Effects of Age-Targeted and Non-Age-Targeted Training on Retirement: Evidence from Germany

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Abstract

As a result of workforce aging, when and how individuals retire has critical implications for the funding of government pension systems as well as the ability of organizations to manage human capital. While most policy solutions involve changes to pension formulas to encourage or require later retirements, there is little discussion of the organizational factors that may importantly influence retirement behavior. This paper focuses on establishment level training activities and the role they may play in influencing retirement decisions. On the one hand, training may be a way to keep individuals working longer because training increases human capital. But as workers age, they experience diminishing returns to training and theory suggests the psychological costs of training may rise. Using a unique source of matched establishment-employee data, this paper empirically examines these competing predictions. Findings indicate a concave relationship between establishment training participation rates and retirement age in men. This effect is strengthened in establishments which offer non-age-targeted training to older workers, however it is reversed in firms which offer age-targeted training. Overall, these results suggest that the age-targeted training has the potential to better increase human capital and lead to later retirement ages.

Introduction

The global workforce is rapidly aging. As workers edge closer and closer to retirement, a number of organizational and governmental problems arise. For example, an influx of retirements with no commensurate increase in the prime aged population puts additional pressure on social security and pension funds under current financing schemes (Parker, 2006). Even in a tight labor market when mass retirements may help to reduce unemployment in the labor force as a whole, individual organizations may face skill shortages due to the departure of their most experienced workers.

These problems are exacerbated by pension formulas that have not kept pace with demographic trends and concomitant funding requirements as well as loopholes in pension rules that allow workers to retire before normal retirement age. Yet even as these formulas are revised and pathways to early retirement are closed, organizational policies and practices based on decades of earlier retirements may continue to shape retirement behavior. There is a large body of empirical evidence that indicates workers do respond to financial incentives to delay retirement but very little is known about the potential role played by non-financial factors and organizational policies and practices in particular.

In a recent worldwide survey of more than 28,000 employers, only 21% had strategies to retain their older workers (Manpower, 2007). This figure does not include organizational

policies that may not have the explicit goal of retaining older workers but in practice may play an important role. For example, generous paid leave may make postponing retirement more palatable. Conversely, employers may both explicitly and implicitly encourage earlier retirements through their policies and practices. Buyouts and early retirement incentives are common explicit ways to encourage attrition among older workers when desired. But organizations may engage in other activities that, while not aimed at inducing retirement, do push older workers towards an early exit from the labor force. The establishment's training practices may have such an effect. Training of older workers should help to keep their skills relevant and create a perception of shared investment in the employment relationship that may in turn delay their retirement. Yet, older workers have fewer years over which to reap the benefits of increased productivity and wages associated with training. Also, older workers may find training more distasteful than younger workers. Therefore, they may opt to exit jobs that require additional training at an earlier age.

This study provides an empirical analysis of the complex relationship between employer provided training and retirement timing using the Linked Employer-Employee Data of the Institute for Employment Research (LIAB), a nationally representative German dataset that links individual administrative data from German Social Security records to establishment survey data. Progress in this stream of literature has been inhibited by a lack of good training measures in large representative data sets. In particular, studies using individual survey data have been hampered by measures that confound the availability or requirement of training in the workforce with whether or not the individual participates in the training himself. The training information in the LIAB data is derived from establishment surveys and not only includes whether or not the establishment engages in advanced training but also how many workers are involved, and whether older workers in particular are involved. This information allows us to differentiate between organizations that are heavily involved in training and those that restrict training to a subset of the workforce.

Training certainly differs not only in intensity but also in content and delivery across establishments. Some types of training may encourage longer working lives, others may lead older workers to opt out and in some cases retire rather than participate. The LIAB establishment survey data also indicate whether the establishment offers training opportunities that are specifically targeted towards older workers. This information allows us to determine whether specialized training programs for older workers are more likely to encourage longer working lives than one size fits all training programs.

Background and Previous Studies

Economic theory provides conflicting predictions for the relationship between training and a person's decision to retire. Human capital theory predicts further training will prolong working lives by enhancing productivity and increasing wages, which makes it advantageous for both the employer and employee to maintain the employment relationship (Becker, 1962). But, older employees have less incentive to invest in training because they have fewer remaining years of work to reap the returns on their investment (Ben-Porath, 1967). Also, older workers may find training more distasteful or burdensome than younger employees and thus bear higher "psychic costs" that reduce their incentives to participate in training (Green, 1993). If further training is a requirement of continued employment--regardless of whether this is communicated to the employee--then the training costs the worker incurs will reduce the net wage and may

cause it to fall below the reservation wage at an earlier age. In this case, training would lead to earlier retirement as the pay-off for continuing work is too low to offset the psychological costs.

The few studies that have estimated the relationship between training and retirement timing suggest training may prolong work lives, but unfortunately the measures used do not capture the relationship of interest. Picchio & van Ours (2011), using data from 7,257 individuals from 1996-2001 in the European Community Household Panel (ECHP), found that training led to greater worker retention in the Netherlands for workers aged 50-64. Their dynamic unobserved effects probit model found that employees in this age group were 6 percentage points less likely to be out of the workforce if they had participated in firm training the previous year. The measure of training available in the ECHP is derived from a single survey question that asks worker respondents whether they participated in any on the job training Therefore, their analysis provides an estimate of the effect of training among the trained; it does not include any relationship between organizational training activity and retirement decisions among workers who do not participate in training. So, even if the true effect of training on retirement likelihood among those who participate in training is negative, the total effect of training requirements among all older workers could still be positive if it induces workers to retire to avoid participation.

Herrbach et al. (2009) also use individual survey data from a sample of 514 late career managers to examine the relationship between training and retirement timing and also found training reduces the likelihood of early retirement, but unlike Picchio and van Ours (2011), their survey items ask respondents to rate the extent to which certain types of training are available rather than to report their participation in training. Unfortunately though, their measure confounds the availability of any sort of training with the efficacy of the training. Specifically respondents use a 5 point Likert scale to rate the availability of training opportunities that are adapted to their needs, extend their computer skills, develop their management skills, and continuously update their skills. But respondents are not asked to rate the availability of any training opportunities at all. Therefore, it is possible that respondents who were offered ineffective training or training that did not address the specific skills asked about in the survey would be coded in the data set as not receiving any training opportunities. Also, workers who perceived on the job training to be a requirement rather than an opportunity they could decline may have indicated training opportunities were scarce in this survey when in fact their job requires a lot of training.

In a related study, de Luna et al. (2010) used Swedish general adult education transcripts from 1979-2004 to examine the effect of adult education on retirement timing and found no relationship. Like Picchio and van Ours (2011), the de Luna et al. (2010) training measure also captures training participation instead of training opportunities or requirements. Also, their study focuses on general training offered outside the firm which may have a different effect on retirement timing than further in-firm training, which usually consists of more firm or occupation specific skills and may be a requirement of continued employment.

Outside the retirement-specific literature, and in samples of workers of all ages, a wide array of studies have found on-the-job training may increase employee productivity (e.g., Bartel, 1995; Conti, 2005; Dearden et al, 2005; Barrett & O'Connell, 2001; Zwick 2006), slow the depreciation of human capital (Groot & Maassen van den Brink, 2000; Neumann & Weiss, 1995), and promote future employability (e.g., Crepon et al., 2007; Lechner et al., 2007). But

Goebel & Zwick (2010), find these results may not hold for older workers. Using the same dataset we use in the present paper, they found establishments that offered training targeted toward older workers did not have higher rates of productivity among their older employees than establishments that did not offer targeted training. They concluded that training may not be effective for increasing productivity among older workers and proposed this may be due to poor implementation. Zwick (2011) found support for this assertion in a follow up study using the German "Continuing Training as Part of Lifelong Learning" dataset known as WeLL. These findings indicated older workers do have significantly different preferences for training content and delivery, and they also have different perceptions of training effectiveness than younger workers. They also find most organizations do not alter the content or form of training across worker age groups. Thus, the mere inclusion of older workers in training may not be sufficient to increase human capital; training that is not implemented with the needs of older workers in mind may not increase their productivity at all (Goebel & Zwick, 2010).

The ideas that older and younger workers have different preferences for training content and delivery and may differ in their perceptions of training effectiveness have been formalized in the psychological training literature, and there is some empirical support for the idea that training tailored to the needs and preferences of older workers may promote longer working lives. Psychological theory proposes two primary mechanisms through which training targeted at older workers may delay retirement. First, by increasing training effectiveness for older workers in particular, training will enhance their human capital and, borrowing from human capital theory, training should in turn delay retirement (Snow, 1989; Ford & Oswald, 2003). Second, by increasing older workers' psychological commitment to the firm, training should promote longevity in the employment relationship (Blau, 1964; Gouldner, 1960; Knapp, 1978).

Empirical studies in the psychology literature do provide evidence of differing effectiveness of training delivery by age, but there is little empirical investigation in this literature linking better training effectiveness to delayed retirement. Meta-analytic research suggests that, across a larger number of studies, older employees perform better in training that mixed varying delivery methods with self-paced instruction (Callahan, Kiker, & Cross, 2003). More broadly designed training (i.e. training designed without older workers' needs in mind) appears to be more difficult for older workers. Kubeck et al.'s (1996) meta analysis indicates older workers take longer to complete training and don't perform as well on average. Because of this difficulty, non-age-targeted training may in fact drive older workers to retire earlier as the payoffs no longer compensate sufficiently for the required effort. Conversely, numerous studies suggest that when training is developed to accommodate the needs of older workers, older workers can learn and perform as well as younger workers (Charness et al., 2001; Hedge, Borman, & Lammlein, 2006; Sterns, 1986; Sterns & Doverspike, 1988).

Empirical research in psychology grounded in social exchange theory has also found that proper training is related to increased commitment to the firm among older employees. According to social exchange theory, employees will reciprocate perceived commitment received from the firm with commitment to the firm (and thus delayed retirement). Armstrong-Stassen & Ursel (2009) found older workers had stronger intentions to remain with the firm when training practices made them feel supported by the organization. Similarly, Herrbach et al. (2009) found that older managers expressed a higher commitment to their firms when they were involved in training, and these workers also remained with the firm longer. Herrbach et al.

(2009) also find the relationship between worker commitment and training does not appear to be due to a lack of work alternatives but rather to a more positive perception of the organization.

In summary, human capital theory makes competing predictions regarding the relationship between training and retirement timing, and psychological literature predicts that if training is perceived as organizational support workers will reciprocate with longer commitment to the firm. Psychological theory also predicts the effectiveness of training for older workers will depend on whether the training is targeted to meet their specific needs and preferences. We assert that training that is targeted to meet the needs of older workers is more likely to be effective, more likely to be perceived as organizational support, and therefore more likely to result in a net positive effect on retirement age.

Additionally, the existing empirical literature has been hampered by an inability to measure training offer or requirement separate from participation in large representative samples. Therefore, there are no estimates of the relationship between training and retirement timing in the workforce as a whole, only between training participation and retirement timing. Importantly, this limitation means extant empirical studies miss a potentially important effect of training: the possible effect of firm training activities on workers who opt to retire rather than participate. Further, using establishment level data on firm training activity, we test the assertion that training targeted at older workers will be more likely to lead to longer working lives than involvement in training alone. This paper not only improves upon existing estimates of the relationship between training's and retirement but also advances the literature by distinguishing between one size fits all training and training that is explicitly targeted at older workers. More generally, this study addresses an important gap in the study of retirement behavior by analyzing how employer practices may affect retirement timing.

Data and Method

Our data come from the Linked Employer-Employee Data from the IAB (LIAB). The LIAB matches data from the German IAB Establishment Panel, which is an annual representative survey of establishments and focuses primarily on labor demand topics, to demographic information contained in individual records from the German social security system. Our sample consists of a cross section of all employees who were employed in a surveyed establishment at any time between 2001 and 2003 and who retired by 2008. These criteria result in a sample of 188,832 individuals. The key dependent variable is age at retirement.

In 2001 and 2003, the IAB Establishment Panel collected information about the number of employees participating in advanced training within the establishment. We average those numbers across the two years at the establishment level and divide by total establishment employment to create our key independent variable, which is a proxy for training required within the establishment. We opt to average across years of data because we want to avoid capturing single year fluctuations in training activity.

In 2002, the survey contained a multi-punch question about the measures the establishment has in place for older workers including whether or not the establishment involved older employees in training activities and whether they extended "special advanced training offers" to older employees. The same question also recorded whether the establishment used

partial retirement, special equipment, lower job performance requirements, mixed age teams, other measures or no measures targeted toward older employees. Including these additional practices for older workers in our analysis allows us to differentiate between firm commitment explanations of the relationship between training and later retirement and human capital explanations.

Control variables at the establishment level include the proportion of the workforce over age 50, business size measured by total investments, the percentage of total investments dedicated to technology, total number of employees in the establishment, the region in Germany in which the establishment was located, and the establishment industry. All of the establishment level training variables, measures for older workers, and control variables are matched to the individual data so that the final data set remains a cross section at the individual level. We also include individual level daily wage, gender, occupation, and educational attainment as controls in our analysis.

To examine the overall relationship between training and retirement timing, we estimate the following model using OLS with robust standard errors clustered at the establishment level:

$$RetireAge_{ij} = \beta_0 + \beta_1 train_j + \beta_2 train_j^2 + X_j\gamma + X_{ij}\delta + \varepsilon_{ij} \qquad (1)$$

Where $RetireAge_{ij}$ is the age at which employee i in establishment j eventually retires, $train_{ij}$ is the number of employees within the establishment involved in advanced training divided by total establishment employment, and X_j is a vector containing the establishment level control variables listed above, X_{ij} is a vector containing the individual level control variables listed above. We include a quadratic of our training measure because some training within the firm may increase the productivity of older workers through skill complementarities between younger and older workers or raise wages by increasing the productivity of the firm in general and thus result in later retirements. But as the number of employees participating in training within the establishment increases, the likelihood that older workers will be required to complete training as a condition of continued employment may also increase. In this case, we expect training would be more likely to lead to earlier retirement.

To examine the potential moderating role of training targeted at older workers, we modify Equation 1 as follows:

$$RetireAge_{ij} = \beta_0 + \beta_1 train_j + \beta_2 train_j^2 + \beta_3 otrain_j +$$

$$\beta_4 train_j * otrain_j + \beta_5 train_j^2 * otrain_j + \beta_6 itrain_j + \beta_7 train_j * itrain_j \qquad (2)$$

$$+\beta_8 train_j^2 * itrain_j + X_j\gamma + X_{ij}\delta + \varepsilon_{ij}$$

Where $otrain_j$ is an indicator variable equal to 1 if establishment j offers advanced training designed for older workers. In these specifications, X_j includes indicator variables to control for the other practices the firm offers to support older workers. In doing so, we attempt to isolate the human capital effects of training on retirement age from any perceived social support effect. Also, we include the variable $itrain_j$ which indicates whether the firm explicitly involves older workers in existing advanced training activities to determine whether training designed specifically for older workers has an effect above and beyond involvement in existing training

programs. We also interact $itrain_j$ with $train_j$ with the assumption that establishments with high levels of training that state they do involve older workers are more likely to make training a condition of further employment than those that engage in high levels and do not involve older workers..

We estimate Equations 1 and 2 separately for men and women because there is extensive theoretical and empirical evidence that men and women invest differently in human capital (e.g. Barron, Black & Loewenstein, 1993; Olsen & Sexton, 1996), have distinct lifecycle labor supply patterns (e.g. Altonji & Blank, 1999; Loprest 1992), and may not make retirement decisions in the same way (e.g. Bajtelsmit, Bernasek, & Jianakoplos, 1999; Talaga & Beehr, 1995). Because interpretation of interactions with quadratic variables is difficult, we supplement the results reported in tables with graphs of the interaction effects.

Results

Descriptive statistics for key variables are presented in Table 1. The mean retirement in age (defined as withdrawal from the labor force) in the German population as a whole fell from 64.7 years in the late 1960s to level out at just over 60 years in the early 1990s (Gendell 1998). This is quite low when compared with the U.S. where the average age at labor force exit is 65.5 (OECD 2006). In our sample, the mean retirement age is 52.23 years.

Table 1 shows there is substantial variation in training activities across establishments. In the average establishment, 29 percent of the workforce is involved in advanced training. Additionally, while 35 percent of all establishments include older workers in advanced training activities, only 4 percent offer training programs specifically targeted for their older workers.

Table 2 contains the results from estimating Equation (1). In the first column of results we estimate the model for all workers and control for gender; the second and third provide separate estimates for men and women respectively. In the first column of results, there is a positive sign on the level and a negative sign on the quadratic of our training measure. These estimates suggest the more employees involved in training within the establishment, the later an older worker will retire but the change in retirement age is smaller in establishment that already engage in a lot of training. Specifically, at the sample mean level of training participation (i.e. $train = 0.289$), a ten percentage point increase in the share of workers participating in advanced training in the establishment is related to a 0.08 year (approximately 1 month) increase in age at retirement for a given older worker, but in an establishment where 75 percent of the workers already participate in advanced training, the estimates suggest a ten percentage point increase would be related to a 0.13 year *reduction* in retirement age. Indeed, these estimates indicate the relationship between training and retirement age is positive for establishments with fewer than 49 percent of workers involved in advanced training and negative for those with more.

Looking at the second and third columns of results in Table 2, it appears the relationship between training and retirement age observed in the overall sample comes entirely from men. Although the coefficient sign pattern is the same for men and women, *train* and *train²* are not statistically significant in the female regression. For men, the coefficients are larger in absolute value than the coefficients in the overall regression, meaning the relationship between training and retirement age is more concave. For example, based on these estimates a 10 percentage point increase in training participation is related to a 0.10 year increase in retirement age for

workers in establishments with average training participation rates and a 0.29 year decrease in establishments with 75 percent of the workforce participating in training. The turning point based on these estimates is at 45 percent training involvement.

The results of estimating Equation (2) for men and women are reported in the last two columns of Table 2, but before including the interactions between establishment training policies for older workers (*otrain* and *itrain*), we add these variables to Equation (1) to see if they have a direct impact on retirement age regardless of the level of training participation within the firm. For men, neither of the establishment policy variables is significant and there are no important changes in the significance or magnitude of the coefficients on *train* and $train^2$. For women, there is still no statistically significant relationship between overall training participation in the establishment and retirement age when the policy variables are added to the model and there is no statistically significant relationship for involvement of older workers in existing training programs, but the estimates suggest women in establishments that offer targeted training for older workers retire 0.70 years later than those in establishments that do not, all else equal. This result does not hold when we estimate the full model with interactions as specified in Equation (2).

The results of estimating Equation (2) are in Columns 6 and 7 of Table 2. For men, all interaction terms are statistically significant as are the two establishment policy variables, *itrain* and *otrain*. None of the training variables are statistically significant for women. For ease of interpretation we plot the fitted values for retirement age by establishment training participation and by establishment training policies for men and women in Figures 1a, 1b, 2a, and 2b.

Figure 1a displays the relationship between training participation and retirement age among men and separates those in establishments that involve older workers in advanced training from those in establishments that do not. We predicted workers in establishments that have a high percentage of workers participating in advanced training and that explicitly involve older workers in advanced training would likely retire earlier because training is more likely to be a requirement for continued employment. Figure 1a indicates the estimates support this prediction.

Predicted retirement age is statistically significantly lower for men who work in establishments that involve older workers in advanced training and have training participation rates above 60 percent, and the difference approaches 3 years in establishments with the highest rates of training involvement. There is no significant difference in predicted retirement age between establishments that include and those that do not include older workers in advanced training if overall training participation is between approximately 30 and 60 percent, but involvement in advanced training appears to be related to earlier retirements in establishments with less than 30 percent of the workforce involved in training. This difference is somewhat smaller than the difference observed in establishments with high training involvement, but the estimates suggest it may be greater than one year in establishments with the lowest levels of training involvement.

Figure 1b displays the same estimates for women and suggests a similar relationship between involvement in advanced training and retirement age in establishments that do relatively little (less than 20 percent of workers involved) or a lot of training (more than 60 percent of workers involved) as exists for men. In either case, women in these establishments retire earlier

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when the firm explicitly involves older workers in advanced training, but the magnitude of the predicted differences is smaller for women than for men. The results for women differ from those for men in establishments with more moderate levels of training participation (between 20 and 60 percent). For women in these establishments, the estimates suggest involvement in advanced training may actually be related to later retirements but the difference is at most 0.25 years.

Figures 2a and 2b display the estimated relationship between retirement age and training participation for establishments that offer training specifically targeted at older workers and those that do not. Figure 2a contains the results for men. Here the differences in retirement age by establishment policy are striking. For men who work in establishments that have training designed for older workers, the relationship between training participation rates and retirement age is convex. That is, in establishments that offer advanced training targeted at older workers, the higher the percentage of the workforce participating in training, the later the men retire. The relationship between training participation and retirement age remains concave in establishments that do not offer advanced training designed for older workers and the estimates suggest the largest difference in predicted retirement age exists between establishments that involve high percentages of their workforce in training. Figure 2b displays similar patterns for women. The relationship between training participation and retirement age is convex for women in establishments that have training programs specifically for older workers and concave in those that do not. In keeping with the rest of the results, the magnitudes of the estimated differences are smaller for women than for men.

Discussion and Conclusion

To date, retirement research has provided extensive information about worker responses to pension incentives and other financial determinants of retirement timing but relatively little is known about the role organizational policies and practices may play in retirement decisions. Based on extensive empirical evidence, there is no doubt that financial incentives play a key role in retirement decision making, but non-financial factors may matter too. Theories in economics and psychology both suggest retirement timing may be influenced by firm training activities but that the direction of the relationship is ambiguous and may depend on whether the training is designed specifically for older workers.

Using the LIAB matched establishment-employee dataset from the German Institute for Employment Research, our findings suggest training does have a significant and complex relationship with retirement age. Specifically, among male workers we find a concave relationship between the proportion of the establishment workforce involved in advanced training and retirement age. That is, male workers in establishments with moderate levels of training participation retire later than those with high levels of training participation. This may be because workers in establishments with high levels of training participation are more likely to have jobs that require further training as a condition of continued employment and may in turn be more likely to leave the labor force early to avoid investing in further training.

Indeed, using establishment survey information to differentiate between establishments that explicitly involve workers in advanced training and those that do not, we find male workers in all establishments retire no later when involved in advanced training and retire earlier when over 60 percent of the workforce is involved in advanced training and the establishment

explicitly involves older workers. These findings are in keeping with the predictions of human capital theory. Some training activity within the firm may lead to longer working lives through enhanced establishment productivity or skill complementarity between younger and older workers that in turn increases wages or other forms of compensation tied to firm performance, but requiring training as a condition of continued employment may lead older workers to opt into an early retirement because the individual costs of training are more likely to exceed the benefits.

However, in keeping with social exchange theory from the psychology literature, we find that training that is specifically targeted at older workers has a very different relationship with retirement timing. Specifically, we find both men and women retire later in establishments that have high percentages of employees involved in training if the establishment offers training specifically for older workers. One potential explanation is that when firms target older employees for in-firm training with low amounts of participation, older employees are singled out and perceive less organizational support. On the other hand, in establishments with high training participation rates and targeting of training toward older workers, the older workers may be overwhelmed trying to keep up with the typical in-firm training designed for the average employee and retire earlier.

The differences in retirement age suggested by our estimates are not small, especially not in establishments with high levels of training participation. Indeed, for men we find at the mean level of establishment training participation, a 10 percentage point increase in training participation is associated with a modest 0.10 year increase in retirement age but in establishments with 75 percent of the workforce involved in advanced training, a 10 percentage point increase is associated with a 0.29 year decrease in retirement age. According to our estimates for men, the differences in retirement ages in establishments that involve older workers in advanced training and those that do not approach 3 years as overall training participation approaches 100 percent. Also, using our estimates to compare establishments that offer targeted training for older workers to those that do not, we find differences in retirement age that near 8 years in the establishments with the highest levels of training participation.

Interestingly, we find most of the above results are driven almost entirely by men. In our regressions, there are few significant relationships between establishment training activities and retirement age among women. This is consistent with previous literature suggests that women's retirement decisions are based more on outside, non-work concerns. Some of these differences may be due to a relative lack of statistical power because there are fewer women participating in the German labor force and in turn our sample of women is smaller. In nearly all cases, however, we find the patterns for women do mirror the patterns for men.

In total, our results suggest that if the goal is to retain older workers, involvement in advanced training is not enough and may even lead to earlier retirements. Instead, our results indicate training that is specifically aimed at older workers may be the best approach for updating skills, especially in organizations that require a majority of the workforce to participate in training. However, as in any study of organizational policies and practices, the ability to discern the causal direction of the relationships we have identified is hampered by the fact that the matching of workers to establishments is not random. For example, we may observe later retirements in establishments that offer targeted training for workers because establishments with more older workers are more likely to offer targeted training. We attempt to account for this possibility by controlling for the share of the establishment workforce that is over age 50 in our

regressions. Indeed, this variable is consistently significant across all specifications. Nonetheless, there are likely to be other organizational factors that matter to older workers and that influence their choice of employment leading up to retirement and their retirement timing decisions. To the extent that those factors are ignored in our model and are possibly related to organizational training activities, our results may be biased. We argue these possibilities underscore the need for further research of these complex relationships.

**TABLE 1: DESCRIPTIVE STATISTICS FOR KEY VARIABLES**

	Observations	Mean	SD	Min	Max
RetireAge	286,108	52.23	7.544	41	76
Percent of employees over age 50	2,334,874	3.558	0.976	1	6
Female	2,344,152	0.40	0.49	0	1
train	1,991,315	.289	.227	0.001	1
otrain	2,308,402	0.345	0.476	0	1
Itrain	2,308,402	0.042	0.2	0	1
Total number of employees	2,343,838	3729.221	8753.474	1	50,524

TABLE 2: RETIREMENT AGE REGRESSION MODELS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variable	All	Male	Female	Male	Female	Male	Female
N	167644	103386	64258	102897	63934	102897	63934
Total number of employees (1000s)	0.1* (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
Percent Employees Over 50	0.828*** (0.075)	0.867*** (0.099)	0.696*** (0.067)	0.906*** (0.095)	0.679*** (0.069)	0.936*** (0.091)	0.673*** (0.07)
Train	2.602* (1.031)	3.854** (1.352)	1.06 (1.004)	3.835** (1.362)	0.963 (1.008)	0.982 (1.335)	-0.35 (1.229)
train^2	-2.67* (1.287)	-4.222* (1.697)	-0.848 (1.169)	-4.145* (1.691)	-0.723 (1.176)	-1.13 (1.56)	0.776 (1.578)
itrain				-0.163 (0.187)	-0.024 (0.154)	-1.67*** (0.431)	-0.542 (0.314)
Otrain				0.098 (0.388)	0.704* (0.347)	2.236* (1.134)	0.246 (0.956)
train x itrain						9.818*** (2.725)	3.71 (2.045)
train^2 x itrain						-10.123** (3.279)	-4.078 (2.418)
train x otrain						-13.198* (6.246)	1.318 (5.66)
train^2 x otrain						14.79* (6.842)	0.203 (5.506)

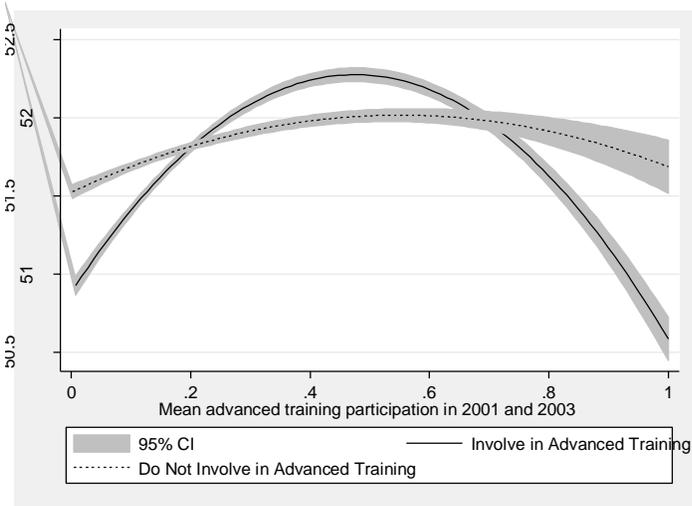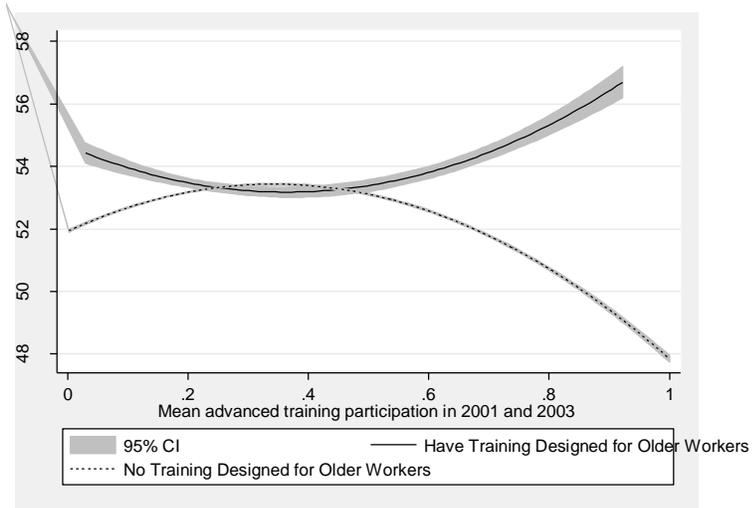*p<0.05; **p<0.01; ***p<0.001*

Figure 1a
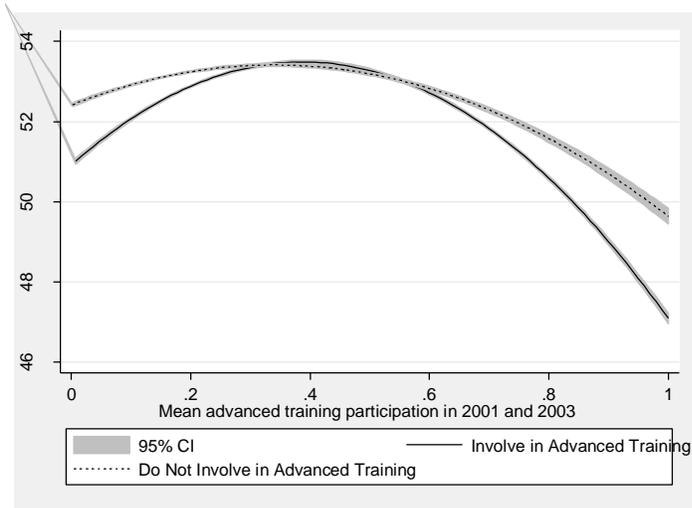
Establishment training participation and retirement age in men, by presence of involvement of
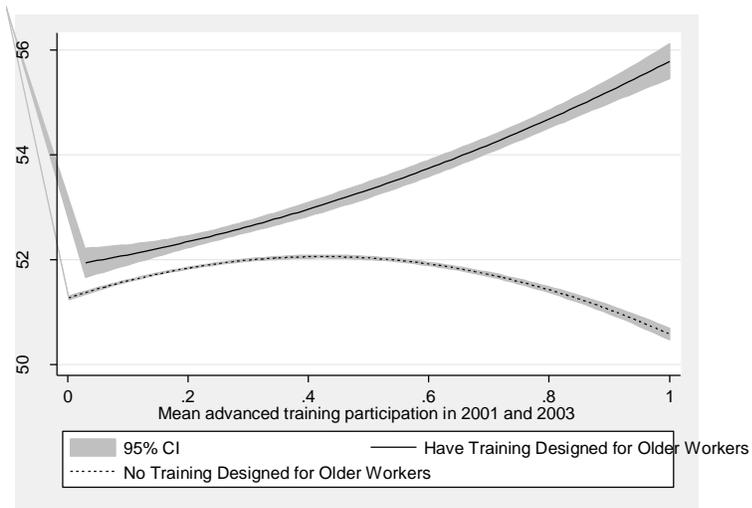
older workers in in-firm training.

Figure 1b

Establishment training participation and retirement age in women, by presence of involvement of
older workers in in-firm training.

Figure 2a

Establishment training participation and retirement age in men, by presence of advanced

training for older workers.

Figure 2b

Establishment training participation and retirement age in women, by presence of advanced

training for older workers.

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