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What you don't know can't help you: pension knowledge and retirement decision making

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What You Don't Know Can't Help You: Pension Knowledge and Retirement Decision Making

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Paper # 05-18

This paper provides an answer to an important empirical puzzle in the retirement literature: while most people know little about their own pension plans, retirement behavior is strongly affected by pension incentives. We combine administrative and self-reported pension data to measure the retirement response to actual and perceived financial incentives. While virtually all recent empirical work has relied on administrative- or employer-reported data, we document an important role for self-reported pension data in determining retirement behavior. Well-informed individuals are five times more responsive to pension incentives than the average. In contrast, ill-informed individuals respond to their own misperceptions of the incentives rather than being unresponsive to any measured incentives.

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**What You Don't Know Can't Help You:
Pension Knowledge and Retirement Decision Making**

October 2004

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Abstract

This paper provides an answer to an important empirical puzzle in the retirement literature: while most people know little about their own pension plans, retirement behavior is strongly affected by pension incentives. We combine administrative and self-reported pension data to measure the retirement response to actual and perceived financial incentives. While virtually all recent empirical work has relied on administrative- or employer-reported data, we document an important role for self-reported pension data in determining retirement behavior. Well-informed individuals are five times more responsive to pension incentives than the average. In contrast, ill-informed individuals respond to their own misperceptions of the incentives rather than being unresponsive to any measured incentives.

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This paper addresses an important empirical puzzle in the retirement literature: while most people do not know the details of their own pension plans, retirement behavior is strongly affected by pension incentives. The answer we find is intuitive: people respond to incentives that they know about. Estimated responses of retirement to financial incentives are driven by a minority of the population who are well-informed about those incentives. Our empirical approach combines administrative and self-reported pension data to measure the retirement response to actual and perceived financial incentives. We find that uninformed people show no response to their actual retirement incentives while well-informed people respond much more than previously thought.

Understanding how responsiveness to pension incentives is related to knowledge of these incentives is important for policy discussions. Virtually all of the recent empirical research on responsiveness to financial retirement incentives is based on administrative data, and several recent studies use their estimates to simulate or forecast the response to policy changes such as altering the normal retirement age or benefit levels.¹ While such estimates may accurately capture an average effect, we find that this average masks a tremendous amount of heterogeneity in individual responsiveness that is directly related to individuals' knowledge of pension incentives. Because alternative policy changes and their specific implementation will almost certainly be associated with different levels of transparency and public knowledge, we need to understand how this knowledge interacts with the incentives to accurately predict which types of individuals are most likely to respond and what their responses will be.

Our findings also have important implications beyond understanding retirement behavior. While much applied economic research seeks to measure the responsiveness of individuals to

¹ For example, see Coile and Gruber (2000), or Samwick (1998).

certain incentives, we are aware of no other study that has made such a direct comparison between the responsiveness to self- and administratively-reported measures of incentives. The issues raised in this study are relevant to a variety of economic policies. For example, would individuals respond more strongly to the various tax-favored savings vehicles if they knew what these complex incentives are?² And, would workers respond differently to the earned income tax credit if they realized the precise marginal tax rate at each level of earnings? At a minimum, our results suggest that heterogeneity in individual knowledge can lead to significant heterogeneity in responses. The availability of self- and employer-reported pension data provides a unique opportunity to quantify the extent to which individuals' lack of information is related to reduced responsiveness to economic incentives.

Our analysis below uses self-reported, employer-reported and Social Security Administration data from the Health and Retirement Study (HRS). To examine the relationship between knowledge of retirement benefits and individuals' responsiveness to those benefits, we begin by calculating two versions of financial retirement incentives, one based on self-reported data, and another based on employer-reported or administrative data. It is straightforward to show that both versions of these incentives affect retirement, and that the self-reports continue to be strongly significant determinants of retirement *even after controlling for the employer reports*. We then use the self-reports to construct summary measures of individuals' knowledge of their pension plans. When these knowledge measures are interacted with the incentives based on employer-provided data, we show that the better-informed fraction of the population generates *all* of the average response to pension incentives, and that the ill-informed segment of the population show no significant response. We further show that this ill-informed population is not completely unresponsive to any incentives, but rather, they are responsive to their own

² Recent work by Duflo and Saez (2003), further described below, suggests the answer to this question is yes.

misperception of the incentives.

Our analyses draw upon two strands of the recent retirement literature. The first of these includes studies that examine the extent of information that individuals possess about their future retirement benefits. The common finding across these studies is that such information is typically quite incomplete. The work of Gustman and Steinmeier (2001a, 2001c) using the HRS sets the stage for our work.³ They examine the determinants of knowledge of Social Security and private pensions, and the implications of this knowledge for retirement planning. They find, for example, that only half of respondents can correctly identify the type of pension plan (defined benefit versus defined contribution) in which they participate, and that age, union membership, longer planning horizons and certain retirement planning activities signal individuals who are better informed about their pensions. In addition, they find that workers who initially overestimate their available benefits retire later than they had originally planned.

A related part of the literature shows the potential for behavioral responses to interventions that alter individuals' information sets. Duflo and Saez (2003) demonstrate that small incentives that encourage individuals to learn more about retirement savings vehicles can have significant effects on participation in retirement savings plans. Their results echo earlier findings by Bernheim and Garrett (2003) that show large effects of financial education on individual savings and other behavior.

Also related to the lack of knowledge about pension incentives is work by Choi, Laibson, Madrian and Metrick (2001). They find that employees tend to follow the “path of least resistance” and that the default options in an employers' pension plan have a major impact on

³Other studies include Mitchell (1988) who uses pension information provided by employers and workers in the 1983 Survey of Consumer Finances, and Luchak and Gunderson (2000) who examine pension information among employees of a unionized public utility industry in Canada.

participation in the plan and on the participants' saving behavior and investment portfolio.

While this is not evidence of a lack of knowledge *per se*, it is certainly consistent with individual behavior that does not pay much attention to knowing or caring about finances and financial incentives.

The second strand of relevant literature includes virtually all studies that examine the effects of private pension incentives on retirement and much of the related work on Social Security incentives. Many papers have utilized data from employer-reports or administrative sources and they have generally found that individuals are quite responsive to the financial incentives embedded in pension plans and Social Security. Stock and Wise (1990), and Lumsdaine, Stock and Wise (1992) estimate both structural and reduced-form models of the retirement decision using data provided by a single large employer. Samwick (1998) uses the employer-provided data on private pensions from the Survey of Consumer Finances to estimate a regression-based counterpart to existing structural models of retirement, focusing on the role of forward-looking financial retirement incentives, or "option value" in determining the probability of retirement. In a similar approach, both Coile and Gruber (2000) and Gustman and Steinmeier (2001b) use employer-provided pension data, along with administrative records of Social Security earnings histories to estimate the effect of private pensions and Social Security on retirement. Our analyses below is the first to provide a direct link between this literature that uses administrative data to study retirement behavior, and the growing evidence that many of these incentives are not well understood by the individuals whose decisions we are modeling.

A possible explanation for why individuals seem to respond to incentives that they do not apparently know is that individuals do know but self-reported pension data are so inaccurately measured that they provide a misleading picture of individual knowledge. We present evidence

below that this is unlikely to be the case. While it is almost certainly true that self-reported pension data are measured with some error, financial incentive measures based on these self-reported data are significant predictors of retirement behavior, even after conditioning on incentives based on administrative data. This confirms results from Chan and Stevens (2004) that finds, after controlling for earlier retirement expectations or individual-specific fixed effects, the self-reported financial incentives are still important determinants of retirement behavior.

Thus, another key contribution of this paper is to demonstrate that self-reported data, while largely ignored by economists when administrative data are available, do provide relevant information. This is an important finding given the extensive effort devoted to the collection of self-reported data, and the rarity with which some of these data have been used by economists to study behavior. If self-reported data are truly so poorly measured as to be uninformative, that would raise questions of whether they should continue to be collected. However, as we illustrate below in the case of retirement decision-making, the self-reported data are extremely useful in understanding how these decisions are made.

I. Data and Samples

We use data from the first four waves of the Health and Retirement Study (HRS), including: (i) the self-reported, publicly released data on retirement income sources, retirement behavior, and retirement expectations, (ii) the employer-provided pension plan details, and (iii) the Social Security earnings histories, which allow us to calculate individuals' Social Security benefits at alternative future retirement dates. Several points should be made regarding these

data sources.

First, the employer-provided pension data are available only for jobs held at or before wave 1 of the survey, while self-reported pension data are available for all waves. Similarly, the administrative earnings histories include Social Security covered earnings only up to the initial wave. However, it is possible to use the employer-provided data to judge the accuracy of self-reported private pension information because job changes are not very frequent at this age range. Individuals who do change employers before retirement are dropped from our samples, as is the small fraction of individuals who report changes to their pension plans between waves.⁴ The wage histories from Social Security records are supplemented with self-reported earnings in subsequent years so that Social Security benefits can be calculated for later waves as well. Because of this projection of the administrative data to subsequent waves, we control for the survey wave in our analysis and compare results across the initial and later waves.

Second, we follow many previous researchers in assuming that the employer and Social Security administrative data represent the true benefit information. In some cases, particularly with respect to the employer reports, this assumption may not be accurate. For defined contribution pension accounts in particular, there are good reasons to expect that the employer reports could deviate from the truth (as we discuss below). Thus, throughout the analysis, we have also examined the sub-sample of workers with defined benefit plans since we are more confident about relying on their employer reports as the “true” pension. However, we find little evidence of systematic differences across pension plan types. We also consider how measurement error in the employer-reported data might affect interpretation of our estimates.

⁴ Individuals are asked whether there have been any changes to their pension plans since the previous survey. They are then asked about the details of their pensions, even if they report no change since the previous wave.

Third, while the self-reported data are useful because they reflect what individuals actually know, many researchers have expressed concerns that self-reports may contain substantial measurement error. They may differ from the employer reports not only because individuals do not know the information, but also because they misreport this information. While this is certainly a concern, we believe that the potential importance of understanding how knowledge affects retirement decision-making overrides the concern about measurement error. Indeed, our results described below demonstrate that there are large and statistically significant differences between informed and uninformed individuals and these differences may be understated if our measures of knowledge are severely affected by measurement error.

Using the self- and employer-reported data on pensions, our first step is to take the pension plan details and use them to construct the present value of pension wealth available to the individual at each possible future retirement age. Following previous literature, we construct financial incentive measures that are based on the difference between: (i) the present value of pension wealth if an individual retires at the future date that maximizes his or her present value of pension wealth, and (ii) the present value of pension wealth if an individual retires today. We refer to this measure as an individual's "pension gain":

$$[1] \quad GAIN_{it} = PV (\text{pension wealth if } R = \text{argmax}_{(t+1 - \infty)} [PV(\text{pension wealth})]) \\ - PV (\text{pension wealth if } R=t)$$

where $GAIN_{it}$ is the pension gain of individual i at time t , and R is the retirement date.⁵

For individuals self-reporting defined benefit (DB) pensions, we have information on annual benefit amounts, the normal retirement (pension eligibility) age, the early retirement age,

⁵This is similar to the option value concept used in Lumsdaine, Stock and Wise (1992), and Samwick (1998), equivalent to the "peak value" used by Coile and Gruber (2000) and related to the "premium value" used by Gustman and Steinmeier (2001b).

cost of living adjustments, and benefit reduction amounts in the case of early retirement from each survey wave. For those reporting defined contribution (DC) pensions, we have information on the current account balance, employer- and own-contributions, and basic portfolio allocation decisions for existing DC accounts. These pieces of data are combined to generate estimates of the present value of pension wealth at each possible retirement age. The employer-provided reports, while more detailed, contain similar information for each pension plan. In calculating the present discounted value of pension wealth at each retirement age, we assume a discount factor of 3 percent, and weight future values by age- and gender-specific survival probabilities taken from Social Security Administration actuarial tables.

Table 1 shows summary statistics for our sample. To be included in the analyses, individuals must have an employer-reported pension plan, and cannot yet be retired at the time of the wave 1 survey. We consider the probability of retirement at each different age between the wave 1 and wave 4 surveys. Observations from the wave 1 survey are excluded, since (by our sample definition) all retirements occur following wave 1. Individuals remain in the sample through wave 4, or until they retire. Roughly 13 percent of all observations reflect a retirement in the current year, while 34 percent of individuals in our sample have retired by the time of the wave 4 survey. Slightly more than half of the sample is male, and the average age is just over 58 years. The sample includes 5 percent Hispanic respondents and 16 percent black respondents. More than three-quarters of the sample members are married.

The lower section of Table 1 provides means for key summary measures of pension wealth, based on both self- and employer-reports. The average level of pension wealth (assuming the individual retires in the current year) is approximately \$69,000 (in 1992 dollars) based on self-reports, but is more than \$153,000 based on the employer-reports. The average

pension gain (the present value of pension wealth if retirement occurs at the wealth-maximizing age minus the present value if retirement occurs today) is somewhat higher in the self-reports: \$56,534 versus \$25,152 from the employer-reports. However, if we consider median values of pension gain, this ranking is reversed: the median pension gain based on self reports is \$0, while the median pension gain from employer reports is \$11,545.

Table 2 presents some summary statistics of variables intended to describe the accuracy of individuals' self-reported pension values. First, following the basic strategy of Gustman and Steinmeier (2001a), we consider whether individuals report "don't know" when asked about the value of their pension. Specifically, we construct a variable, *REPORT*, that is equal to one for individuals who report enough of the key components of their pension plans to allow us to construct the present value of benefits at various possible retirement ages.⁶ If individuals report not knowing some major component of their pension, *REPORT* is set equal to zero. As noted by Gustman and Steinmeier, a large fraction of individuals report not knowing the value of their pension. In our sample, just over a third have *REPORT* equal to zero.

An alternative measure used in previous work is to compare the present value of an individual's *level* of pension wealth based on the self-report with that based on the administrative report.⁷ To implement this, we create a variable *KNOW_LEVEL* that is equal to one if (i) the ratio of the self-reported to employer-reported pension wealth is between 0.5 and 2, or (ii) one of the reported pension wealth values is zero and the other is less than \$5,000. The second component of this definition is included to avoid misclassifying as uninformed those who report

⁶ These key components for defined benefit plans include normal and early retirement ages, benefit amounts per year, and benefit reduction rates for early retirement. For defined contribution plans we require current account balances, along with own and employer annual contributions.

⁷ Gustman and Steinmeier (2001a), for example, create a variable equal to one if the self-report is within 25 percent of the administrative report of pension wealth.

zero wealth rather than very small amounts of pension wealth. For those who do not report enough information on their pension to calculate the value of pension wealth (*REPORT*=0), we set *KNOW_LEVEL* equal to zero. We do this also for similar variables discussed below. Among those with *REPORT* equal to one, Table 2 shows that 51 percent of our sample report levels of pension wealth relatively close to those based on the employer reports.

Because we are primarily interested in individuals' knowledge of the financial incentive to retire inherent in their pension structure, we use a third measure that captures the accuracy of individuals' knowledge of their pension gain. After calculating each individual's pension gain using both self- and employer-reported values, the variable *KNOW_GAIN* is set equal to one if the ratio of pension gain based on self- and employer- reports is between 0.5 and 2, or if one is zero and the other is within \$5,000. Table 2 shows that 27 percent of our sample are well-informed regarding this more complex measure of the incentive effects of pensions. This measure requires individuals to understand benefit eligibility ages, amounts and reductions at alternative hypothetical retirement ages.

The second and third columns of Table 2 split the sample into those with and without an active defined benefit plan (based on the employer-report).⁸ For both *REPORT* and *KNOW_LEVEL*, those with a DB plan are more knowledgeable than those without. However, when the knowledge measure is based on knowing actual pension gain (*KNOW_GAIN*), individuals with a DB plan are far less likely to be informed. This is not surprising since DB plans are usually associated with a more complex incentive structure.

Finally, we construct a measure of knowledge that captures whether individuals simply understand the sign of their pension gain. *KNOW_SIGN* is equal to one if the employer- and

⁸ Some workers excluded from this column may have defined benefit plans from previous employers.

self-reports of pension gain are both positive, both negative, or if both are equal to zero. Fifty-five percent of individuals reporting key pension values have self-reports that lead to a pension gain of the same sign as the employer-report.

The knowledge measures that include Social Security are constructed in a similar fashion to those for private pensions only. Unfortunately, the self-reported data on expected Social Security benefits are much less extensive than the self-reported pension data. Specifically, individuals are asked only for their expected Social Security benefit amount at their expected retirement age. Thus, for Social Security, we can only create a knowledge measure, *KNOW_SS*, that indicates whether the expected level of benefits at that expected retirement age is close to the level we calculate from Social Security Administration data.⁹ It is not possible to construct a measure similar to *KNOW_GAIN* for Social Security benefits. Another limitation is that only a single respondent per household was asked to provide expected benefit information. To avoid using a spouse's knowledge of Social Security benefits to determine an individual's behavior, we include only those individuals who directly report their own expected Social Security benefit in this analysis. Just 40 percent of the sample report their anticipated Social Security benefits, with most of the missing reports the result of the relevant household member not being asked the question. Among the subsample providing information on expected Social Security benefits, more than three-quarters are reasonably accurate in their expected benefit level.

⁹ In calculating Social Security benefit levels we consider benefits available based on both own and spouse's earnings histories, and choose the larger of the two benefit levels as the one relevant to decision-making.

II. Empirical Strategy and Results

A. Comparing the Effect of Self- and Administratively-Reported Financial Retirement Incentives on Retirement

We begin by directly comparing the effect of financial retirement incentives, calculated from employer- and self-reported pension data. Following much recent empirical work, we estimate a retirement equation described by:

$$[2] \quad R_{it} = \beta_0 + \beta_1 GAIN_{it} + X_{it} \beta + \varepsilon_{it}$$

where R_{it} is a binary variable indicating that individual i retires in year t , and ε is an error term. $GAIN_{it}$ represents the pension gain to continued work, as defined above, based on employer-reported pension data. Samwick (1998) and Coile and Gruber (2000) show that forward-looking measures such as pension gain have greater explanatory power than alternative myopic summary measures of financial status or incentives. X_{it} is a vector that contains control variables, including: race, education, gender, self-reported health status, marital status, dummy variables for age, the level of non-pension assets, a measure of average lifetime earnings¹⁰, and dummies for the survey wave. In results not reported, we have also included indicators for retiree health insurance and an insurance indicator interacted with poor health. Adding these controls does not change our basic results and they are excluded here because of a large number of missing values for the retiree health insurance variables.

¹⁰ See Coile and Gruber (2000) for a discussion of the importance of carefully controlling for measures of lifetime earnings. It is also crucial to control fully for age because there are spikes and non-linearities in the age profile of retirement probabilities and because knowledge may also be correlated with age. Thus, we include a series of dummy variables for each year of age (51 to 70) in our sample.

The first column of Table 3 shows the effects of pension gain from the employer-reports on the probability of retirement using a probit model and all sample observations. Standard errors have been corrected to account for repeated observations from the same individual across survey waves. We present results for men and women pooled, although we have also obtained similar results when we estimate separate regressions for men and women.¹¹

As expected, the pension gain variable is negative and significant, implying that a larger gain to delaying retirement until a future optimal date reduces the likelihood of retirement. The estimated coefficient of -0.0179 shown in the first column implies that a \$10,000 increase in pension gain would reduce the probability of retirement by approximately a quarter of a percentage point, or 3 percent.¹² This magnitude is very close to that reported by Coile and Gruber (2000) for a similar measure including both pensions and Social Security. As in some earlier research, we find that the level of pension wealth (if retirement occurs immediately) has a positive and significant effect, suggesting that those with higher levels of pension wealth are more likely to retire.¹³ The magnitude of this pension wealth effect, also similar to previous work, is quite small, with a \$10,000 increment to pension wealth increasing retirement by less than one-tenth of a percentage point.

In the next column, we repeat the exercise, but restrict the sample to individuals who have valid self-reports of their pensions (*REPORT*=1). The coefficient on pension gain rises slightly, but is not significantly different from that in the first column, suggesting that restricting

¹¹ While none of the regression results shown below use the HRS sampling weights, we have estimated all specifications using these weights and find no substantive differences in our results from weighting.

¹² Marginal reported effects are shown in italics below the standard errors in the tables and are calculated for a 60-year old, married, white male, with some college education, observed in wave 2, and with all continuous variables set to their mean values.

¹³ We should note that some other previous work has not found a significant effect of the level of pension wealth on retirement probabilities. Samwick (1998), for example, finds that the level of pension wealth has no effect on retirement once a forward-looking incentive measure is included in the model. Overall, however, these basic results are consistent both with theoretical predictions and with previous empirical work.

the sample to those with valid self-reported pension values does not systematically alter the response to pension incentives.

In the third column of Table 3, we use pension gain and pension wealth variables based on individuals' self-reports. The coefficient on pension gain based on the self-reports is very close to the comparable coefficients based on employer reports and is statistically significant. In the fourth column, we include both the self- and employer-based versions of pension gain and pension wealth levels. The correlation between the two measures of pension gain is 0.22. When both are included together (in column 4), the self-reported pension gain variable remains statistically significant and is somewhat larger in magnitude than the employer-reported variable. This indicates that, rather than being dominated by noise, the self-reported data contain important information relevant for individual decision-making. For pension wealth levels, the employer-reported data remain statistically significant (although quite small), while the self-reported version does not.

B. Are Well-Informed Individuals More Responsive?

We next document differences in the responsiveness of individuals to financial incentives based on a variety of measures of their understanding of these incentives. To capture this possible heterogeneity, we modify [2] to allow a differential response by the knowledge of pension incentives:

$$[3] \quad R_{it} = \alpha_0 + \alpha_1 GAIN_{it} + \alpha_2 INFORMED_{it} + \alpha_3 GAIN_{it} * INFORMED_{it} + X_{it} \beta + \varepsilon_{it}$$

where, as before, R_{it} is a binary variable indicating that the individual i retires in year t , $GAIN_{it}$, is the pension gain to continued work based on employer-reported pension data, and ε is an error term. With the exception of the terms associated with coefficients α_2 and α_3 , this specification

is identical to that used in previous work. $INFORMED_{it}$ is one of the variables described above (and summarized in Table 2) that attempts to capture the extent of individuals' knowledge of their pension benefits.

Probit estimates of [3] are shown in Table 4. For ease of comparison, the first column replicates the results from the first column of Table 3 and shows the negative and statistically significant effect of pension gain on the probability of retirement when knowledge is ignored. Marginal effects implied by the probit coefficients are shown at the bottom of the table, along with the change in the retirement probability implied by the dummy variables for our various measures of information.

In column 2 of Table 4, we show that $REPORT=1$ (knowing, or at least reporting some guess of, the key components of a pension plan) is associated with an increased probability of retirement. Reporting all of the key pension plan values is associated with an annual probability of retirement that is approximately 4 percentage points higher. This may reflect reverse causality: individuals who are actively considering retirement may be more likely to know enough to report some values for their pension plan. There is no significant interaction between this information measure and pension gain.

Column 3 of Table 4 displays results using $KNOW_LEVEL$ (being reasonably well-informed about the *level* of pension wealth). These results suggest that individuals with better knowledge of their pension plans may show a greater responsiveness to pension-related incentives in making the retirement decision. The total effect of pension gain is statistically significant only for well-informed individuals (pension gain plus $KNOW_LEVEL * pension\ gain$). However, the interaction between $KNOW_LEVEL$ and pension gain is not itself statistically different from zero.

In column 4 of Table 4, we use *KNOW_GAIN* (being reasonably well-informed about the size of pension gain) and its interaction with pension gain. This specification produces much stronger evidence of heterogeneity in responsiveness to pension incentives, as we would expect since pension gain itself is the measure of the incentive to retire. The main coefficient on pension gain, capturing the effect of employer reported pension gain for individuals whose self-reports are substantially different than their employer reports (or who do not report enough information to construct it), is very small and no longer statistically significant. The interaction between pension gain and *KNOW_GAIN*, however, is significant and implies a marginal effect that is over five times as large as the coefficient on pension gain by itself in column 1. This suggests that all of the responsiveness to pension incentives is driven by the roughly 20 percent of the sample who correctly perceive the incentive to delay retirement. Among individuals who meet this definition of informed, a \$10,000 increase in pension gain raises the annual probability of retirement by 1.4 percentage points, or nearly 20 percent. The main effect of *KNOW_GAIN* is also large and statistically significant: individuals who know their pension gain are 4 percentage points more likely to retire in a given year.

Columns 5 and 6 of Table 4 repeat some of the above analysis using the measure of *GAIN* constructed from both pensions and Social Security. As noted above, the sample size is dramatically reduced when we require both self- and administratively-reported data on Social Security. The coefficient on *GAIN* combining both pension and Social Security benefits in column 5 is slightly smaller than the effect of pension incentives alone, and is statistically significant. However, knowledge of the level of these Social Security benefits is not significantly related to retirement behavior: neither the main effect nor the interaction effect is statistically significant. We view this result primarily as a reflection of the limited data we have

available on individuals' knowledge of their Social Security benefits.

Finally, in columns 7 and 8, we show results based on the sample of individuals with a defined benefit pension. As discussed further below, employer-reported pensions are more likely to represent the true pensions for DB plans. These results are similar to those for the full sample. Results based on individuals without an active DB pension (not shown in the table) are also similar, though less precisely estimated. This reflects the fact that most of the identification of the pension gain coefficient is coming from defined benefit pensions, for which pension gain takes on a wider range of values at different ages.

We have also tried specifications in which we drop from the sample individuals who do not report enough information to form a self-reported measure of pension gain ($REPORT=0$ and thus, $INFORMED=0$). This allows us to distinguish between individuals who simply do not report information on their pensions and those who report values that are very different from their employer-reports. These coefficients are very similar to those reported in Table 3.

We have explored several alternative definitions of the knowledge variables. In particular, we tried altering the definition of $KNOW_GAIN$ to allow for different degrees of error in determining who knew their pension gain accurately. For example, we considered definitions in which the ratio of self- to employer-reported pension gain was between 0.75 and 1.25, and other cut-offs. The coefficients on $KNOW_GAIN$ were not sensitive to these cutoffs. This suggested that individuals were responding to something other than the precise dollar values of their pension gain. One possibility is that individuals retire when they face a zero gain or a loss from continuing to work. If this is the case, it may be enough if individuals simply understand the sign of their pension gain. To explore this possibility, we use $KNOW_SIGN$ (knowing the sign of pension gain) as the measure of pension knowledge.

The results of interacting *KNOW_SIGN* with pension gain are shown in Table 5. Column 1 simply repeats the first column of Tables 3 and 4 for ease of comparison. In column 2, we show that there is no statistically significant response to pension gain among the roughly two-thirds of the sample who do not know whether they stand to gain or lose pension wealth from continuing to work. In contrast, those who know the sign of pension gain have the expected negative and significant response to the financial incentive measure, and again, the magnitude of their response is over five times that of the average response to pension gain from column 1.

Finally, since the sign of pension gain appears to be an important piece of individual knowledge, we consider whether the sign alone can explain retirement behavior. In column 3 of Table 5 we show results of a model of retirement in which dummies for negative and zero pension gain are included (the omitted category is positive pension gain). The dummy for a negative pension gain is positive and significant, consistent with those who are past their pension wealth peak being substantially more likely to retire; the retirement probability is almost doubled for those with negative pension gain. Surprisingly, the dummy on pension gain equal to zero is negative. Column 4 shows this specification with the relevant interactions with *KNOW_SIGN*. In the lower half of Table 5, we illustrate the magnitudes of these estimated effects by calculating the probability of retirement for all combinations of *KNOW_SIGN* and whether pension gain is positive, zero, or negative. There are much larger differences between those with positive and negative pension gain values among the well-informed group, with probabilities ranging from 0.027 to 0.242. In contrast, those who are not informed according to this measure show very little difference in retirement probabilities with pension gain. It is also worth noting that the main effect of this knowledge measure does not always serve to increase the probability of retirement. For individuals with a positive pension gain (i.e., those who can increase pension

wealth by deferring retirement into the future), being knowledgeable actually reduces the probability of retirement from 0.068 to 0.027. This provides evidence that at least some of the main effect of knowledge does not reflect a reverse causality in which individuals only become informed when they are on the verge of retirement.

Nevertheless, we have further considered this alternative explanation for our findings of stronger responsiveness among the knowledgeable individuals. If individuals do not actively collect information about their pensions until they are seriously considering retirement, then unobserved individual characteristics may make individuals both more likely to be well-informed, and more likely to retire. We have attempted to explore this possibility directly by estimating a selection model in which the level of information about one's pension is estimated jointly with the decision to retire. Such a model, however, is unlikely to be identified empirically since it requires data on factors that help predict individual knowledge about their pension, but that can be excluded from a model of the retirement decision. We are not convinced that such factors exist, and so do not report the full results from our selection model here. None of our main results are altered by allowing for selection into informed and not informed states.¹⁴

In the next section, we further consider the appropriate interpretation of our results, but taken at face value, they suggest significant “mistakes” in retirement decision-making, as the result of misinformation. If the costs of obtaining information on one's pension are reasonably low, this raises questions about the value of the information. How costly is it, for example, to retire according to one's perceived pension incentive, rather than the true incentive? To address

¹⁴ In our estimation of the selection model we use union status, having multiple pension plans, firm size, and time left to the pension wealth-maximizing age to identify the level of knowledge, and exclude these factors from the retirement model.

this, we calculate the difference in the present value of pension wealth (from the employer reports) if retirement occurs at the wealth maximizing age, versus the present value if retirement occurs at the self-reported wealth maximizing age (but using wealth values from the employer reports). While not all individuals will retire at the wealth maximizing age, this gives us a rough idea of the potential cost of responding to perceived pension incentives rather than the true incentives. For the full sample of individuals with both employer- and self-reports of pension values, the median difference in pension wealth calculated in this way is roughly \$3,000, or 3 percent of the maximum pension wealth from the employer reports. This, of course, includes very small differences for those who are well-informed. When we calculate this gap among the uninformed, the values are substantial. Among those with $KNOW_GAIN=0$, the median reduction in maximum pension wealth from misinformation is \$6,900, or roughly 6 percent of pension wealth at the wealth maximizing age. The 75th percentile of this distribution is more than \$20,000, or 18 percent of pension wealth. Similarly, among those with $KNOW_SIGN=0$, the median difference in pension wealth at the employer- and self-reported wealth maximizing ages is more than \$9,000, and the 75th percentile difference is almost \$24,000. While it can be subjective to categorize magnitudes as large or small, it does not seem easy to dismiss these dollar amounts as economically unimportant. Individuals who do not have detailed pension information may stand to lose substantial portions of their pension wealth.¹⁵

¹⁵ If individuals work *longer* than suggested by their pension wealth-maximizing retirement age, they will make up some of this reduced wealth through higher earnings. However, because roughly similar numbers of individuals retire before as retire after the optimal age, this cannot fully offset the reductions in pension wealth.

C. Do Uninformed Individuals Respond to Perceived Incentives?

One interpretation of the results thus far is that knowledge can have powerful effects on individual behavior. We are cautious in reaching such a conclusion, however, since it is likely that at least some information acquisition is not exogenous to the retirement decision. One possible explanation for our finding of stronger responsiveness among the knowledgeable, for example, is that individuals might determine how much information to gather based on how likely they are to take account of that information in making retirement decisions. In this case, causality runs from dispersion in responsiveness to dispersion in knowledge and some individuals will be uninformed because they have no intention of taking financial incentives into account in choosing a retirement date.

This poses a challenge for estimation of causal effects, similar to the issues raised in the literature on estimating heterogeneous returns to education (see Card, 1999, for a discussion). Given the lack of any convincing instruments for pension knowledge in this situation, we cannot formally rule out this possibility. However, by considering the role that self-reported pension incentives play in retirement decisions, we are able to provide some evidence that this form of endogeneity is not driving our results. If it is simply the case that those who are responsive gather information, while those who are unresponsive do not (because information collection is costly and does not benefit them in any way), then the non-responders should not respond to any pension information, including their own self-reported information. We have shown above that misinformed individuals do not respond to the administratively reported pension incentive, but do these same misinformed individuals respond to their self-reported and objectively incorrect incentive? Or, are they simply nonresponsive to any incentive whatsoever?

Table 6 produces results analogous to those in Table 4, but focuses on self-reported

pension information (rather than employer-reports) interacted with the knowledge measures. The first column simply reproduces column 2 of Table 3, where we estimated the average effect of employer-reported pension gain on retirement for the sample with a valid self-report. In the second column, we use self-reported pension gain, *KNOW_GAIN*, and their interaction. The coefficient on self-reported pension gain by itself, which reflects the responsiveness of misinformed individuals, is statistically significant and of similar magnitude to the average responsiveness to employer-reported pension gain in column 1. Thus, misinformed individuals nevertheless respond to their perceived incentive in making their retirement decisions. The better-informed group has a much larger response to self-reported pension gain, as shown by the interaction of *KNOW_GAIN* and pension gain. Because better informed individuals do respond more strongly to their self-reported pension gain than the uninformed group, we cannot rule out the possibility of the type of reverse causation described above. The fact that the uninformed do show a statistically significant response to their perceived pensions, however, also suggests that at least some of the effect is running from individuals' information sets to their behavior. The results in the third column are even more striking: there is only a small difference in the responsiveness of informed and misinformed individuals to their own perceptions of pension gain when our measure of knowledge is simply whether they are aware of the sign of their incentive.

D. Can Measurement Error Explain these Results?

Our results thus far suggest a potentially important role for self-reported pension data, or individual knowledge of pension details, in retirement decision-making. Other possible interpretations of these results arise, however, if we take seriously the possibility of measurement

error in the employer-reported data, as well as in the self-reported data. Work by Rohwedder (2003), Engelhardt (2003), and Uccello and Perese (1999) point to several ways that measurement error could affect the employer-reported pension data. One concern is that for individuals with defined contribution (DC) pensions, employers may not have full access to information regarding account balances (particularly if there are multiple plans from earlier employers) or voluntary contributions. This is the motivation for restricting the sample to individuals with DB pensions (according to the employer reports), as was done in Table 4. Given the similarity between results with and without the DC pension plans, it seems unlikely that this type of measurement error in the employer reports is driving our results.

Measurement error may also exist in the employer reports of DB pension plans, however. Plans may change, or employers with multiple plans could report on the wrong one for a given employee. In addition, data on years of service (often a critical determinant of DB pension eligibility amounts) are taken from individual self-reports of their start dates on the job. This suggests that our assumption that the employer-reported pensions represent the “true” pension may not be valid. On the other hand, Rohwedder (2003) acknowledges that “for capturing important retirement incentives that are associated with sudden increases in entitlements at the time of the early and normal retirement age...this employer information can be very valuable, especially if estimating retirement models that are particularly sensitive even to small mismeasurement of the incentive structure, like option value models.” Rohwedder goes on to note that for measurements of the *level* of pension wealth, the employer-provided data are less obviously well-suited.

Given the two available sources of pension data, it is probably impossible to account for measurement error and the role of information simultaneously. It is instructive, however, to

consider an alternative to the interpretation we have given our results that relies primarily on measurement error as the driving factor. Recall that our definition of “informed” and “uninformed” simply reflect whether the self- and employer- reports are similar to one another. Individuals that we classify as “uninformed” may actually be those who have particularly severe measurement error in their employer-reported data. (Of course, such individuals could also be those with substantial measurement error in the self-reported data.) Informed individuals may appear to respond more to pension incentives simply because the measured incentives contain less measurement error.

If measurement error is of substantial concern in both the self- and employer-reported data, then an alternative estimation strategy would be to instrument the pension gain based on employer-reports with the pension gain based on self-reports, and vice-versa. Note that the strategy of instrumenting employer-reported pension variables with the self-reports will only be sensible if there is *not* an independent role in the retirement decision for individual knowledge.¹⁶ If the self-reports, or individual knowledge, directly affect the retirement decision, the self-reports will not be a valid instrument, since they cannot be excluded from the retirement equation. Nonetheless, the instrumental variables exercise will be informative under the hypothesis that only measurement error (and not individual knowledge) is a key determinant of the estimated responsiveness of individuals to pension incentives as measured from the different data sources.

Table 7 shows the results from OLS and IV regressions in which we (i) instrument the self-reports with the employer-reports and (ii) instrument the employer-reports with the self-reports, for both the full sample and the sample of those with DB plans only. If both sources of

¹⁶ We also assume that measurement error in the two pension variables are independent of one another.

data provide poorly measured proxies for the pension incentives faced by well-informed individuals, we should expect the two IV estimates to be similar to one another. This is not the case. Columns 1 & 2 show the results from OLS and IV regressions in which the self-reported pension gain variable is the key independent variable, instrumented with the employer-reported version. This suggests substantial measurement error in the self-reports since the IV coefficient is roughly 3 times as large as the OLS coefficient when using the full sample.¹⁷ For the sample of individuals with DB pensions, the IV and OLS estimates are not statistically different from one another, and the IV estimate is quite imprecisely estimated.

In columns 3 & 4 of Table 7, we present results using the employer-reported values, and those values instrumented with the self-reports. The evidence here is consistent with a bias in the IV estimate. The IV coefficient is almost 40 times the size of the OLS coefficient. This is virtually impossible to explain as the result of measurement error, but is quite sensible when viewed as the result of using an invalid instrument. More specifically, if an individual's knowledge of their pension is an important determinant of retirement behavior, the IV coefficient will be biased, and the bias term will be given by the ratio of the covariance of the self-reports and the error-term of the retirement equation to the covariance between the self- and employer-reported pension gain.¹⁸ The IV results in columns 3 and 4 are thus consistent with an important role for individual perceptions of pension details in the retirement equation, even after conditioning on the employer report (as a proxy for the true pension), but are difficult to explain relying only on measurement error. In truth, our results may be driven by a combination of

¹⁷ This result could also occur if having a correct self-report (one that is highly correlated with the true pension gain) leads to greater responsiveness; individuals may simply respond less to a best guess of their pension that they know is unlikely to be accurate.

¹⁸ That is, let $X\text{-sr}$ be the self-reported pension gain, $X\text{-er}$ be the employer-reported pension gain, and e be the retirement equation error term. Then the bias on the IV coefficient is given by $\text{Cov}(X\text{-sr}, e) / (\text{Cov}(X\text{-er}, X\text{-sr}))$.

measurement error and a role for individual perceptions or knowledge. Given the prior literature's almost exclusive focus on administrative data, and the lack of attention to the role of individual knowledge in determining retirement timing, our findings, at the least, highlight an important new factor in understanding retirement decisions.

III. Conclusion

This paper documents the differential responsiveness to economic incentives by knowledge of those incentives in the case of retirement decision-making. Specifically, we have shown that there is important heterogeneity in how individuals consider financial factors in choosing a retirement date, and that this heterogeneity is directly related to individuals' level of knowledge about these financial factors. This finding is important since the existing literature on retirement decision-making has largely ignored information issues, and since researchers have tended to ignore self-reported data on pensions when they are available. A limitation of our findings is that we cannot yet say whether they reflect an exogenous effect of information provision, or whether information gathering and retirement decision making are jointly determined. Future work should focus on disentangling this difficult empirical problem. Finally, we show that, rather than being unresponsive, misinformed individuals do respond to their perceived, but incorrect, pension information.

A final contribution of this study is that we demonstrate the usefulness of self-reported data as collected in the Health and Retirement Study and other surveys. Individuals respond directly to these self-reports, suggesting that they do capture the economic incentives that

individuals perceive themselves to be facing. The self-reported pension data provide an important intermediate step between administrative reports of pensions and the retirement response of individuals. Instead of being substitutes for one another, the self- and administratively-reported data are complements in understanding individual responses to retirement incentives.

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Table 1
Sample Summary Statistics

	Fraction	Mean	Standard deviation
Retired this year	0.13		
Retired by end of sample	0.34		
Male	0.53		
Hispanic	0.05		
Black	0.16		
Married	0.78		
Age		58.3	3.5
Total non-pension assets \$		277,655	688,461
Average Lifetime Earnings \$		23,385	11,836
Pension wealth if retire immediately (self-report) \$		68,794	290,577
Pension wealth if retire immediately (employer-report) \$		153,218	251,503
Pension gain (self-report) \$		56,534	154,064
Pension gain (employer-report) \$		25,152	46,813
Number of observations		8,471	

Notes: Pooled data from waves 1-4 of the Health and Retirement Study (HRS).
The sample includes all HRS respondents for whom there is an employer-reported pension at wave 1.
Further details are given in section I of the text.

Table 2
Measures of Knowledge

Sample:	Full	With a DB plan	With no DB plan
Fraction reporting key values of pension (<i>REPORT</i> =1)	0.63	0.68	0.56
Among those reporting key values of pension:			
Fraction with <i>KNOW_LEVEL</i> = 1 (ratio of employer to self- reported level of pension wealth is between 0.5 and 2)	0.51	0.55	0.43
Fraction with <i>KNOW_GAIN</i> = 1 (ratio of employer to self- reported level of pension gain is between 0.5 and 2)	0.27	0.20	0.42
 (employer and self- reported pension gain is of the same sign.)	0.55	0.59	0.49
Fraction reporting expected Social Security benefits	0.40	0.42	0.32
Among those reporting expected Social Security benefits:			
Fraction with <i>KNOW_SS</i> = 1 (ratio of SSA- to self- reported expected SS benefits between 0.5 and 2.)	0.77	0.75	0.79
Number of observations	8,471	5,207	3,264

Notes: Pooled data from waves 1-4 of the Health and Retirement Study (HRS).
The sample includes all HRS respondents for whom there is an employer-reported pension at wave 1.
Further details are given in section I of the text.

Table 3
The Effect of Self- and Employer-Reported Pension Gain on the Annual Probability of Retirement

Dependent Variable:	Retire			
Sample:	Full	With <i>REPORT</i> =1 only		
	1	2	3	4
Pension gain based on employer-report	-0.0179 (0.0080) <i>-0.0025</i>	-0.0190 (0.0093) <i>-0.0027</i>		-0.0168 (0.0098) <i>-0.0024</i>
Pension wealth level based on employer-report	0.0054 (0.0013) <i>0.0007</i>	0.0049 (0.0015) <i>0.0007</i>		0.0061 (0.0018) <i>0.0009</i>
Pension gain based on self-report			-0.0213 (0.0029) <i>-0.0034</i>	-0.0228 (0.0027) <i>-0.0032</i>
Pension wealth level based on self-report			0.0014 (0.0011) <i>0.0002</i>	0.0010 (0.0010) <i>0.0001</i>
Correlation(pension gain based on employer-report, pension gain based on self-report)				0.22
Correlation(pension wealth level based on employer-report, pension wealth level based on self-report)				0.21
Number of observations	8,471	5,368	5,368	5,368

Notes: Probit coefficients estimated using data from waves 1-4 of the HRS. Standard errors are in (). The marginal effect of a \$10,000 increase in the variable (calculated for a 60-year old, married, white male, with some college education, observed in wave 2, and with all continuous variables set to their mean values) is shown in italics below the standard errors.

The sample in columns 2-4 include only those for whom a self-reported pension gain can be calculated. Pension gain and wealth levels are in \$10,000s.

Other explanatory variables include race, education, health, marital status, non-pension assets, age, gender, wave, lifetime earnings and an intercept.

Table 4
The Effect of Pension Gain and Knowledge on the Annual Probability of Retirement

Dependent Variable: Sample:	Full				Retire			
					Self-reporting SS benefits only		DB only	
	1	2	3	4	5	6	7	8
Pension gain	-0.0179 (0.0080)	-0.0179 (0.0170)	-0.0120 (0.0097)	-0.0046 (0.0078)			-0.0222 (0.0087)	-0.0090 (0.0088)
<i>REPORT</i> =1		0.2520 (0.0604)						
(<i>REPORT</i> =1)*Pension gain		-0.0030 (0.0186)						
<i>KNOW_LEVEL</i> =1			0.1288 (0.0668)					
(<i>KNOW_LEVEL</i> =1)*Pension gain			-0.0123 (0.0152)					
<i>KNOW_GAIN</i> =1				0.2636 (0.0661)				0.2795 (0.0881)
(<i>KNOW_GAIN</i> =1)*Pension gain				-0.0950 (0.0323)				-0.0996 (0.0356)
Pension and Social Security gain					-0.0113 (0.0060)	-0.0074 (0.0119)		
<i>KNOW_SS</i> =1						0.0401 (0.1915)		
(<i>KNOW_SS</i> =1)*Pension and Social Security gain						-0.0047 (0.0124)		
Effect of \$10,000 increase in pension gain:								
average	-0.0025				-0.0013		-0.0031	
uninformed		-0.0026	-0.0018	-0.0006		-0.0009		-0.0012
informed		-0.0031	-0.0036	-0.0136		-0.0014		-0.0149
Change in P(retire) due to main effect of informed:		0.0436	0.0211	0.0436		0.0044		0.0468
Number of observations	8,471	8,471	8,471	8,471	3,341	3,341	5,207	5,207

Notes: Probit coefficients estimated using data from waves 1-4 of the HRS. Standard errors are in ().

The marginal effect of a \$10,000 increase in pension gain and the change in probability of retirement is calculated for a 60-year old, married, white male, with some college education, observed in wave 2, and with all continuous variables set to their mean values.

Pension gain is in \$10,000s and are based on employer-reports.

Other explanatory variables include pension wealth, race, education, health, marital status, non-pension assets, age, gender, wave, lifetime earnings and an intercept.

Table 5
The Effect of Knowing the Sign of Pension Gain on the Annual Probability of Retirement

Dependent Variable: Sample:	Retire Full			
	1	2	3	4
Pension gain	-0.0179 (0.0080)	0.0046 (0.0079)		
<i>KNOW_SIGN</i> =1		0.1703 (0.0558)		-0.4407 (0.0625)
<i>(KNOW_SIGN</i> =1)*Pension gain		-0.0960 (0.0193)		
Pension gain=0			-0.1241 (0.0654)	-0.4622 (0.0825)
Pension gain<0			0.4274 (0.0590)	0.1185 (0.0684)
<i>(KNOW_SIGN</i> =1) and (Pension gain=0)				0.9927 (0.1371)
<i>(KNOW_SIGN</i> =1) and (Pension gain<0)				1.1129 (0.1137)
P(retire) for <i>KNOW_SIGN</i> =1:				
employer reported pension gain > 0				0.0268
employer reported pension gain = 0				0.0807
employer reported pension gain < 0				0.2422
P(retire) for <i>KNOW_SIGN</i> =0:				
employer reported pension gain > 0				0.0681
employer reported pension gain = 0				0.0255
employer reported pension gain < 0				0.0851
Number of observations	8,471	8,471	8,471	8,471

Notes: Probit coefficients estimated using data from waves 1-4 of the HRS. Standard errors are in (). Pension gain is in \$10,000s and are based on employer-reports. Other explanatory variables include pension wealth, race, education, health, marital status, non-pension assets, age, gender, wave, lifetime earnings and an intercept.

Table 6
The Effect of Self-Reported Pension Gain and Knowledge on the Annual Probability of Retirement

Dependent Variable: Sample:	Retire With <i>REPORT</i> =1 only		
	1	2	3
Employer reported pension gain	-0.0190 (0.0093)		
Self-reported pension gain		-0.0183 (0.0028)	-0.0157 (0.0032)
<i>KNOW_GAIN</i> =1		0.0925 (0.0784)	
<i>(KNOW_GAIN=1)*</i> Self-reported pension gain		-0.0957 (0.0341)	
<i>KNOW_SIGN</i> =1			0.0163 (0.0732)
<i>(KNOW_SIGN=1)*</i> Self-reported pension gain			-0.0115 (0.0062)
Effect of \$10,000 increase in self-reported pension gain:			
not informed		-0.0014	-0.0024
informed		-0.0086	-0.0042
Change in P(retire) due to main effect of informed:		0.0154	0.0028
Number of observations	5,368	5,368	5,368

Notes: Probit coefficients estimated using data from waves 1-4 of the HRS. Standard errors are in ().

The sample includes only those for whom a self-reported pension gain can be calculated.

The marginal effect of a \$10,000 increase in pension gain and the change in probability of retirement is calculated for a 60-year old, married, white male, with some college education, observed in wave 2, and with all continuous variables set to their mean values.

Self- and employer-reported pension gain are in \$10,000s.

Other explanatory variables include pension wealth, race, education, health, marital status, non-pension assets, age, gender, wave, lifetime earnings and an intercept.

Table 7
OLS & IV Estimates of Self- and Employer-Reported Pension Gain
on the Annual Probability of Retirement

Dependent Variable:	Retire			
Sample:	Full	DB plans only	Full	DB plans only
Pension gain from:	Self-reports		Employer-reports	
	1	2	3	4
OLS	-0.008 (0.001)	-0.012 (0.002)	-0.012 (0.005)	-0.016 (0.005)
IV	-0.024 (0.012)	-0.005 (0.007)	-0.429 (0.174)	-0.494 (0.158)

Note: IV estimates in columns 1 & 2 are for self-reported pension gain instrumented with employer reported. IV estimates in columns 3 & 4 are for employer-reported pension gain instrumented with self-reported.