as a range of possibilities (represented by the green shaded area), which may result in total earnings either higher or lower than the single salary schedule.

To provide insight into the financial implications of opting into the incentive pay system, these figures illustrate the range of income under hypothetical best- and worst-case incentive pay scenarios. For teachers opting in to ProComp with 1, 7, and 14 years of experience, the figure plots the potential range of income available, extending from the projected salary for a teacher who earns zero incentives to that of a teacher who earns every available incentive and also has permanent rewards build over time (excluding rewards for advanced degree).²¹ At the end of 5 years, the difference in salary between those teachers who earn zero incentives and those who earn them all represents about \$10,000 dollars in potential additional salary.²² In principle, all teachers could increase their salary under ProComp if they earn every incentive, however the vast majority of teachers would not expect to earn all incentives in a single year and would have an even lower expectation of earning every incentive consistently over a five year period.²³

Nonetheless, examining this range of outcomes gives some sense of how ProComp offers different awards based on teacher tenure at the time of entry. A teacher with a bachelor's degree and one year of experience has an opportunity to earn much higher pay under the incentive pay system in each of the next five years. Given the

²⁰ Approximately 12 percent of teachers under the traditional salary schedule switched lanes between 2005 and 2009.

²¹ We exclude the advanced degree award because teachers earning this award would likely switch lanes if they remained on the uniform salary schedule. A small number of Denver teachers did earn incentives for every available element.

²² Note that this difference is greater in later years, as not all incentives were available during the first year of implementation. See Appendix A for more details.

²³ It is important to note here that not all teachers face the full range of possibly salary outcomes; the implication that all teachers could earn all incentives – and increase their salary by \$10,000 over 5 years under ProComp – is untrue. For example, by definition, not all teachers in a given year can earn market incentives. Furthermore, only teachers of mathematics and language arts in grades 4 through 10 are eligible for the individual performance incentive. Thus, the potential incentives – and the associated potential costs and benefits of opting into ProComp – vary widely across teacher types.

experience-salary profile in Denver Public Schools, there is little downside relative to the single salary schedule even if she earns no rewards until after the fifth year of teaching (assuming she remains in the bachelor's degree lane). The situation is very different for teachers with seven years of experience, when the marginal return to experience is much higher, who may quickly find themselves much worse off financially under ProComp. Teachers with thirteen or more years of experience could only earn less under ProComp by increasing their educational attainment or earning National Board certification because they will no longer receive regular pay increases under the single salary schedule; thus, any incentives earned would only serve to increase their total earning vis-à-vis the traditional salary schedule.

3. Data and Methods

3.1 Data

Teacher and student data for this study are provided by Denver Public Schools. The teacher data include demographic information, personnel records, and payroll records for teachers employed by DPS in school years 2002-03 through 2009-10. The demographic information includes teacher age, gender, and race, and the personnel records contain information on teacher participation in the incentive program, awards received, teacher credentials, experience, and teaching assignments. Student-level data include test scores and student growth percentiles (for tested grades and subjects) based on the Colorado Growth model (Betebenner, 2007). Students are linked with their classroom teachers, which allows us to generate teacher effectiveness measures by aggregating the student-level growth scores to the teacher level. For much of our analysis we restrict our sample to full-time classroom teachers, which includes approximately 3,000 teacher observations per year.

Teacher-level survey data are also provided by DPS. Administered to all members of DCTA in May 2007, the survey contains data regarding each of the four incentive areas (Knowledge and Skills; Professional Evaluation; Market Incentives; Student Growth); it also includes data regarding opt-in and ProComp participation and general attitudes about ProComp. Surveys were administered to 4,107 members and responses gathered from 2,281 respondents, for a total response rate of 58% (Wiley et al., 2008). Survey responses include student services professionals (or SSPs) in addition to classroom teachers, although for our analyses the sample was restricted to only include classroom teachers. Among survey respondents, 38% identify themselves as having opted in to ProComp, 15% identify themselves as new employees required to join ProComp, and 47% identify themselves as non-participants (Wiley et. al, 2008).

In **Table 1**, we present selected sample statistics for all full-time classroom teachers during the 2005-06 school year who had the choice to opt into ProComp or remain on the traditional salary schedule. The pattern of opt-in decisions suggests that decisions are motivated by the financial incentives of the ProComp salary schedule. For instance, teachers guaranteed to receive a bonus for serving in a high needs school or

eligible for a high needs assignment are far more likely to opt into ProComp.²⁴ And, teachers with 12 or more prior years of experience, who no longer receive experienced-based pay raises under the traditional salary schedule, are also far more likely to opt in.

[Table 1 About Here]

Key to understanding who opts in to ProComp is the determination of which teachers will receive bonuses under the new salary structure. Since teachers face uncertainty about which bonuses they will receive in the future we map out two extreme possibilities, one that represents the minimum number of bonuses and one that represents all the bonuses for which a teacher is eligible. For the minimum, we assume that teachers in high needs schools or those teaching in high needs assignments will receive the respective bonuses each year, and all other teachers receive no bonuses. For the maximum, we assume that all teachers earn the professional development, student growth objective, and professional evaluation awards each year, that teachers in a school that was designated as a top performing or high growth school in the prior year earn the school-based performance awards, and that only teachers with at least 10 eligible students in CSAP-tested grades and subjects earn the individual performance (IP) award.²⁵ In **Table 2**, we show the projected salaries for teachers with the choice to enter into ProComp in 2005-06 (the first year of ProComp) and also in 2008-09 (the first year of ProComp 2.0), when the ProComp system underwent significant changes. We display the projected earnings over a 5-year time horizon under these three scenarios – (a) they choose to remain in the traditional salary schedule, (b) they opt in to ProComp and earn all eligible bonuses, and (c) they opt in to ProComp and only earn the minimum bonuses.²⁶

[Table 2 About Here]

We find that, overall, teachers who only earn the minimum bonuses would earn less under ProComp than they would under the traditional salary schedule; for most teachers, the bonuses from the high needs schools and assignment awards are not enough to compensate for the yearly salary increases in the traditional system. However, the differential is positive for teachers who opted in beginning in 2009, suggesting that these teachers were making the financially advantageous choice. On the other hand, if teachers earn all the bonuses for which they are eligible, the differential is universally positive and larger for teachers opting in. For example, teachers choosing to remain on the single

²⁴ While we cannot know with certainty whether a teacher would earn a hard-to-staff assignment bonus, we can make inferences based on the teacher's qualifications. Teachers are assumed to teach in a hard-to-staff assignment if they have a special education qualification or teach math in a secondary school.

²⁵ While we focus on these bonuses, there are also bonuses available for advanced degrees and licenses and tuition reimbursement. We ignore the tuition reimbursement because we cannot infer which teachers would be eligible for the award unless they opt in, and we ignore the advanced degrees and licenses bonus because teachers who remain on the single salary schedule and earn an advanced degree change "lanes" in the step and lane system and earn salary increases. For details on the bonuses see Appendix A.

²⁶ We use DPS administrative data to obtain steps and lanes for teachers prior to opting into ProComp. For teachers who opt in, we estimate the counterfactual salary on the traditional salary schedule by assuming that teachers progress a single step each year and remain in the same lane. ProComp salaries are estimated by adding the values of the bonuses to the base salary in the opt-in year. Future earnings are discounted using a 3% discount rate, but the pattern of results is similar with other discount rates and time horizons.

salary schedule could have earned up to approximately \$7,500 more over the five-year period starting in 2005-06 and \$20,000 more over the period starting in 2008-09 if they would have opted in to ProComp and earned all bonuses for which they are eligible. The five-year differential between ProComp earnings and the traditional salary schedule is even greater, over \$15,000 for teachers who choose to opt in the first time period and nearly \$30,000 for the second period. **Table 2** also highlights the difference in compensation before and after the structural changes that occurred in 2009. After these changes took effect the differentials increased by \$12,000-\$15,000 for each of the comparisons.

3.2 *Model and Empirical Approach*

The primary aim of this study is to better understand how teachers respond to a choice between two different pay systems – the traditional single salary schedule (SSS) and ProComp. A primary factor in determining which system a teacher chooses is the difference in expected earnings under the two systems. Earning more under ProComp would make a teacher more likely to opt in; however, pay under ProComp is uncertain. Since ProComp teachers forgo future pay step increases on the SSS, opting in is risky for many teachers. Though risk preferences are heterogeneous in any population, risk aversion is common overall and may be more common among teachers. Therefore, teachers may only opt in if the ProComp system provides a sufficiently large risk premium to compensate the disutility of risk.

Earnings and risk are not the only factors affecting teachers' opt-in decisions. As discussed in previous sections, evidence suggests that, on average, the current and prospective teacher workforce may harbor nonpecuniary preferences opposed to a pay-for-performance system. Similarly, opting into a PFP system may degrade the intrinsic motivation/rewards associated with teaching (Gneezy et al., 2011) – or may even present teachers a value-based dilemma. By many accounts, teachers are expected to be child-centered – or even subject-driven as we see with those who highly value their content area – and being conceived as “benefits-oriented” is “anathema to these normative expectations” (Jacobson, 1995).²⁷ Even teachers topped out on the SSS who have nothing to lose, in terms of salary, by opting into ProComp may still choose to remain on the SSS because of these non-pecuniary preferences.

A. Predicting Opt In

We begin by examining whether teacher characteristics and award eligibility predict teachers' decisions to enroll in ProComp. As discussed previously, the structure of ProComp is favorable to certain kinds of teachers. For instance, teachers who have reached the last step on the single salary schedule can only increase their earnings

²⁷ There is also evidence that non-pecuniary aspects of schools, such as the demographics of the students to whom they are assigned, influence teachers' career decisions (Boyd et al., 2013; Goldhaber et al., 2010; Hanushek et al., 2004), but, for simplicity we assume that teacher assignments to school and classroom are unaffected by choice of pay system.

through education or professional development. Teachers in schools that are deemed high needs or who teach in high needs assignments are also eligible for additional bonuses. As a first indication of whether teachers respond to the incentives embedded in the system, we model the teacher opt-in decision using award eligibility and teacher characteristics. In particular, we estimate a logit model

$$y_{ijt} = \beta_0 + \beta_1 T_{it} + \beta_2 S_{jt} + \beta_3 E_{ijt} + G_j + \delta_{jt} + u_{ijt}, \quad (1)$$

where i indexes teachers, j indexes schools, and t indexes year. The binary variable y_{ijt} takes the value of 1 if teacher opts in to ProComp and zero if the teacher remains on the single salary schedule. T_{it} is a vector of teacher characteristics, including gender, race/ethnicity, experience, degree level, and, in some specifications, a measure of teacher effectiveness. S_{jt} is a vector of school characteristics, including attendance, measures of student achievement, school-level percentage of students receiving free/reduced price lunch, and percentage of minority students. E_{ijt} is a vector that indicates teacher eligibility for particular ProComp awards. In particular, we include controls for eligibility for the individual performance (IP) bonus, teaching in a high needs assignment, and serving in a high growth, top performing, or high needs school.²⁸ G_j is a grade-level indicator (elementary, middle, or high school), δ_{jt} is the percentage of a teacher's peers who are enrolled in ProComp, and u_{ijt} is the error term. We estimate variations of this model on the sample of teachers eligible to voluntarily to opt into ProComp during each of the first 6 opt-in windows. Only teachers with a choice are included in the sample (which excludes teachers hired after January 2006 and those who have already opted in), and each observation is a unique teacher-window (so teachers may be included in the sample up to 6 times).

As discussed in Section 2.2, the structure of ProComp bonuses changed dramatically in 2008-09. Table A-2 outlines the available incentives – and changes from the prior system – following the structural changes. Because it is likely that the effect of being eligible for certain bonuses were different under the new ProComp system, we estimate each model separately by ProComp time period (the first four opt-in windows, for the 2005-06, 2006-07, and 2007-08 school years, are designated as being ProComp 1.0; the last two opt-in windows of our dataset, for the 2008-09 and 2009-10 years, are designated as being ProComp 2.0 years). We estimate this baseline model in a variety of ways (with and without peer-variables and school-level variables).

It is important to note that the number of teachers with a choice to opt in or remain on the SSS decreases as time goes on because teachers who opt into ProComp leave the sample. Therefore, teachers who are remaining in the sample in later years may be different on unobservable characteristics and may be less likely in general to opt into an alternative pay system.²⁹ As a result, the estimated effects for particular bonuses implemented only in later years may understate the true population effects. If this were

²⁸ The eligibility assumptions for these bonuses are the same as those used in **Table 2**.

²⁹ We discuss this further in subsection 4.3 with the survey responses about attitudes and perceptions of ProComp.

the case we might expect greater effects with a sample more representative of all teachers.

As mentioned above, the foregone guaranteed raises generated by switching to ProComp vary substantially over a teacher's career. The expected magnitude of the pay differential between the single salary schedule and ProComp also depends on a teacher's school and assignment. High needs schools and assignment bonuses, and bonuses for student growth depend on the subject area and school. Three of the bonuses are based on individual-level performance, and it is uncertain the degree to which teachers can anticipate their future performance because of imperfect information about performance and the variability in the instruments used to measure it. Colorado was implementing a new accountability system at the time, and teachers did not have access to either their own Colorado Growth Model (student growth percentiles) scores or any experience with its annual variability before the implementation of ProComp. Second, teachers may have faced uncertainty about the parameters of the program. DPS changed the structure of the program substantially during the 2008-2009 school year and converted the IP award from a base-building salary increase to a one-year bonus, which greatly reduced its value to many high-performing teachers.³⁰ After this change, teachers may have become less certain about how to forecast the probability of receiving future awards. Second, survey evidence, including the data collected in Denver, suggests that most teachers did not understand how the awards were determined (Wiley et al., 2008; Proctor et al., 2011). For instance, DPS changed each of the formulas for determining which schools qualified as high needs, top performing, or high growth at least once between 2005-2006 and 2009-2010. Despite some unavoidable measure of uncertainty, Muralidharan and Sundararamin (2008) suggest that more effective teachers seem to identify themselves as such, and tend to be more likely to support performance-based pay systems, even prior to receiving information about their effectiveness.

Following this perspective, we expect that more effective teachers are more likely to opt into ProComp, but also that less experienced teachers have less precise information about their own effectiveness. Furthermore, teachers' likely access to information regarding the potential to receive an individual effectiveness bonus should increase over time since they will have greater access to student growth information (Rothstein, 2012). The impact of this additional information may have been particularly important for the individual performance incentives for student growth; as previously mentioned, there was a significant lack of information regarding these incentives prior to implementation, and this likely shifted after teachers began earning the incentives in 2007-2008 and the district began publically recognizing incentive earners. As teachers became more experienced with the formulas used to determine the school-based awards, they may also have become better able to predict their likelihood of receiving a bonus.

³⁰ Although the value of the award diminished for teachers planning to remain in DPS for at least 2 years, the empirical effect of the change on selection into ProComp is unclear. DPS simultaneously increased the amount of the award and teachers might have been more responsive to the posted amount of the award than the actual accumulated benefits over time (Chetty et al., 2009).

We estimate the effect of teacher effectiveness on the likelihood of ProComp opt in by including a measure of effectiveness in the vector of teacher characteristics, T_{it} . We include the average median student growth percentile (the measure of student achievement gains based on the Colorado Growth Model used by DPS to determine performance awards) from all years prior to the current opt-in window in which teachers had at least 10 eligible students (which is the part of the criteria for the IP award). Because teachers only needed to exceed expectations in one subject to earn the IP award, we also estimate a model that includes a separate measure for median growth percentiles (MGPs) in math, reading, and writing, a model that includes the mean of all prior MGPs, and a model that includes the maximum average prior MGP out of the three subjects.

B. Teacher Attitudes and the Decision to Opt in to ProComp

As **Figure 1** demonstrates, for many teachers ProComp represents a likely salary increase over their existing pay level. Nonetheless, not all teachers for whom ProComp is financially beneficial choose to participate. Teachers at the highest pay step on the single salary schedule provide the clearest example of reluctance to join ProComp despite potential rewards. Short of switching lanes on the single salary schedule (e.g., by earning an advanced degree), ProComp provides the only means for these teachers to increase their pay, and yet each year many of them choose to remain on the single salary schedule. This is even true for teachers in high needs schools, who are guaranteed to receive an award, as well as for teachers who are qualified to teach in a hard-to-staff assignment. (See **Figure 2**.)

[Figure 2 about here]

A large number of teachers appear to be leaving money on the table for reasons that are unlikely to be related to risk aversion. We provide additional evidence of this pattern in **Figure 3**, which displays the amount of bonus salary teachers would have earned under the high needs schools and assignment bonuses. While many teachers who opt in appear to earn positive bonuses from these two sources alone (as the weight of the distribution for the dotted line is positive), there are a number of teachers who choose not to opt in despite the fact that the guaranteed money would exceed losses due to switching from the single salary schedule (as shown by the shaded area under the solid line). For teachers who would have seen positive salaries from these two bonuses, we estimate that the average lost net present income over a five-year horizon was approximately \$6,800.³¹ So, what can explain this apparent lack of responsiveness? In order to shed light on potential non-pecuniary sorting under ProComp, we investigate the ways that teacher attitudes and perceptions impact self-selection into the program.

[Figure 3 about here]

³¹ Note that this estimate is likely conservative because it excludes bonuses for PDUs, SGOs, and evaluations, which most teachers receive.

Part of the explanation may be that some teachers do not understand the ProComp incentive structure. Teacher responsiveness to ProComp incentives may be diminished by the complexity and ambiguity of the ProComp incentive package. ProComp includes numerous types of awards, each of which is tied to criteria that may not be entirely clear from a teacher's perspective. Even with DPS's and DCTA's efforts to inform teachers about how the program works, the survey results (taken two full years after ProComp implementation) show that only 48 percent of non-ProComp teachers and 59 percent of ProComp teachers 'agree' or 'strongly agree' that they have a "clear understanding of the ProComp program." When asked about their understanding of specific awards, teachers provided similar responses. They had even less clarity regarding the individual performance bonus and top performing school bonuses. Given this perceived lack of understanding, many teachers may not have been fully aware of the magnitude of the potential risks and rewards, or they may not have felt confident enough in their assessment to commit themselves irreversibly to the program. Provided that teachers are ambiguity averse, we would expect that a lower level of understanding would be associated with a lower probability of opting into ProComp.

Another possible explanation is multi-dimensional sorting (Dohmen and Falk, 2011). Prior research suggests that individuals sort into pay structures based not only on anticipated gains, but also along other dimensions, including social preferences and attitudes regarding the characteristics and implications of pay structures. (Several examples are provided in section 2.) Survey evidence clearly shows that teachers have well-developed preferences about how they are paid (Goldhaber et al., 2011; Jacob and Springer, 2008) and, additionally, how pay is distributed (Perez, 2010; Perez and Muraki, 2013). In general, teachers appear to prefer pay structures that are more secure and more equitable than those offered under performance pay. In the case of those teachers who face no downside risk, the additional earnings potential may be insufficient compensation for what they regard as a less desirable pay structure. We would expect that, all else equal, teachers who have less favorable views of the ProComp system would be less likely to opt in.³²

In order to provide additional context on why teachers choose to opt in to ProComp, we make use of the results from a survey of teachers about the ProComp system taken in the spring of 2007. Consistent with the discussion above, we focus on questions associated with teachers' understanding of the structure of the program as well as their perceptions about the program's fairness and efficacy. For details on the survey items, see **Appendix B**.

The survey item measuring teachers' understanding of ProComp bonuses links to the discussion above regarding the potential impact of the complexity and/or ambiguity

³² One last potential explanation is that teachers may believe that ProComp participation implies a substantial differential in required effort. While this may be true of very poorly informed teachers, we do not believe that it should have a large effect. All teachers, regardless of ProComp status, were subjected to new forms of observation and evaluation as a result of the implementation of ProComp. Participation in activities leading to an award is voluntary for all teachers. Awards based on school or assignment do not entail any added duties or obligations.

of the ProComp program. Though the survey does not include specific questions regarding teacher pay preferences, the item regarding fairness may capture these preferences more broadly. The next two items measure teacher perceptions of the efficacy of ProComp. This is important for measuring how teachers respond to the anticipated outcomes of the ProComp program. Incentive structures that highlight extrinsic motivation may have the effect of crowding out other forms of intrinsic motivation (Gneezy, Meier, and Rey-Biel, 2011). Teachers who are intrinsically motivated to do their jobs well may resist a monetary incentive structure if they feel it diminishes the intrinsic value of teaching. They would, presumably, also resist an incentive structure (monetary or otherwise) that they believe leads them to be worse at teaching. Lastly, the item on school morale is exploratory. It ties into a teacher's sense of regard for her school community, particularly her colleagues. High morale may signal greater interest and concern in the outcomes of peers and overall satisfaction with the status quo, while low morale may signal a more fragmented school community and a desire for change.

To assess how teacher perceptions are related to their decision to opt in, we sequentially add teachers' responses to the survey questions to our model of ProComp participation in equation (1).

4. Results

We break our discussion of the decision to opt into ProComp into three parts. First we focus on all teachers who are eligible to opt into ProComp, regardless of whether they teach in grades and subjects where the state CSAP tests are administered. Next we focus on the sub-sample of teachers who are eligible (if they opt in to ProComp) for the individual performance bonus because they do teach in tested grades and subjects. Finally, we focus on explaining how teacher perceptions of and attitudes toward ProComp impact their decision drawing on a survey of DPS teachers administered in 2007.³³

4.1 *ProComp Opt-in Decisions: All Teachers*

In this sub-section we report the findings from three model specifications estimating the decision to opt into ProComp among eligible teachers. All models include teacher demographics and variables for whether teachers are likely to receive certain bonuses (specification 1). The second specification adds school-level variables (aggregate student achievement, percent FRL, percent minority, and attendance), and specification 3

³³ Given evidence that teacher compensation preferences vary by school type/grade configuration (elementary, middle, and high schools) (Goldhaber et al., 2011), and that ProComp effects on student achievement differ across school types (Goldhaber and Walch, 2012), we estimate all models separately for elementary, middle, and high school grades. However, Chow tests do not indicate that the results presented in this section are inconsistent across school type; consequently, we choose to only report models estimated across all grades, with indicators for school type included in each model.

includes school-level variables and the percentage of teachers in the school who are enrolled in ProComp. Selected coefficient estimates of the marginal probability that teachers enroll in ProComp, using all years available, are reported in columns 1-3 in **Table 3**.³⁴ As noted above, ProComp changed substantially beginning with the 2008-09 school year. We report the results from each specification for teachers opting in during ProComp 1.0 years in columns 4-6 and for ProComp 2.0 years in columns 7-9. The findings are very consistent across model specification, but there are some interesting differences across time period.

Not surprisingly, teachers eligible for ProComp bonuses that they will definitely receive if they enroll in the new pay system (the high needs subject and school awards) are much more likely to opt into ProComp than teachers not eligible for these bonuses. Working in a high needs assignment raises the probability of opting into ProComp by about 3 percentage points, and teachers working in a high needs school were more likely to opt in by about 3 to 4 percentage points in ProComp 1.0 years and 7 to 8 percentage points in ProComp 2.0 years. To put these effects in perspective, on average about 10 percent of eligible teachers in our analytic sample opt in during each window. It is not surprising that we see the largest effects with the high needs subject and high needs school awards, as teachers knew with near certainty whether they would be eligible for these bonuses during each opt-in window.³⁵ We would also expect the large increase in the effect of the high needs schools bonus during ProComp 2.0 years, since the value for the bonus more than doubled.³⁶ Curiously, we only find an increase in ProComp 2.0 years with the high needs school bonus and not in the high needs assignment bonus, even though the payout increased by the same amount for both bonuses. However, it is worth noting that the high needs eligibility variable is measured with error because it reflects teacher licensure status and may not reflect the actual teaching assignment for the following year.

Teaching in a school designated as high growth increases the probability of opting in by about 3 to 4 percentage points. This bonus was not available during the first years of ProComp and the effect is only marginally significant in ProComp 2.0 years. Teaching in a top performing school and teaching in CSAP-tested grades and subjects, and thus being potentially eligible for the individual performance award, are not significant predictors of opt in. This is not necessarily surprising given that there was much more uncertainty about the probability of earning these awards, compared to the high needs

³⁴ While not reported in **Table 3**, we also include indicators for pay step and lane, and the results are very consistent across models.

³⁵ The list of hard-to-serve schools is updated each year and finalized between January and March, so teachers knew whether the school they were teaching in during each opt-in window would be eligible for the bonus if they chose to opt into ProComp.

³⁶ While the results suggest that the difference in the amount of the bonus leads to a higher likelihood of opt in during 2.0 years, we also test for the possibility that the increase in probability is due to a difference in how teachers value each additional dollar in the different time periods. We interact the value of the expected bonuses with ProComp 2.0 years and only find significant (and negative) effects with the HTSS bonus, which indicates that the effect of additional dollars was smaller during ProComp 2.0 years.

school and assignment awards.³⁷ While teachers knew beforehand which schools would be designated as high needs, they could only make assumptions about which schools would be designated as high growth or top performing based on student achievement results from the prior year.³⁸

African American teachers are less likely to opt into ProComp by about 3 percentage points.³⁹ We do not know what drives this demographic difference, but the findings are broadly consistent with research that African American teachers are more likely to avoid risk in other contexts (Chingos and West, 2012; Clark et al., 2006; Goldhaber and Grout, 2014). There is no significant effect for gender in any of the models, which is consistent with Jacob and Springer (2008) but inconsistent with findings from Ballou and Podgursky (1993) and Goldhaber et al. (2011), who find male teachers more likely to prefer merit pay.

There is also evidence that teachers in schools with a high proportion of ProComp teachers are more likely to opt in. For example, an increase in the proportion of ProComp teachers from 0 to 10 percent in a teacher's school results in about a 2 percentage point increase in the probability of opting in (with a smaller effect in ProComp 2.0 years that is not statistically significant). This result in particular is descriptive and may be due to peer effects or informational networks or may merely reflect teachers with similar attitudes about the system clustering in the same schools. However, these results are consistent with other evidence that teachers in districts with merit pay are more likely to support these types of systems (Ballou and Podgursky, 1993).

To get a better sense of how teachers' opt in decisions are related to the incentives they face given their placement on the single salary schedule, we estimate the probabilities of ProComp enrollment for teachers at each degree and experience level, and report these findings in **Figure 4** (based on the specification in Columns 6 and 9). The figure shows the probabilities overlaid against the single salary schedule and potential awards under ProComp. The top of the shaded area represents the maximum differential, discounted over five years, assuming that teachers earn all awards for which they are eligible, averaged over all teachers; the bottom of the shaded area represents the minimum differential assuming that teachers earn no bonuses.⁴⁰ As is readily apparent,

³⁷ We find a high degree of stability over time for each of the school-based awards for the schools in our analytic sample. For each of the bonuses, over 75 percent of schools eligible in a particular year are also eligible for the bonus in the following year.

³⁸ We also estimated models that included indicators for schools that were eligible for school-based awards for multiple years, since teachers in those schools may expect those schools to be more likely to be eligible in the future and may be more likely to opt into ProComp. However, the effects were very small and not significant in any of the models, indicating that teachers base their decision to opt in primarily on the most recent year of eligibility.

³⁹ The African-American coefficient is smaller and not statistically significant when we limit the sample to ProComp 2.0 years, suggesting perhaps that the increase in the value of the bonuses during the ProComp 2.0 years offsets the risk of opting in for these teachers. We revisit the effect on the probability of opt-in for African American teachers in section 4.3.

⁴⁰ We calculate the maximum salary under ProComp for each teacher using the following assumptions for each year: teachers in a high needs school earn the high needs school award; teachers with qualifications that are consistent with teaching assignments designated as high needs (special education, middle and high

the pattern of opt-in for each level of degree and experience closely mirrors the potential salary gains associated with opting into ProComp. For example, teachers at step 1 and step 13 have the most to gain financially from opting in and we see the highest probability of opt-in for these teachers. Similarly, teachers between step 5 and 9 have the lowest salary differentials and are less likely to opt in. The structural changes that occurred in 2009 resulted in a much larger average maximum, corresponding to a greater probability of opt-in at nearly every level of degree and experience. For instance, comparing the highest step for those on the BA lane, teachers were more likely by about 6 percentage points to opt into ProComp during the 2.0 years compared to 1.0 years.

[Figure 4 about here]

In sum, the results presented in this sub-section strongly suggest that teachers are responsive to the incentives laid out in the ProComp system. The bonuses that had the biggest impacts on increasing the likelihood of opting in were also the bonuses with the least amount of ambiguity (the high needs subject area and high needs schools bonuses) because teachers knew whether they would be eligible for these bonuses before opting in. The less certain bonuses showed smaller effects. Additionally, teachers were responsive to their placement on the salary schedule because they were more likely to opt in at steps where they would see the largest salary gains.

4.2 *Are ProComp Decisions Related to Estimates of Individual Teacher Effectiveness?*

As discussed above, we did not find evidence that teachers who were potentially eligible for IP awards (based on teaching in tested grades and subjects) were more likely to opt into ProComp. This is not altogether surprising given that there is uncertainty about the receipt of the IP award as it depends on the achievement of a teacher's students on the state assessment. Here we explore whether teachers who were able to accurately gauge their effectiveness could use this information to make better opt-in decisions. For example, good teachers who knew they were good teachers (and thus more likely to earn the IP award) may be more likely to opt in, and teachers who were less successful at raising student achievement scores may be less likely to opt in.

Table 4 reports selected coefficient estimates on the probability of opting into ProComp for the subsample of teachers who are eligible for the individual performance bonus because they teach in tested grades and subjects. For our measure of past performance we use the math MGP, reading, MGP, and writing MGP (in Column 1), as

school math) earn the high needs assignment award; teachers in CSAP-tested grades and subjects (math, reading, and writing in grades 4-10) earn the IP award; teachers in a school designated as high growth or top performing in the prior year earn the respective school-based awards; and all teachers earn the PDU, SGO, and CPE award. Salary differentials are calculated by subtracting the hypothetical salary under the SSS (assuming a single step increase each year and no lane changes) and expected ProComp salary using the assumptions above. All dollar amounts are based on the 2005-06 salary schedule and factor in cost-of-living adjustments for all years. For the results presented in **Figure 4** we use a discount rate of 3 percent, but the pattern of results is similar when we use different discount rates and different time horizons.

well as the mean (Column 2) and maximum MGP (Column 3) of the historical subject averages. We include the same covariates used in specification 3 of **Table 3**, using all years available.

[Table 4 about here]

We find evidence that effective teachers are more likely to opt into ProComp. For instance, a 20-point increase (e.g. going from an MGP of 40 to 60) in a teacher's maximum MGP over the three subjects (Column 3) results in an increase in the probability of opting in by about 2 percentage points.⁴¹ We find a slightly smaller effect with the mean MGP and no statistically significant effect when we include a separate measure for each subject.

This finding is consistent with Muralidharan and Sundararaman (2011), who find that effective teachers in India were more likely than less-effective teachers (as measured by student achievement scores) to opt into a performance pay system, even before they knew their own effectiveness rating, which suggests that teachers can gauge their own effectiveness. However, it is possible that a positive association between effectiveness and opt in is due not to effective teachers making better opt-in decisions but to effective teachers having different dispositions that lead them to be more likely to opt into a performance pay system.

4.3 *Are ProComp Decisions Related to Teacher Attitudes?*

Prior research has found that Hispanic and male teachers, teachers with disadvantaged and low achieving students, and teachers with experience in merit pay settings are more likely to support pay-for-performance systems (Ballou and Podgursky, 1993; Goldhaber et al., 2011). Our survey responses allow for a more complete picture of how teachers' attitudes and knowledge about an alternative compensation system impacts their likelihood of opting in.

The results reported in this section rely on the subset of teachers who completed a 2007 survey measuring perceptions and attitudes regarding ProComp.⁴² As described above, few teachers opted in to ProComp in 2007-08 (during the 3rd opt-in window) so in this section we include the survey responses of teachers who had the choice to opt in to ProComp during the 2nd and 3rd opt-in window.

We focus on 5 survey items, which are each coded as agree, neutral, or disagree.⁴³ (1) I know the range of salary increases and ProComp bonuses; (2) ProComp is a fair program; (3) the design of ProComp provides incentives for teachers to accomplish what is most important; (4) ProComp can motivate participants to improve teaching practices;

⁴¹ The standard deviation for the maximum MGP measure in our sample is about 14 points, so an increase of 20 points is approximately equivalent to a 1.5 standard deviation change in teacher quality.

⁴² See section 3 and Appendix B for more details about the survey.

⁴³ Strongly agree and agree are collapsed; strongly disagree and disagree are also collapsed.

and (5) the morale at my school is high. Teachers enrolled in ProComp were more likely to agree on the first 4 items and were slightly less likely to agree on the 5th item about school morale.

Table 5 below reproduces specification 3 from **Table 3** using only the subset of teachers with survey responses and only for the 2nd and 3rd opt-in windows. We then sequentially add dummies for agree and neutral (with disagree as the omitted reference category) for each of the survey items.

[Table 5 about here]

The findings from the full sample and the survey sample are fairly consistent,⁴⁴ and a likelihood ratio chi-square test suggests that the inclusion of the attitudinal variables significantly improves the fit of the model.⁴⁵ This is consistent with Brown and Weisbenner (2014) who find that including controls for beliefs and attitudes greatly increases the amount of explained variation in teacher pension plan choices.

There are, however, a few findings that differ from the results from the full sample of teachers in **Table 3**. The coefficients for top performing school are greater than with the full sample and are significant, and African American teachers are no less likely than white teachers to opt in. Because these differences exist even in the standard model that exclude the attitudes variables (column 1), they appear to be attributable to the differences in the samples. Finally, the percentage of enrolled teachers in the same school is not significant in any of the models that control for teacher attitudes.

Table 6 below displays the predicted probability of opt in for each of the survey response categories. Teachers who agreed with the first four items and had a more knowledgeable or favorable view of ProComp were more likely to opt in than those who disagreed, with differences ranging from about 4 percentage points for item 3 (ProComp provides incentives for teachers to accomplish what is most important) to 15 percentage points for item 2 (ProComp is a fair program).⁴⁶ Teachers working in a school with high morale were about 7 percentage points less likely to opt into ProComp compared to teachers in low-morale schools. Because of the temporal issue discussed above it is not clear whether teaching in a low morale school leads to greater rates of opt in or whether high rates of ProComp opt-in leads to lower school morale.

[Table 6 about here]

⁴⁴ For instance, as with the full sample results, the coefficients for high needs schools and assignments range from about .02 to about .04.

⁴⁵ The log likelihood and pseudo R-squared is -492.3 and .234 in the model without survey items, and -417.0 and .351 in the model with survey items, respectively.

⁴⁶ We also estimated the same model among teachers who face no earnings risk (those at the highest pay step based on experience, assuming no lane changes) and find that the fairness item has an even larger effect among this group. For these teachers, the non-pecuniary factors associated with opting into a program they believe is unfair outweigh the likely financial benefits of enrolling.

The responses to the survey items appear to explain key contextual and non-pecuniary aspects of teacher decisions. The effect of knowing the ProComp bonus structure, feeling that ProComp motivates better teaching, and working in a high morale school are approximately the same magnitude as the effect of the high needs schools bonus. The effects of differing fairness perceptions are substantially larger than the effects of the bonuses. Though these results are highly suggestive, they must be interpreted with caution because of questionable temporal precedence (e.g., the survey was conducted one year after the decision to join ProComp was made), and although consistent with most research in the social sciences, the response rate of the survey nevertheless excludes nearly half of the sample.

5. Conclusion

In the results outlined above, we analyze teachers' choices for compensation using the implementation of an incentive pay plan in Denver Public Schools. The compensation plan we study combines elements of several other teacher compensation reforms, with both individual and group incentives, differential pay for working in certain schools and positions, and bonuses based both on student outcomes and professional development activities. The differential eligibility of teachers to each of these components allows us to study the responsiveness of teachers to different kinds of incentive pay systems.

We find several consistencies in teacher preferences in Denver. Overall, we find that teachers are responsive to incentives. The bonuses with the least amount of uncertainty (high needs school and high needs assignment bonuses) showed the largest and most consistent positive impacts on the likelihood of opting in. Teachers also tended to be more likely to opt in when they had the most to gain, based on their placement on the single salary schedule. After the change to the system in 2008, when the high needs school bonus more than doubled, the effect of the bonus on the probability of opt in increased significantly as well.

Teachers were also responsive to eligibility for the group-based incentives embedded in ProComp. Teachers are much more likely to opt into ProComp if they will receive a bonus for working in a high needs school, and to a lesser extent, a high growth school. There may be several reasons for this pattern. Teachers may have preferences for a certain amount of equity in the distribution of pay, and group awards may be more consistent with this preference. Teachers may also perceive school-wide incentives and bonuses for working in disadvantaged schools as more consistent with their professional values, and may be more consistent with their professional identity in this urban, high minority, high poverty district. Finally, the set of schools receiving school-based bonuses is very consistent across years, and teachers may merely be responding to the greater likelihood of earning future bonuses.

The results suggest that teachers were overall unresponsive to eligibility (based on teaching assignments in tested grades and subjects) for an individual award tied to the

performance of their students on standardized exams. However, when we look at teachers' individual effectiveness measures we find that more effective teachers, as defined by MGPs, are more likely to opt-in.

We also find that large numbers of teachers who would likely earn more under ProComp nonetheless declined to participate. Survey evidence suggests that teachers' notions of fairness may have contributed to their decisions about whether to enroll. Teachers may prefer to participate in a more compressed pay structure with less variance in earnings, even if it comes at personal expense (Perez, 2010; Perez and Muraki, 2013). Furthermore, there seems to have been widespread confusion about the structure of the program. Teachers' perceptions that the system was difficult to understand seem to be validated by some patterns we observe in the opt-in decisions; however, the survey results should be treated with caution because of the timing and response rate of the survey. Controlling for school-wide bonuses, we find that the percentage of teachers in a school who have previously opted in is related to the decisions of remaining teachers. While we cannot disentangle a peer effect from endogenous factors, it may be that first-hand information about the structure of the program reduced teacher ambiguity about its awards.

As more districts experiment with compensation systems that include an incentive-based component, the experiences of Denver Public Schools may prove instructive. Survey evidence suggests that very few teachers understood the compensation system, the range of bonuses, or how awards were determined. Given the importance of maintaining trust in the operation of schools (Bryk and Schneider, 2002), a lack of understanding of the program may have blunted its effects.⁴⁷ Nonetheless, we do find evidence that teachers respond to the incentives embedded in the system. Teachers who would forgo future relatively large earning increases tied to experience on the single salary schedule were less likely to opt in. Teachers responded strongly to the certain incentives based on school characteristics and performance. And teachers who are effective in at least one subject appear more likely to participate in a program that rewards individual classroom performance.

Our analysis of the ProComp incentive structure and its resulting impact on teacher sorting is instructive for incentive design and for our understanding of sorting behavior more generally. Unsurprisingly, teachers respond to the range of incentives implied by an incentive structure, both the explicitly incentivized aspects of the program and the differences in potential losses from forgoing step increases once they leave the single salary schedule. There is also evidence that individuals respond more strongly to incentives that are straightforward, well defined, and predictable. This issue is probably especially important for multifaceted programs such as ProComp. In the case of performance pay specifically, differential self-selection of individuals would likely be strengthened if teachers have clear information about their own ability and know how their position in the ability distribution impacts their probability of earning an award. Lastly, our findings suggest that workers sort differently based on their attitude toward

⁴⁷ For instance, Clotfelter et al. (2008) study another incentive for working in disadvantaged schools and argue that misunderstanding of the incentive structure may undermine its impacts on teacher retention.

the program. Those who view the program as a fair and an effective means to improve teaching are more likely to participate.

While this study focuses on teachers who were already employed by DPS when the alternative pay system was introduced, one potential avenue for future research would be to investigate whether the structure of compensation draws in different types of teachers. Alternative pay systems may attract individuals weighing their career options who would become effective teachers if they chose to enter the profession. New types of pay structures could be an important mechanism to strengthening the teacher workforce and increasing student achievement.

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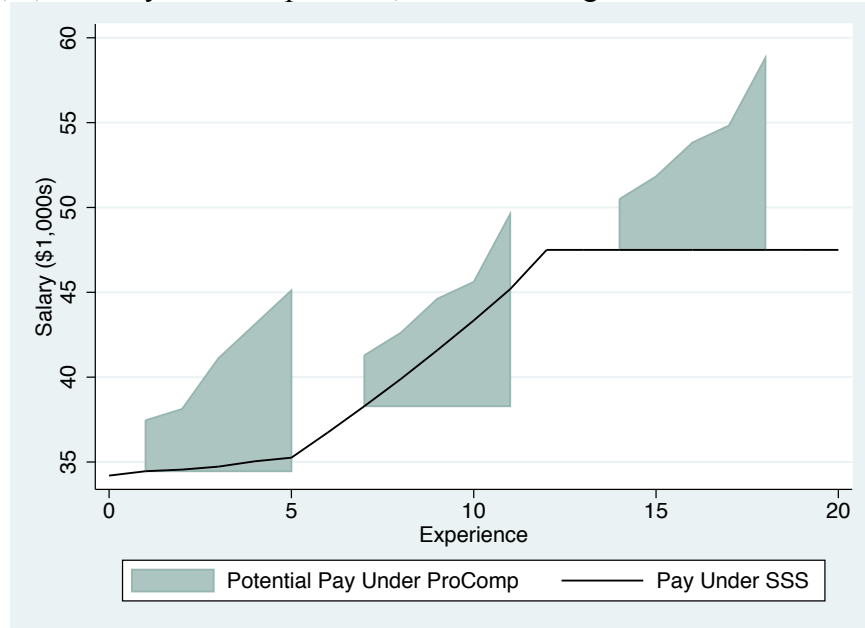
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Figure 1

Panel A. Projected Teacher Salary over 5-year Period for Teachers Entering Incentive Pay with 1, 7, and 14 years of experience, Bachelors Degree



Panel B. Projected Teacher Salary over 5-year Period for Teachers Entering Incentive Pay with 1, 7, and 14 years of experience, Masters Degree

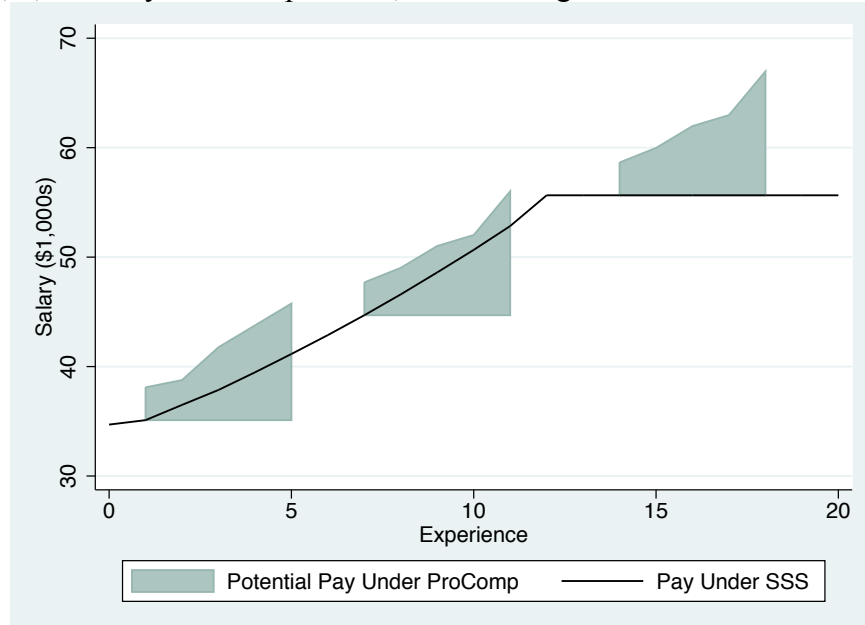
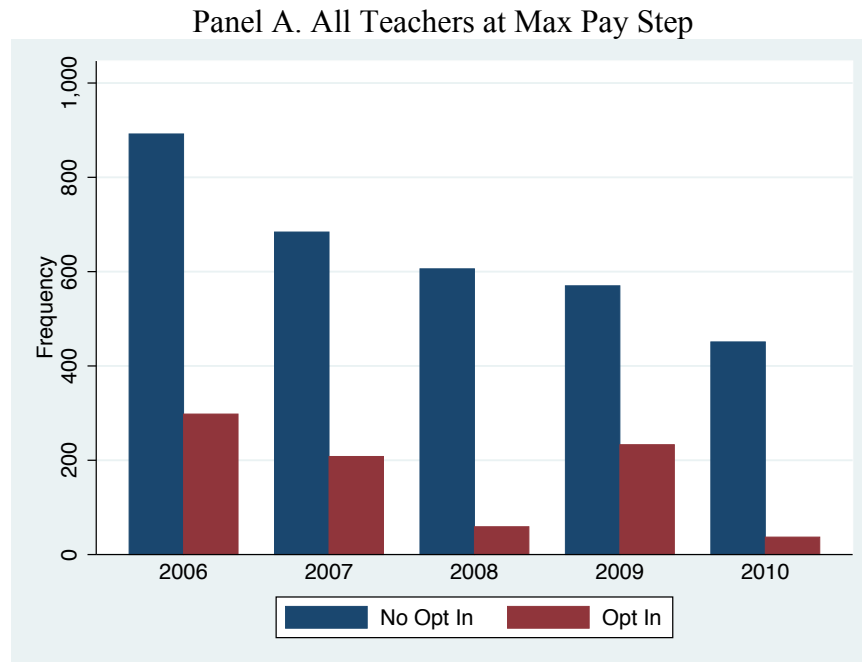
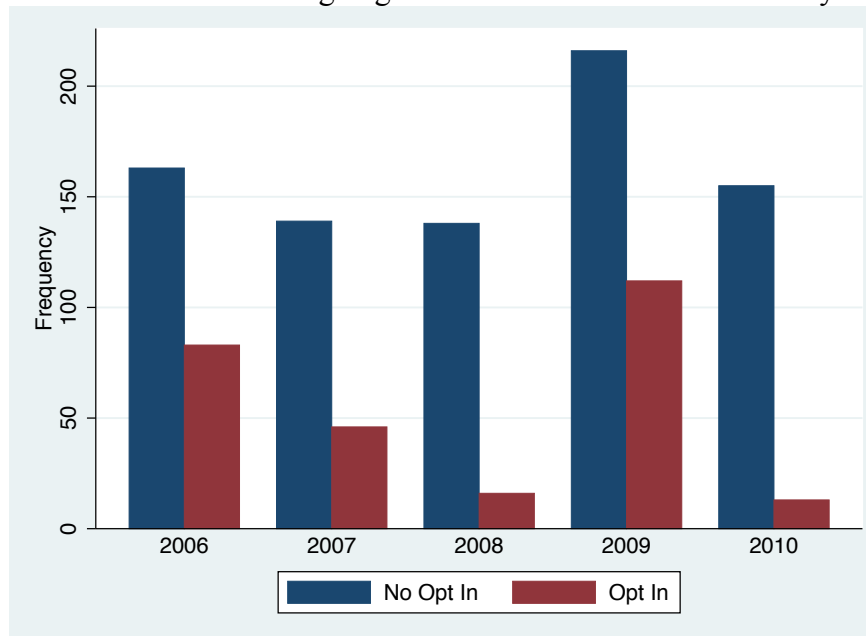


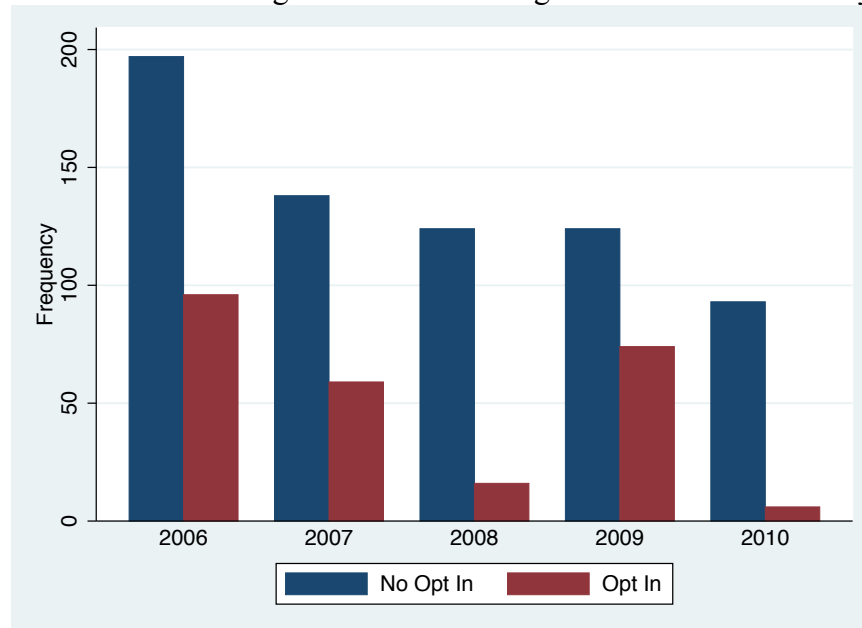
Figure 2. Frequency of ProComp Opt In among Teachers at Max Pay Step by Entry Year: All Teachers, Teachers Earning High Needs School Bonus, and Teachers Earning Hard-to-Staff Assignment Bonus



Panel B. Teachers Earning High Needs School Bonus at Max Pay Step



Panel C. Teachers Earning Hard-to-Staff Assignment Bonus at Max Pay Step



Note: The number of teachers in each subsequent year decreases by the number of step 13 employees who opt in and/or who exit, and increases by the number of step 12 retained from the previous year.

Figure 3. Difference of Bonuses from High Needs Schools and High Needs Assignment Incentives from Single Salary Schedule Income by Opt-in Status

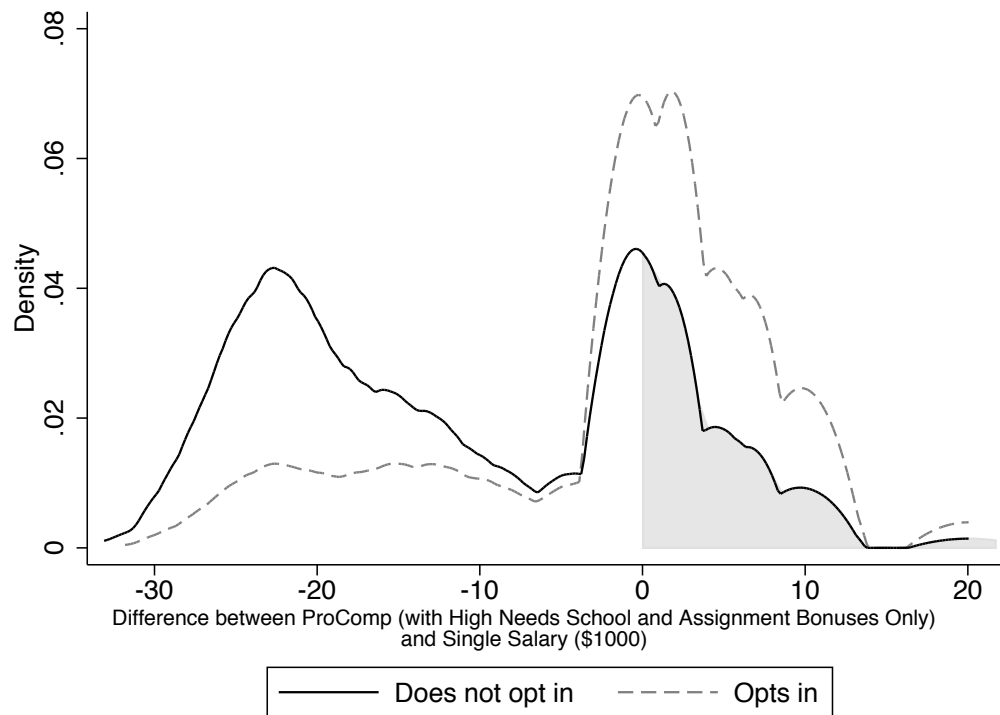
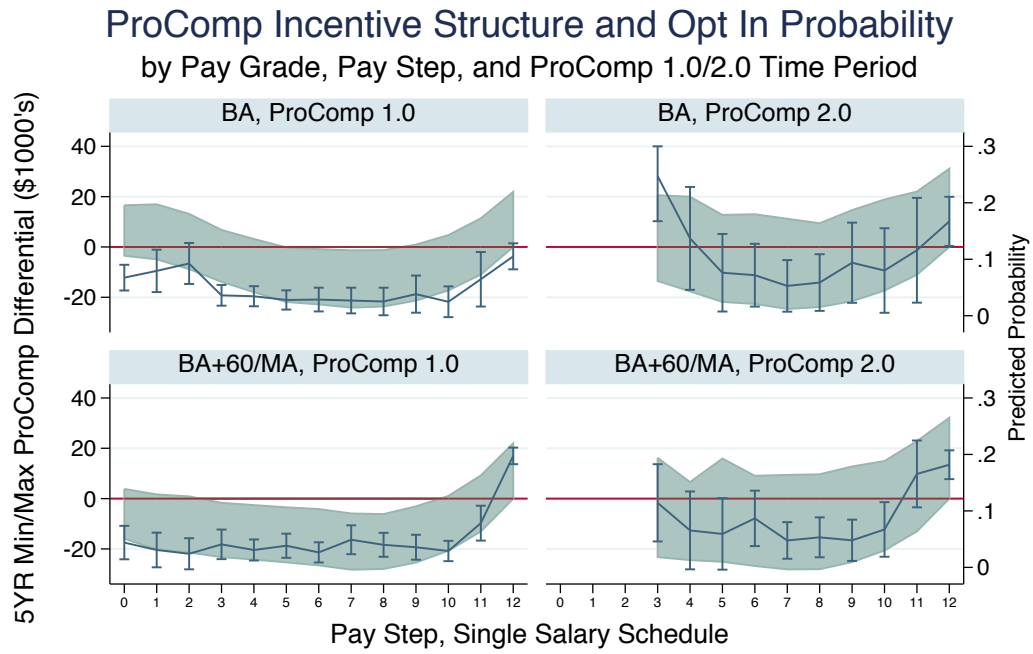


Figure 4.



Note 1: The min and max differential are the average over all individuals within each period, pay grade, and pay step. Min is defined as winning zero awards. Max is defined as winning all plausible awards.
 Note 2: The secondary y-axis (on right side) is the predicted probability of opt in based on Table 3, Model 3.

Table 1. Selected Sample Statistics by Initial (2005-06) Opt-In Status

	<u>Non-ProComp</u>	<u>ProComp</u>	
Demographics			
Female	73.9%	75.1%	
Black	6.6%	2.7%	*
Native American	0.4%	0.4%	
Asian	1.0%	0.9%	
Hispanic	15.6%	13.8%	
Bonuses			
Hard-to-Staff Assignment	15.7%	27.8%	*
Hard-to-Serve School	19.2%	29.2%	*
Degree and Experience			
Master's or higher (or BA+60)	58.6%	74.8%	*
Experience: 0-1 Years	11.9%	7.6%	*
Experience: 2-5 Years	27.1%	12.0%	*
Experience: 6-11 Years	24.5%	10.5%	*
Experience: 12+ Years	33.2%	66.4%	*
School Type			
Elementary	60.5%	57.0%	
Middle	18.0%	19.8%	
High	21.4%	23.2%	
N	2,238	449	
%	85.7%	14.3%	

Note: *significant difference between the means of groups ($p < .01$, two-tailed test)

Table 2. Projected Salaries for Traditional Salary Schedule and ProComp

<u>Discounted 5 Year Earnings (\$1,000s)</u>	<u>All Teachers</u>	<u>Choose Traditional</u>	<u>Choose ProComp</u>
Panel A. 5 Year Period Starting with first opt-in window (2006):			
Single Salary Schedule	226.5	223.0	247.4
ProComp (Min Bonuses)	216.7	212.1	244.3
Differential (ProComp Min-SSS)	-9.8	-11.0	-3.1
ProComp (Max Bonuses)	235.1	230.5	262.7
Difference (ProComp Max-SSS)	8.6	7.5	15.3
N (Teachers)	2,687	2,238	449
Panel B. 5 Year Period Starting with first opt-in window of ProComp 2.0 Years (2009):			
Single Salary Schedule	238.0	237.2	242.2
ProComp (Min Bonuses)	231.5	229.1	243.4
Differential (ProComp Min-SSS)	-6.5	-8.1	1.3
ProComp (Max Bonuses)	260.0	257.5	272.1
Difference (ProComp Max-SSS)	22.0	20.3	29.9
N (Teachers)	1,273	1,014	259
Note: 5 year salaries are discounted at a rate of 3%. Minimum ProComp salaries only include the high needs school and assignment bonuses for eligible teachers.			

Table 3. Marginal Effect Estimates of the Probability of Opting Into ProComp

	All Years			ProComp 1.0 Years			ProComp 2.0 Years		
	Model 1 (1)	Model 2 (2)	Model 3 (3)	Model 1 (4)	Model 2 (5)	Model 3 (6)	Model 1 (7)	Model 2 (8)	Model 3 (9)
Black	-0.030** (0.013)	-0.029** (0.013)	-0.029** (0.013)	-0.038** (0.016)	-0.036** (0.016)	-0.036** (0.015)	-0.019 (0.026)	-0.016 (0.026)	-0.015 (0.025)
Native American	0.004 (0.029)	0.01 (0.029)	0.01 (0.029)	-0.024 (0.043)	-0.018 (0.042)	-0.019 (0.042)	0.107 (0.070)	0.107 (0.069)	0.106 (0.069)
Asian	-0.033 (0.027)	-0.03 (0.027)	-0.031 (0.027)	-0.028 (0.032)	-0.026 (0.032)	-0.028 (0.033)	-0.062 (0.066)	-0.047 (0.064)	-0.047 (0.064)
Hispanic	-0.001 (0.007)	0.002 (0.007)	0.002 (0.007)	-0.005 (0.007)	-0.002 (0.007)	-0.002 (0.007)	0.012 (0.018)	0.013 (0.018)	0.012 (0.018)
Female	0.006 (0.006)	0.006 (0.006)	0.006 (0.006)	0.006 (0.007)	0.005 (0.007)	0.006 (0.007)	0.007 (0.014)	0.006 (0.014)	0.006 (0.014)
Hard-to-Staff Assignment	0.034*** (0.006)	0.034*** (0.006)	0.033*** (0.006)	0.034*** (0.007)	0.033*** (0.007)	0.032*** (0.007)	0.031* (0.016)	0.033** (0.016)	0.033** (0.016)
High Needs School	0.041*** (0.010)	0.046*** (0.011)	0.043*** (0.010)	0.033*** (0.011)	0.037*** (0.012)	0.032*** (0.012)	0.068*** (0.016)	0.082*** (0.027)	0.081*** (0.026)
Individual Performance	-0.002 (0.010)	-0.004 (0.010)	-0.004 (0.010)	-0.001 (0.016)	-0.002 (0.016)	-0.001 (0.015)	-0.009 (0.015)	-0.007 (0.015)	-0.007 (0.015)
High Growth School	0.015 (0.019)	0.019 (0.018)	0.02 (0.018)				0.03 (0.025)	0.040* (0.023)	0.038* (0.022)
Top Performing School	0.013 (0.016)	-0.002 (0.015)	-0.002 (0.015)	0.018 (0.017)	0.009 (0.017)	0.009 (0.017)	0.013 (0.026)	-0.026 (0.027)	-0.027 (0.027)
% ProComp			0.0023* (0.001)			0.0030** (0.001)			0.0022 (0.004)
			0.0000 (0.000)			-0.00004* (0.000)			0.0000 (0.000)
School Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Log Likelihood	-3510.74	-3492.45	-3487.76	-2493.2	-2482.14	-2476.31	-964.993	-953.314	-952.352
Pseudo R-squared	0.130	0.135	0.136	0.152	0.156	0.158	0.091	0.102	0.103
N	12458	12458	12458	9444	9444	9444	2796	2796	2796

Notes: *p<.10, **p<.05, ***p<.01

Model 1: teacher demographics and bonus variables; Model 2: Model 1 plus school-level variables; Model 3: Model 2 plus peer variables.

Standard errors are clustered at the teacher- and school-level and are in parentheses.

All models include an indicator for school type (elementary, middle, and high) and opt-in window.

School-level variables include attendance, % FRL, % minority, and % of students scoring "advanced" on the CSAP in the prior year, with squared terms for all variables.

Table 4. Marginal Effect Estimates of ProComp Participation by Teacher Effectiveness

	By Subject (1)	Mean MGP (2)	Max MGP (3)
Math MGP (/100)	0.082 (0.051)		
Reading MGP (/100)	-0.002 (0.061)		
Writing MGP (/100)	0.035 (0.063)		
Mean MGP (/100)		0.084* (0.045)	
Max MGP (/100)			0.098** (0.043)
Hard-to-Staff Assignment	0.002 (0.011)	0.003 (0.011)	0.002 (0.011)
High Needs School	0.030* (0.016)	0.030* (0.016)	0.030* (0.016)
High Growth	0.03 (0.025)	0.032 (0.025)	0.032 (0.025)
Top Performing	-0.027 (0.023)	-0.027 (0.024)	-0.027 (0.024)
Log likelihood	-696.2	-696.4	-695.4
Pseudo R-squared	0.184	0.184	0.185
N	2796	2796	2796

Notes: *p<.10, **p<.05, ***p<.01

Standard errors are clustered at the teacher- and school-level and are in parentheses.

All models include an indicator for school type (elementary, middle, and high), subject taught, and opt-in window.

School-level variables include attendance, % FRL, % minority, and % of students scoring "advanced" on the CSAP in the prior year, with squared terms for all variables.

Step and lane combinations with small sample sizes are collapsed.

For easier interpretation MGPs are divided by 100. For example, the value of .084 for Mean MGP in column 2 means that a 10 point increase in Mean MGP results in an increased likelihood of opt-in by .8 percentage points.

Table 5. Marginal Effects Estimates of the Probability of Opting into ProComp Using Survey Sample and Survey Items

	(1)	(2)	(3)	(4)	(5)	(6)
Hard-to-Staff Assignment	0.016 (0.016)	0.018 (0.017)	0.027* (0.015)	0.030* (0.016)	0.029* (0.015)	0.031** (0.015)
High Needs School	0.048* (0.027)	0.046* (0.026)	0.026 (0.025)	0.026 (0.026)	0.028 (0.025)	0.033 (0.024)
Top Performing (lag)	0.070** (0.030)	0.064** (0.031)	0.059** (0.027)	0.057** (0.026)	0.059** (0.027)	0.048* (0.027)
Individual Performance	-0.003 (0.032)	0 (0.032)	0.005 (0.028)	0.008 (0.028)	0.009 (0.028)	0.002 (0.028)
Know bonuses (neutral)		0.002 (0.019)	-0.002 (0.018)	-0.002 (0.018)	0.002 (0.018)	0.004 (0.018)
Know bonuses (agree)		0.048*** (0.017)	0.040** (0.018)	0.036** (0.017)	0.042** (0.017)	0.045** (0.017)
Fair (neutral)			0.085*** (0.013)	0.063*** (0.018)	0.057*** (0.017)	0.062*** (0.018)
Fair (agree)			0.214*** (0.025)	0.153*** (0.033)	0.127*** (0.032)	0.146*** (0.034)
Incentives (neutral)				0.031 (0.019)	0.01 (0.021)	0.017 (0.020)
Incentives (agree)				0.071*** (0.022)	0.036 (0.024)	0.047* (0.025)
Motivate (neutral)					0.034* (0.018)	0.030* (0.017)
Motivate (agree)					0.064*** (0.021)	0.064*** (0.021)
Morale high (neutral)						-0.041** (0.019)
Morale high (agree)						-0.072*** (0.018)
Log likelihood	-492.34	-486.777	-437.474	-432.07	-427.89	-416.961
Pseudo R-squared	0.234	0.242	0.319	0.328	0.334	0.351
N	1785	1785	1785	1785	1785	1785

Notes: *p<.10, **p<.05, ***p<.01

Model specifications are the same as Model 3 of Table 3.

Standard errors are clustered at the teacher- and school-level and are in parentheses.

Sample only includes teachers with a choice in the second and third opt-in windows (starting ProComp in 2007 or 2008).

Table 6. Predicted Probability of Opting In by Survey Responses

Survey Items	Predicted Probabilities		
	<u>Disagree</u>	<u>Neutral</u>	<u>Agree</u>
I know the range of salary increases and bonuses that I could receive under ProComp	0.09	0.10	0.14
ProComp is a fair program	0.06	0.13	0.21
ProComp provides incentives for teachers to accomplish what is most important	0.10	0.11	0.14
ProComp can motivate teachers to improve teaching practice	0.08	0.11	0.15
Morale at my school is high	0.15	0.11	0.08

Note: average predicted probabilities are calculated using the observed values for each observation; the results are similar when computing the predicted probability by holding all variables constant at their respective means

Appendix A.
ProComp Program Information

Table A-1. Pre-Change Incentive Structure – 2005-2006 School Year

Component	Incentive	Description	Value	Base-Building Salary Increases?	Eligible	Pct. Receiving 2007-08
Knowledge & Skills	Professional Development	Salary increase for completing professional development units; teachers can only receive one per year, although up to two may be banked for future use	\$666	Yes	Every year	60
	Advanced Degree	Salary increase for additional license or certification	\$2,997	Yes	Every 3 years	7
	Tuition Reimbursement	Reimbursement for tuition expenses	\$1000	No	\$1000/ lifetime	11
Evaluation	Positive Evaluation	Salary increases based on a satisfactory evaluation.	\$999	Yes	Every 3 years*	64
Student Growth	Student Growth Objectives	Salary increase for meeting at least one of two individually-determined student growth objectives (or SGOs).	\$333	Yes	Every year**	76
	Exceeding Growth Expectations (Individual Performance)	Salary increase for teachers whose students' growth on state math and/or language arts assessments exceed district expectations	\$999	Yes	Every year***	11
	Top Performing School	Bonus for teachers in schools recognized for outstanding student performance	\$666	No	Every year	38
Market Incentives	Hard-to-Serve School	Bonus to attract teachers to schools with a high free and reduced lunch percentage.	\$999	No	Every year	29
	Difficult to Staff Position	Bonus to attract teachers to roles with high vacancy/ turnover, including those qualified as ELA (English Language Acquisition), special education center assignments, middle school math, speech language specialists, and school psychologists.	\$999	No	Every year	31

* Probationary teachers – those in the first three years of service – are evaluated annually and eligible for an annual \$333 salary increase for a satisfactory evaluation.

** Teachers set two SGOs annually. Those teachers who meet both objectives earn a base-building salary increase of \$333; teachers who meet only one objective of two earn a *non-base-building bonus* of \$333.

*** The first year teachers could earn the individual performance bonus was 2007-08.

Table A-2. Post-Change Incentives Structure – 2008-2009 School Year

Component	Incentive	Changes from 2005-2006 Incentive Structure	Value	Base-Building Salary Increases?	Eligible
Knowledge & Skills	Professional Development	Base building for all teachers for first PDU earned in '08-'09 (and any Pre-Change PDUs); after 08-09, only base-building for teachers in the first 14 years of service	\$733	Yes*	Every year
	Advanced Degree		\$3297	Yes	Every 3 years
	Tuition Reimbursement	Reimbursement for tuition expenses are not pensionable; large increase to lifetime account; student loans added as a reimbursable expense	\$1000	No	\$4000/lifetime
Evaluation	Positive Evaluation	Effective 2009-10 school year, element payable only to teachers who have a formal evaluation during service credit years 1-14 .	\$1099	Yes	Every 3 years
Student Growth	Student Growth Objectives	Still only base-building if both SGOs are met; otherwise, it is a one-time bonus	\$366	Yes**	Every year
	Exceeding Growth Expectations (Individual Performance)	No longer base-building; significant increase to incentive pay-out	\$2345	No	Every year
	Top Performing School	No longer base-building; significant increase to incentive pay-out; now based on DPS School Performance Framework***	\$2345	No	Every year
	High Growth School	New incentive; awarded to teachers in schools that are designated as a “High Growth School” on the DPS School Performance Framework***	\$2345	No	Every year
Market Incentives	Hard-to-Serve School		\$2345	No	Every year
	Difficult to Staff Position		\$2345 (per assignment)	No	Every year

* Base-building for teachers in the first 14 years of service.

** Teachers set two SGOs annually. Those teachers who meet both objectives earn a base-building salary increase of \$333, teachers who meet only one objective of two earn a *non-base-building bonus* of \$333.

*** Both of the school-wide incentives – awarded to teachers in top performing and high growth schools – are now determined by the Denver School Performance Framework, or SPF. Implemented at the same time as the changes to the ProComp system, the SPF “is a comprehensive system for evaluating schools and takes into account a wide range of factors to give ratings on how well each school supports student growth and achievement and how well each school serves its students and families” (spf.dpsk12.org). Schools are scored on academic growth, proficiency, college and career readiness, student engagement, and enrollment rates; these scores are used for accreditation and accountability, and are publicly distributed. The high growth incentive is awarded to teachers in schools that earn 48% or more of the possible points on the Growth Indicator of the SPF; 72 schools (out of just over 200 in the district) earned the award in 2008-09. The top performing schools award is given to ProComp participants in schools that earned the highest overall percentage of points across all categories on the SPF; in 2008-09, 64 schools received this recognition.

Appendix B. Survey Details

We focus on the following questions, to which teachers responded on a five-point scale from “strongly disagree” to “strongly agree”:

1. I know the range of salary increases and bonuses that I could receive under ProComp.
2. ProComp is a fair program.
3. ProComp provides incentives for teachers to accomplish what is most important.
4. ProComp can motivate teachers to improve teaching practices.
5. The morale at my school is high.

We combine the survey responses with the administrative data used in the analyses described above. Very few teachers opted in for the 2007-08 year (the third opt-in window), and even fewer among those participated in the survey. Given this, we link the survey responses to the second and third opt in windows. Though this means that teachers opting in during the second window had already been enrolled in ProComp for one year upon participating in the survey, which would likely impact their view of the program, most teachers had not yet realized a differential in pay given that most awards are not paid – and often not recognized – until the following year (the exceptions are high needs schools and assignment bonuses). Additionally, all teachers completed the same tasks and received the same observation and feedback regardless of ProComp status, so their experiences and information were consistent. With the caveat that some teacher perceptions may have been altered as a consequence of participating in ProComp, we believe that teacher response patterns should be sufficiently stable over time as to provide meaningful information about the ProComp choice.¹ The sample of teachers used in this part of the analysis includes 1,785 teacher-year observations, which constitute approximately 40 percent of all eligible teachers during the second and third opt-in windows.

¹ This view is strengthened by the fact that so few teachers decided to opt in during the year when the survey was administered as well as by the fact that in the following year teachers were given a one-time opportunity to opt out and very few took it. In short, teachers had similar experiences over the 2006-07 year regardless of ProComp status and very few appear to have changed their minds about ProComp from the point of the survey up until when the program was revamped.