The Impact of Automatic Enrollment in 401(k) Plans on Future Retirement Accumulations: A Simulation Study Based on Plan Design Modifications of Large Plan Sponsors

By Jack VanDerhei, Employee Benefit Research Institute

EXECUTIVE SUMMARY

SIGNIFICANCE OF AUTO-ENROLLMENT: Automatic enrollment of participants in 401(k) plans, which was encouraged by provisions in the Pension Protect Act of 2006, is designed to overcome the drawbacks of voluntary enrollment by getting more workers to save in their work place retirement plan. Auto-enrollment for 401(k) plans has been demonstrated by previous EBRI research to have substantial potential benefits for some employees.

NEW EBRI RESEARCH: This EBRI study analyzes plan-specific data of 1,000 large defined contribution plans for salaried employees from Benefit SpecSelect™ (Hewitt Associates LLC) in 2005 and 2009 to compare a subsample of plan sponsors that did not have auto-enrollment in 2005 but that had adopted it in 2009. Actual plan information on both actual auto-enrollment and actual match rate information were coded both before and after adoption of auto-enrollment from 225 large 401(k) plan sponsors and found that the average change was positive under auto-enrollment in each of the following three categories:

- The first-tier match rate.

- The effective match rate.

- The average total employer contribution rate.

MODELING ANALYSIS: This analysis created a series of simulation programs using these data. The analysis indicates that the adoption of automatic enrollment in 401(k) plans is likely to have a very significant positive impact (even greater than EBRI projected in 2008) in generating additional retirement savings for many workers, especially for young and low-income workers:

- Under baseline assumptions, the median 401(k) accumulations for the lowest-income quartile of workers currently age 25–29 (assuming all 401(k) plans were voluntary enrollment plans as typified by the 225 large plan sponsors described above) would only be 0.08 times final earnings at age 65.

- However, if all 401(k) plans are assumed to be using the large plan sponsor auto-enrollment provisions, the median 401(k) accumulations for the lowest-income quartile jumps to 4.96 times final earnings (if 401(k) participants revert back to the default contribution when they change jobs) and 5.33 times final earnings (if they retain their previous contribution level when they change jobs).

- There are also large increases even for high-income workers: The multiple under a voluntary enrollment scenario is 2.41 times final earnings compared with 9.15 or 9.81 under auto-enrollment, depending on the assumptions for employee reversion to default contribution rates upon job change.

Future EBRI research will examine the extent to which the increased 401(k) generosity resulted from modifications to defined benefit plans as pension plans were closed or frozen.

Report availability: This report is available on the Internet at www.ebri.org

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The Impact of Automatic Enrollment in 401(k) Plans on Future Retirement Accumulations: A Simulation Study Based on Plan Design Modifications of Large Plan Sponsors

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Introduction

A previous simulation study (Holden and VanDerhei, 2002) of workers participating in 401(k) plans with voluntary enrollment (VE) has shown that workers participating in these types of 401(k) plans may be able to generate account balances (and either retained in the original plan or rolled over to a successor employer or an individual retirement account) that replace a significant percentage of their preretirement income if they work for 401(k) plan sponsors their entire working careers.

However, if workers are not always eligible to participate in a 401(k) plan, the relative adequacy of the retirement income that may be generated by these plans falls substantially.[1] Moreover, there have been several studies[2] which simulate the likely retirement income generated under these plans for all (or a significant portion of) the work force. These studies also find evidence that significant portions of future retirees would reach retirement age with account balances too low (when combined with expected Social Security income) to achieve replacement rates that are able to meet conventionally defined targets (70 percent to 85 percent of preretirement income).

The concept of automatic enrollment (AE, also known as "negative election") has been familiar to those in the 401(k) field since the mid-1990s. However, the appeal of a legislative change to make this (and other "defined benefit-like" provisions) more popular as a plan design choice for 401(k) sponsors grew in recent years, as various industry studies demonstrated relatively low participation rates among young and low-income workers, and as more defined benefit plan sponsors began freezing their pension plans for future (and sometimes current) employees.[3]

Another simulation study in 2005[4] demonstrated how valuable AE designs would be to low-income 401(k) participants. A year later, the Pension Protection Act of 2006 (PPA) was enacted with several advantageous provisions for 401(k) sponsors with a specific type of AE design. While it will take several years to see whether this type of encouragement is sufficient to switch an overwhelming majority of 401(k) sponsors from a VE design to an AE design, this *Issue Brief* simulates (under several assumptions) the likely impact of this change on future 401(k) accumulations for a significant portion of workers (not just current 401(k) participants or those eligible to participate) if the switch is made. Moreover, it updates previous EBRI research (VanDerhei and Copeland, 2008) by using actual plan design modifications of large plan sponsors to estimate the employer response.

It should be noted that this analysis did not attempt to take the next step and evaluate what this change means with respect to the prospects of retirement income adequacy. Such an analysis needs to carefully consider Social Security benefits, net housing equity, individual retirement account (IRA) balances that do not originate from rollovers, as well as defined benefit (pension) accruals. Since PPA also substantially modified the funding requirements for defined benefit plans, researchers are still evaluating the extent to which this is likely to modify the current trends among pension plan sponsors to freeze defined benefit plans and/or modify their structure (for example, by converting them to cash balance plans). EBRI is currently revising its Retirement Security Projection Model® to provide a comprehensive analysis of the impact of PPA on retirement income adequacy.

In the interim, this report compares 401(k) accumulations (presented as a multiple of final earnings) with other targets available for determining whether these amounts, when combined with expected Social Security benefits, are likely to be adequate for those with no other sources of retirement income. While many of these targets use average longevity, average (historical) rates of return, and average (or no) retiree health care costs and/or nursing home costs, a 2006 EBRI simulation study[5] provided some benchmarks for what an individual may need as a multiple of final earnings to

have various chances of being able to meet basic retirement expenses plus any health care/nursing home costs not covered by Medicare (or Medicaid if asset and income thresholds are satisfied).

The analysis presented in this report indicates that the adoption of automatic enrollment in 401(k) plans is likely to have a very significant positive impact in generating additional retirement savings for many workers—especially for low-income workers.

For example, under the baseline set of assumptions used in this *Issue Brief*, the median 401(k) accumulations for the lowest-income quartile of workers currently age 25–29 (assuming all 401(k) plans were VE plans as typified by the large plan sponsors defined later in the analysis) would be only 0.08 times final earnings at age 65 (this is largely due to the fact that a sizeable percentage of workers—as opposed to participants—were assumed to have zero balances at age 65).

However, if all 401(k) plans are assumed to be using the large plan sponsor AE provisions, the median 401(k) accumulations for the lowest-income quartile jumps to 4.96 times final earnings under the assumption that 401(k) participants revert back to the default contribution when they change jobs and participate in a new 401(k) plan and 5.33 times final earnings under the assumption that the participants retain their previous contribution level when they change jobs.[6] Even when one considers the top 25 percent of these workers (when ranked by 401(k) accumulations as a multiple of final earnings), there are large increases: the multiple under a VE scenario is 2.41 times final earnings whereas AE provides multiples of either 9.15 or 9.81, depending on the assumptions for employee reversion to default contribution rates upon job change.

Previous Research

The retirement income prospects for future generations of retirees have been modeled by EBRI extensively in recent years, in an attempt to more accurately predict how various cohorts of Americans will likely fare in retirement. Results have ranged from very bleak for substantial portions of the U.S. population[7] to fairly positive for 401(k) participants with continuous coverage throughout their working careers: Results suggest a significant portion of these workers' preretirement income could be replaced by 401(k) accumulations when combined with Social Security (at least Social Security benefits projected under current statutory provisions).

There have been two types of simulation studies in recent years attempting to model the likely retirement income generated by 401(k) plans:

- Those based on administrative records of individual employees currently participating in 401(k) plans, and

- Those based on all (or a significant percentage of) workers whether they are currently participating in a 401(k) plan or not.

While each type of simulation model has relative strengths and limitations, it is important to understand that they are designed to answer different questions, or at least answer questions for different subsets of the population. The first portion of this section highlights the major findings from one type of these models before moving to an explanation of the hybrid model used in VanDerhei and Copeland (2008)—one that utilizes parameters estimated from administrative records of actual participants and applies them to a broad segment of the entire population of workers.

The second portion of this section summarizes recent research by Soto and Butricia (2009) which concluded that, among a sample of large 401(k) plans, match rates are lower among firms with automatic enrollment than among those without automatic enrollment after controlling for firm characteristics. Using plan-specific data for large employers from Hewitt Associates, EBRI analysis finds that employers instituted higher matching rates when adopting AE, and did so when measured by several different standards. The results are summarized and the data set used in the subsequent simulation modeling is described.

Simulation Studies Based on 401(k) Participants in the EBRI/ICI Database

Assuming that 401(k) accumulations were used to purchase nominal annuities at age 65, the EBRI/ICI 401(k) Accumulation Projection Model (Holden and VanDerhei, 2002) predicts baseline median replacement rates at retirement ranging from 51–69 percent, based on final five-year average salary ("replacement rate" meaning the percentage of a worker's final salary that is replaced in retirement by a nominal annuity purchased with 401(k) assets). However, these baseline results were predicated on the assumption that any worker currently participating in a 401(k) plan would *continue to be offered* a 401(k) plan for each future job. If it is assumed that the worker would have only an *average* chance of being offered a 401(k) plan at future jobs, the income replacement rates decrease to a range of 21–26 percent. While this scenario is too pessimistic to be correct, the disparity between the two sets of results demonstrates the importance of continued participation in a 401(k) plan throughout an employee's working career.

Phrased another way, a crucial factor in the future retirement security of many Americans is *whether they continue to be offered* a 401(k) plan when they change jobs, and, if they are, *whether they continue to participate* in it and contribute at a significant level of savings. Moreover, Holden and VanDerhei (2002) conducted additional sensitivity analysis that showed an increase in median replacement rates from 5 to 13 percentage points if 401(k) participants do not cash out their balances at job change.

Modeling the Impact of Automatic Enrollment

A year prior to the enactment of the PPA, the EBRI/ICI 401(k) Accumulation Projection Model was used to simulate the impact of universal adoption of AE features under a combination of default contribution rates and default investment allocations.[8] In order that the beneficial effect of the expected increase in participation rates could be included in simulation results, "synthetic" employees were generated in the model to include eligible workers who chose *not to participate* in the 401(k) plan. When these employees were added to the model, the median replacement rates under the baseline assumption mentioned above decreased significantly for the lowest-income quartile (23 percent, down from 51 percent) but only mildly for the highest-income quartile (56 percent, down from 67 percent).

Assuming that *all* 401(k) plan sponsors would adopt automatic enrollment immediately (in 2005), the median replacement rates for the lowest-income quartile increased to 37 percent (from the 23 percent baseline) even under the conservative assumptions of a 3 percent default contribution rate and a money market default investment. When the default contribution rate was increased to 6 percent and the default investment was changed to a life-cycle (or target-date) fund, the median replacement rate for this group increased further to 52 percent.[9] These results illustrate the very strong improvements that can result from AE of workers in a 401(k) plan—especially for the lowest-income workers. However, because this study was written a year prior to the enactment of PPA, it did not include any modeling on automatic escalation of employee contributions.

One of the extremely important plan design decisions a 401(k) plan sponsor must make is whether to introduce automatic enrollment features. There is extensive literature on the potential benefits of AE on participation rates, especially for young employees and those with low incomes.[10] However, there is also a recognition that the introduction of these programs has a tendency to "anchor" participants' contribution rates and asset allocation to the defaults chosen by the sponsor;[11] hence, the overall increase in expected account balances from adopting these "automatic" 401(k) plans will be a function of both the employee's relative wage level and the employer's default decisions.

Modeling the Impact of Automatic Escalation of 401(k) Contributions

Although the automatic escalation of 401(k) contributions described above has been shown to potentially increase employee contributions considerably in a limited number of test cases,[12] these experiments have simply been too recent to show how long and/or to what extent workers are likely to continue the periodic escalations before opting out of any additional increases. There has been detailed exploration of the impact of AE on participation decisions, investment allocations, and the desired contribution rate in the pre-PPA environment; however, the inability to measure the worker's optimal stopping point in the automatic escalation process has made it difficult to simulate the impact of PPA on 401(k) accumulations.

Fortunately, as part of the 2007 Retirement Confidence Survey (RCS),[13] this information could be elicited from 456 employees who were currently contributing to a 401(k) plan, based on their responses to the following question:[14]

> *Suppose your employer automatically increased the percentage of your salary contributed to the plan by 1% each time you received a raise. For example, your contribution might increase from 3% to 4% of your salary with your first raise, and from 4% to 5% with your next raise. You could choose to discontinue the automatic increase at any time. At about what percentage of your salary do you think you would discontinue the automatic increase?*

Three percent of the employees responded that they would discontinue the increase immediately or before the first raise. Twenty-five percent indicated a percentage between 1–5 percent, while another 44 percent estimated they would continue until some place in the 6–10 percent range. Thirteen percent chose a limit between 11–15 percent, while 14 percent indicated they would allow the increase to exceed 15 percent. While there is no guarantee that the survey responses will reflect how 401(k) participants will actually react when given the chance to opt out of additional increases in deferrals, it does provide a useful contrast to the simplistic assumption that all 401(k) participants will allow the annual increase until it reaches a point pre-specified by the employer.[15]

This information was added into the simulation model's baseline assumptions from the 2005 simulation study mentioned above with a 3 percent initial default contribution rate and life-cycle default investment (VanDerhei, 2007). These plan design assumptions were rather obvious, given the requirements for the PPA safe-harbor and the Qualified Default Investment Alternative regulations;[16] however, setting the proper values for other assumptions proved somewhat more problematic.

For example, take the question of whether employees are likely to maintain their higher contribution rate from a prior job when it comes to setting the initial contribution rate with a new employer. If employees start at a 3 percent contribution rate with the first employer and leave when they have already increased the contribution rate to 6 percent, will they *maintain their contribution rate* when they move to the second employer? Or would they *start over,* and drop back down to 3 percent? Since it will likely be years before researchers have sufficient information to determine which of these scenarios is more likely, and for whom, the results were simulated separately for both scenarios.

This type of simulation model was expanded by VanDerhei and Copeland (2008) to apply to all workers as opposed to just 401(k) participants and eligible nonparticipants. Given the close proximity to the enactment of PPA, it was still too soon to analyze how plan sponsors were likely to change their plan design parameters when they changed from VE to AE plans. Therefore, the 2008 study estimated a joint distribution of asset allocation and total (employee and employer) contributions for VE and assumed all AE plan sponsors would adopt the safe harbor provisions specified under PPA. This current *Issue Brief* is able to relax these assumptions by focusing on a group of 225 large plan sponsors that had modified their 401(k) plans from VE in 2005 to AE by 2009, as detailed below.

The Impact of Adopting Automatic Enrollment on Employer Contribution Rates

Soto and Butrica (2009) conclude that among a sample of large 401(k) plans, match rates are lower among firms with automatic enrollment than among those without automatic enrollment after controlling for firm characteristics. However, there were two major limitations of this analysis:

- This study was based on U.S. Department of Labor Form 5500 data that *do not include* specific information on 401(k) match rates. Instead, the authors constructed an estimate for the match rate as the ratio of employer-to-employee contributions for each 401(k) plan.

- They merged the Form 5500 data with information on automatic enrollment from the *Pensions & Investments* database of the top 1,000 pension funds, which includes a flag indicating whether plan administrators reported offering automatic enrollment in their defined contribution (401(k)-type) plans. However, this database does not

report the year that the automatic enrollment provision was adopted, so there is no way to tell from this data source how long auto-enrollment had been implemented in a plan.

The authors ran regression analysis on this database and produced a finding that:

> suggests a negative relationship between automatic enrollment and match rates and is statistically significant at the firm-level. In particular, match rates are about 7 percentage points lower among firms with automatic enrollment than among those without automatic enrollment, after controlling for firm characteristics.

The authors correctly point out that although the regressions *suggest* a relationship between automatic enrollment and match rates, they do <u>not</u> necessarily imply that auto-enrollment *causes* lower match rates; however, this crucial qualification has been generally ignored in third-party accounts of the study.

Earlier EBRI Research

These conclusions conflict with previous EBRI research published in 2007,[17] which surveyed Mercer Human Resource Consulting defined benefit plan sponsors to gauge their recent activity and planned modifications to their defined benefit (pension) and defined contribution (401(k)-type) plans. The survey also was able to determine what, if any, increases in employer contributions to defined contribution plans were provided in conjunction with reductions to their defined benefit plans.

Although the association between the adoption of automatic enrollment and employer contributions to 401(k) plans was not the focus of this study, one-third of the defined benefit plan sponsors surveyed indicated that they had already increased or planned to increase their <u>employer match</u> to a defined contribution plan, and 20.9 percent indicated that that they had already increased or planned to increase their <u>nonmatching</u> employer contributions to a defined contribution plan. There was some overlap between the two groups, but overall, 42.5 percent of the defined benefit plan sponsors surveyed indicated that they had already increased or planned to increase their employer match and/or nonmatching employer contribution to a defined contribution plan. This was particularly true of defined benefit plan sponsors that had either closed a defined benefit plan to new hires or frozen the plan to all members in the last two years or planned to do so in the next two years.[18]

Moreover, the 2007 EBRI study found an extremely large correlation between the adoption of automatic enrollment for a 401(k) plan and the freezing or closing of the defined benefit plan.[19] Of those defined benefit plan sponsors that had closed their defined benefit plans in the last two years, 80.5 percent had either already adopted or were currently considering adopting automatic enrollment features for their 401(k) plans. Of those defined benefit plan sponsors that had closed their defined benefit plans in the last two years, 76.1 percent had either already adopted or were currently considering adopting automatic enrollment features for their 401(k) plans.[20]

EBRI's New Research and Methodology

This study analyzes in detail plan-specific data of approximately 1,000 large defined contribution plans for salaried employees from Benefit SpecSelect™ (a trademark of Hewitt Associates LLC) in 2005 and 2009. From that information, a subsample of plan sponsors was created that had adopted automatic enrollment 401(k) plans by 2009, but did not have them in 2005 (the last observation that was not influenced by PPA). The following information was coded for each plan:

- The default contribution rate for the AE plan in 2009.
- The entire match rate contribution formulae for both years.[21]
- All nonelective contributions paid to the defined contribution participants by the employer.

Whether plan sponsors were more or less generous after adopting AE was measured with three different metrics:

- The average 2009 first-tier match rate was 87.78 cents for each dollar contributed, while the average 2005 first-tier match rate was 81.26 cents for each dollar contributed. The difference of 6.52 cents for each dollar contributed suggests that, to the extent that this sample is representative of the universe of large 401(k) sponsors, those sponsors adopting AE were *more generous* to the 401(k) participants when measured by this variable after automatic enrollment was implemented than they were before.

- The average effective match rate[22] for 2009 was 4.32 percent of compensation, but only 4.00 percent of compensation in 2005. The increase of 0.32 percentage points again suggests that large 401(k) sponsors adopting AE were *more generous* to the 401(k) participants when measured by this variable after the adoption of automatic enrollment than before.

- The average total employer contribution rate[23] for 2009 was 6.35 percent of compensation and 5.46 percent of compensation in 2005. The increase of 0.89 percentage points once more suggests that those large 401(k) sponsors adopting AE were *more generous* to the 401(k) participants when measured by this variable than before.

Influence of Defined Benefit Plan Activity

This information was then combined with the defined benefit information for the same sponsor in an attempt to analyze whether EBRI's 2007 findings of the association between defined benefit freezing/closing and enhanced 401(k) contributions were corroborated. Figure 1 demonstrates that the average improvements for all three metrics were much higher for sponsors that had frozen/closed their defined benefit plans than for the overall average. For example, the change in the total employer contribution rate for all frozen plans was 1.64 percent of compensation versus 0.89 percent for the overall average. Employers that had closed their defined benefit plans to new employees had an even larger average improvement: 2.82 percent of compensation.

The defined benefit plan sponsors that had frozen or closed their plans were then split into those that had done so prior to adopting AE and those that had changed their defined benefit plans between 2005 and 2009. If the hypothesis that the 401(k) improvements were a result, at least partially, of a simultaneous quid pro quo for the decreased accruals in the defined benefit plan, one would expect that the earlier modifications would be less generous than the modifications that took place approximately at the time of the conversion to AE. In fact, this is exactly what is found for all six comparisons in Figure 1. For example, the average total employer contribution improvement for firms that had frozen their plans prior to 2005 was 0.69 percent of compensation, compared with 2.45 percent for those that froze between 2005 and 2009. Similar evidence is found for those that closed their pension plans to new employees: The average improvement in total employer 401(k) contribution was only 0.56 percent of compensation for those that closed prior to 2005, but 3.34 percent for those that closed the plan between 2005 and 2009.

Model Assumptions

The primary objective of this study is to provide an assessment of how "401(k) accumulations" (namely, retirement income available at age 65 that originated in a 401(k) plan—whether or not it is still in an employer's 401(k) plan or has been rolled over to an IRA) are likely to be affected by a move from voluntary enrollment to automatic enrollment. As it is far too soon to analyze what percentage of 401(k) sponsors with voluntary enrollment (VE) will adopt an automatic enrollment (AE) approach, similar to previous EBRI analysis of defined benefit freezes,[24] this analysis models the scenario in which all VE sponsors switch to AE.

In an attempt to make the modeling more tractable, several simplifying assumptions are adopted in this version of the model:

- First, it is assumed that the legislative and regulatory modifications for defined benefit and defined contribution plans resulting from passage of PPA will not increase the percentage of workers eligible to be covered by 401(k) plans in the future.

Figure 1
Modifications to Employer Contributions to 401(k) Plans That Adopted Automatic Enrollment Between 2005–2009, by Modifications to Defined Benefit Plans (If Any)

Modification to Defined Benefit Plan	Change in First-tier Match Rate	Change in Effective Match Rate	Change in Total Employer Contribution Rate
Frozen	14.68%	0.73%	1.64%
Prior to 2005	10.29%	0.24%	0.69%
Between 2005 and 2009	18.40%	1.15%	2.45%
Closed to New Employees	15.06%	0.58%	2.82%
Prior to 2005	5.56%	0.22%	0.56%
Between 2005 and 2009	17.26%	0.66%	3.34%
Grand Total	6.52%	0.32%	0.89%

Source: EBRI analysis of plan-specific data from Benefit SpecSelect™ (a trademark of Hewitt Associates LLC).

- Second, the results from this model are limited exclusively to salaried employees of the 225 large defined contribution plan sponsors in the Hewitt Associates' Benefit SpecSelect™ data. At the present time, EBRI does not have sufficient data to analyze how these results would change if the database were expanded to smaller employers and/or hourly employees. It is important to note this caveat when interpreting the results of the model below.

The new simulation model constructed for this study adopts the basic structure of the EBRI/ERF Retirement Income Projection Model.[®25] The model is based on private-sector wage and salary workers ages 21–64 with at least $10,000 in annual earnings found in the 2001 Survey of Income and Program Participation (SIPP) Topical Module 7.[26] A predicted ratio of wage to average national wages was estimated as a function of gender, education level, and age similar to that used in Holden and VanDerhei (2002) and future average national wages were assumed to follow the intermediate assumptions used by the Board of Trustees of the OASDI Trust Funds.[27] Initial and subsequent eligibility for both types of 401(k) plans and participation in a VE plan was based on an integration of the distribution of defined contribution plan participant status by age and earnings found in the Census Bureau's Survey of Income and Program Participation (SIPP) along with the participation probabilities among eligible employees in VE plans from Fidelity Investments (2007).

Additional employee behavior in voluntary enrollment plans was based on a joint distribution of asset allocation and contribution behavior as a function of employee age and income from the year-end 2008 EBRI/ICI Participant-Directed Retirement Plan Data Collection Project (VanDerhei, Holden, and Alonso, 2009). Participation behavior, contribution activity, and asset allocation for automatic enrollment plans were based on an integration of data from Nessmith, Utkus and Young (2007); Fidelity (2007); and Choi, Laibson and Madrian (2004). All simulation results were based on simulated annual returns as described in Park (2009).

Perhaps the most challenging set of assumptions to develop in a model of this type is the serial correlation of 401(k) plan eligibility between jobs. The baseline case in Holden and VanDerhei (2002) assumed that, if an employee was a 401(k) participant in the current job, this status would remain constant in every subsequent job until retirement. Knowing that this was certainly too optimistic for many employees, sensitivity analysis was provided by assuming that there would only be a random chance of being eligible for a 401(k) plan in a subsequent job.

Until empirical information is available to track individual employees from one job to the next and track their 401(k) eligibility status, one needs to rely on some type of assumption with respect to this variable. Since there appears to be a well-documented body of evidence that individuals with a propensity to save would seek out 401(k) sponsors (or vice versa),[28] an admittedly ad-hoc approach was developed to compute eligibility probabilities conditional upon the eligibility status on the previous job, as shown below:

Let z = unconditional probability of being covered (empirical value as a function of age and wage).

Let x = probability of being covered given that your last job was covered.

Let y = probability of being covered given that your last job was NOT covered.

VanDerhei and Copeland (2008) analyzed two cases for x:[29]

1. Complete independence (e.g., x=z=y).

2. An ad-hoc assumption that the value of x will be half-way between the unconditional value and 100 percent. In other words, $x = (1+z)/2$ and $y = (z-.5*(z)(1+z))/(1-z)$.

There is no way to tell at this point which of these assumptions is likely to be more realistic. However, all simulations were conducted using *both* sets of assumptions to check the sensitivity of the results in VanDerhei and Copeland (2008) and there were not significant differences between the two assumptions in most cases. All results in the current study make use of the second assumption.

Since this study focuses on account balances in a current or previous employer's 401(k) as well as any IRA rollovers originating in 401(k) accounts, it simulates the likelihood that a participant will cash out the 401(k) balance at job termination,[30] as well as the likelihood of leaving it with the previous employer or rolling it over to the new employer or an IRA. The current model uses a similar approach to Holden and VanDerhei (2002) for this decision. [31]

The analysis in this *Issue Brief* is entirely forward-looking: It only tracks accumulations resulting from post-2009 contributions. All existing balances are ignored, which makes the concept of a replacement ratio (or indeed any proxy for retirement income adequacy for all but the youngest age cohorts) beyond the scope of this report. Instead, the 401(k) accumulations are reported as multiples of final earnings available at age 65.

Figure 2 provides the median post-2009 401(k) accumulations as a multiple of final earnings for both VE plans (with the 2005 plan formulae) and AE plans (with the 2009 plan formulae) as a function of current age. In both cases, the older cohort will have only minimal accumulations due to their proximity to retirement; but even for those currently in their late 50s, the median multiples are approximately twice as large for the AE plans when compared with the VE plans. Differences in type of 401(k) plan obviously have the largest impact on the youngest cohorts, who would have the most time in the work force to experience the difference. For those currently ages 25–29, the difference in the median multiples would be approximately 2.39 times final salary in an AE-plan relative to a VE-plan.

However, when one considers the 75th percentile of each age cohort (i.e., those with a multiple higher than three out of four workers their age) in Figure 3, the magnitude of the differences are much smaller and virtually nonexistent after age 50. The difference between the two figures is due to some very well-known influences of automatic enrollment. While the primary benefit of increasing participation rates is extremely important for those groups with chronically low rates (the young and the low-income), there have been some well-documented limitations with respect to a significant percentage of these participants never saving more than the default contribution rates set by the employer under AE plans. Several studies have shown that under VE plans, workers who choose to participate tend to cluster around the maximum amount that the employer will match (traditionally 6 percent of compensation)[32] while employees in AE plans often maintain the default contribution rate (traditionally 3 percent of compensation) for a significant period of time unless automatic escalation is included in the plan design. Holden and VanDerhei (2005) showed the likely impact of switching to AE plans as a function of salary, and in some scenarios the medians for the higher-income workers actually fell. Again, this was prior to PPA and did not include the introduction of automatic escalation of worker contributions, which should help to mitigate the lower relative balances for some AE participants.

The remaining analysis in this *Issue Brief* focuses on employees currently ages 25–29. This serves two purposes: (1) it indicates what the maximum impact of a change from VE to AE is likely to be in the future, and (2) it allows refinement of the results with respect to additional percentiles in the distribution analysis as well as the impact of salary and number of years participating in a 401(k) plan on the final balances.

Figure 2
Auto-Enrollment (With 2009 Formulae)
vs. Voluntary Enrollment (With 2005 Formulae): 50th Percentiles
(assuming future eligibility is a function of current eligibility)
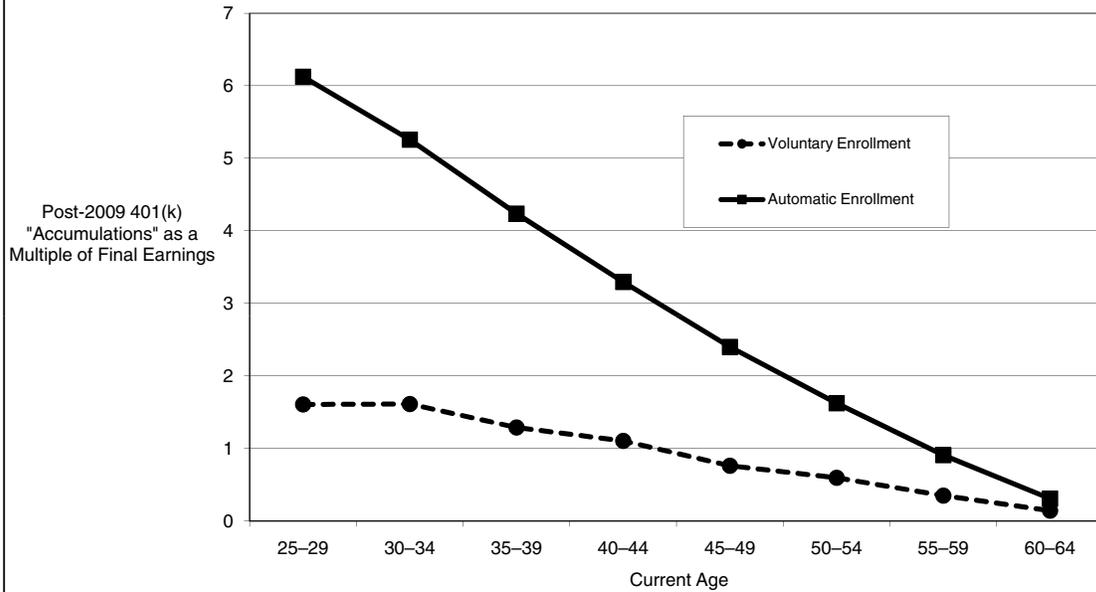
Post-2009 401(k)
"Accumulations" as a
Multiple of Final Earnings

Current Age

Source: EBRI/ERF Retirement Security Projection Model,® versions 100205a1 and 100205b1. See text for explanations of models and assumptions.

Figure 3
Auto-Enrollment (With 2009 Formulae)
vs. Voluntary Enrollment (With 2005 Formulae): 75th Percentiles
(assuming future eligibility is a function of current eligibility)
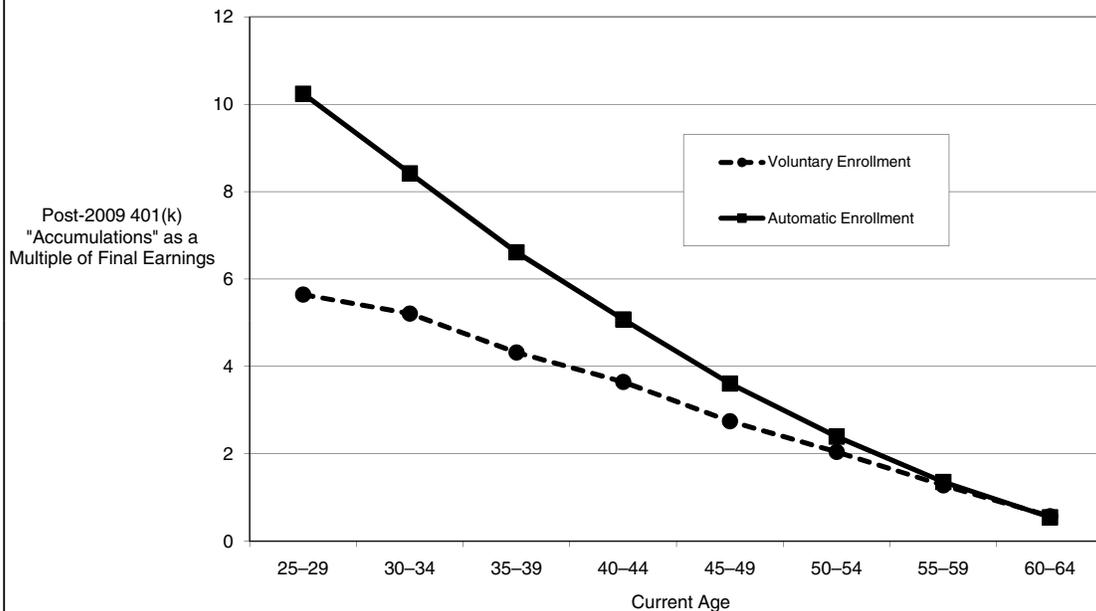
Post-2009 401(k)
"Accumulations" as a
Multiple of Final Earnings

Current Age

Source: EBRI/ERF Retirement Security Projection Model,® versions 100205a1 and 100205b1. See text for explanations of models and assumptions.

Figure 4
Auto-Enrollment (With 2009 Formulae) vs. Voluntary Enrollment (With 2005 Formulae):
Post-2009 401(k) "Accumulations" as a Multiple of Final Earnings for Those Currently Ages 25–29
(baseline assumptions)

Panel A: Total Accumulations

Voluntary Enrollment

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
1	0.00	0.00	0.00	0.08	2.41	6.30	9.75
2	0.00	0.00	0.00	1.14	4.34	8.76	12.56
3	0.00	0.00	0.00	2.25	6.11	11.22	15.77
4	0.00	0.00	0.78	4.27	9.10	15.61	21.57

Automatic Enrollment

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
1	0.00	0.00	0.16	4.96	9.15	14.27	18.83
2	0.00	0.00	1.62	5.96	10.07	15.68	20.51
3	0.00	0.00	2.51	6.49	10.60	16.22	21.28
4	0.00	0.00	3.08	6.83	11.00	16.93	22.36

Panel B: Accumulations Attributable to Employer Contributions Only

Voluntary Enrollment

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
1	0.00	0.00	0.00	0.03	1.15	3.08	4.78
2	0.00	0.00	0.00	0.50	1.98	4.05	5.92
3	0.00	0.00	0.00	0.98	2.60	4.82	6.85
4	0.00	0.00	0.30	1.61	3.32	5.76	8.00

Automatic Enrollment

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
1	0.00	0.00	0.08	1.95	3.85	6.36	8.53
2	0.00	0.00	0.65	2.35	4.27	6.92	9.43
3	0.00	0.00	0.97	2.59	4.53	7.28	9.80
4	0.00	0.00	1.20	2.77	4.75	7.65	10.21

Source: EBRI/ERF Retirement Security Projection Model,[®] versions 100205a1 and 100205b1. See text for explanations of models and assumptions.

Figure 5
Auto-Enrollment (With 2009 Formulae) vs. Voluntary Enrollment (With 2005 Formulae):
Post-2009 401(k) "Accumulations" as a Multiple of Final Earnings for Those Currently Ages 25–29
Alternative (lower) rate of return assumptions

Panel A: Total Accumulations

Voluntary Enrollment

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
1	0.00	0.00	0.00	0.00	1.33	3.36	4.74
2	0.00	0.00	0.00	0.68	2.47	4.40	5.67
3	0.00	0.00	0.00	1.31	3.39	5.43	6.91
4	0.00	0.00	0.50	2.59	4.92	7.39	9.15

Automatic Enrollment

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
1	0.00	0.00	0.04	3.11	5.13	6.94	8.20
2	0.00	0.00	0.96	3.64	5.45	7.22	8.45
3	0.00	0.00	1.57	3.95	5.64	7.35	8.59
4	0.00	0.00	1.98	4.13	5.77	7.49	8.75

Panel B: Accumulations Attributable to Employer Contributions Only

Voluntary Enrollment

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
1	0.00	0.00	0.00	0.00	0.64	1.61	2.30
2	0.00	0.00	0.00	0.30	1.11	1.99	2.68
3	0.00	0.00	0.00	0.57	1.42	2.30	2.98
4	0.00	0.00	0.18	0.97	1.76	2.63	3.28

Automatic Enrollment

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
1	0.00	0.00	0.02	1.19	2.10	3.04	3.69
2	0.00	0.00	0.39	1.39	2.26	3.18	3.83
3	0.00	0.00	0.61	1.52	2.37	3.25	3.90
4	0.00	0.00	0.76	1.62	2.45	3.33	3.99

Source: EBRI/ERF Retirement Security Projection Model,[®] versions 100205a2 and 100205b2. See text for explanations of models and assumptions.

Figure 4 compares several distribution percentiles for post-2009 401(k) accumulations as a multiple of final earnings for workers currently ages 25–29 for automatic enrollment versus the results expected under voluntary enrollment as a function of salary quartile. This type of analysis has the advantage of showing how well those in the upper and lower ends of the distributions will do under the two types of programs, in addition to those in the middle of the distribution. Panel A of Figure 4 compares AE with VE plans for total accumulations (those resulting from both employee and employer contributions). It is clear that AE dominates VE throughout the percentile distributions, but the relative differentials for the higher-salary quartiles are much smaller than those for their lower-paid counterparts.

Although Panel A of Figure 4 appears to provide significant support for the notion that the trend from VE to AE 401(k) plans will improve employees' 401(k) accumulations (especially for the low-income employees), there is still an open question with respect to the extent to which employees are financing this increase through their own contributions. Panel B of Figure 4 performs a similar comparison to Panel A; however, in this case only accumulations attributable to *employer* contributions (whether matching or nonelective) are included. Similar to Panel A, all percentiles for each salary quartile are larger under AE than VE. For example, the median accumulation attributable to employer contributions only for the lowest income quartile is is merely 0.03 times final earnings under VE but 1.95 times final earnings under AE. Although the relative median differences decrease with increasing salary, the differential is still quite large for the highest-salary quartile (1.61 for VE vs. 2.77 for AE).

Figure 5 provides the same analysis as Figure 4, however with a lower set of assumed rates of return.[33] Each set of medians decreases to approximately 60 percent of the value in Figure 4 with the lower-return assumptions.[34]

Figure 6 provides a sensitivity analysis on the baseline assumption that employees do not "remember" what their contribution rate was from their previous 401(k) plan or, due to inertia, simply rely on the default employee contribution rate when they begin their participation in a 401(k) plan with a new employer. When this assumption is modified and employees are instead given the contribution rate they had with their previous 401(k) plan when they change jobs, the median total accumulations increase by approximately 7 percent while the median accumulations attributable to employer contributions increase by approximately 3 percent.[35]

Figure 7 provides another sensitivity analysis from the baseline assumptions in Figure 4. Similar to the analysis first undertaken in Holden and VanDerhei (2002), this figure shows the impact of assuming that employees do not cash out their 401(k) balances when they change jobs. As expected, the gains from making this change are the most dramatic for the lowest-income quartile under VE plans, with a gain of 812 percent. The gains drop quickly for VE plans as one moves up the salary distribution due to the much larger account balances generated. The second income quartile would have an increase of 37 percent in the median, and the third-income quartile's median would increase by 15 percent. The top income-quartile median would increase only by 4 percent. In contrast, the medians from AE plans would have a much smaller percentage increase: only 14 percent for the lowest-income quartile, dropping down to 3 percent for the top-income quartile.

Figures 8, 9, 10, and 11 present another way of analyzing the 401(k) accumulations of VE plans versus AE plans. Given that this version of the simulation model assumes no impact on the likelihood a worker will be eligible for a 401(k) plan, it is possible that much of the differential between these types of plans will be simply due to the "luck of the draw" as to whether an individual works for an employer that sponsors a 401(k) plan. Therefore, the median 401(k) accumulations are analyzed not only by salary but also by the number of simulated years these individuals have been eligible to participate in a 401(k) plan (whether or not they actually choose to participate in a VE plan or opt out of participation in an AE plan). Figure 8 provides this analysis for the total accumulations under AE plans, while Figure 9 shows only the portion of the AE plan accumulations attributable to employer contributions. Figures 10 and 11 provide similar analysis for VE plans.

Comparing the total accumulations for VE plans with the AE plans (see Figures 8 and 10) shows that there is much less difference in median 401(k) accumulations for high-income employees than for their lower-income counterparts. For example, among employees with 31–40 years of eligibility, the median VE total accumulations are 71 percent of those

Figure 6
Auto-Enrollment (With 2009 Formulae) vs. Voluntary Enrollment (With 2005 Formulae):
Post-2009 401(k) "Accumulations" as a Multiple of Final Earnings for Those Currently Ages 25–29
(impact of whether employee "remembers" contributions from previous 401(k) plan)

Panel A: Total Accumulations

Automatic Enrollment (assuming employee does remember)

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
1	0.00	0.00	0.23	5.33	9.81	15.26	19.98
2	0.00	0.00	1.76	6.39	10.82	16.83	21.84
3	0.00	0.00	2.67	6.97	11.46	17.46	22.94
4	0.00	0.00	3.28	7.33	11.89	18.28	23.97

Automatic Enrollment (assuming employee does not remember)

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
1	0.00	0.00	0.16	4.96	9.15	14.27	18.83
2	0.00	0.00	1.62	5.96	10.07	15.68	20.51
3	0.00	0.00	2.51	6.49	10.60	16.22	21.28
4	0.00	0.00	3.08	6.83	11.00	16.93	22.36

Panel B: Accumulations Attributable to Employer Contributions Only

Automatic Enrollment (assuming employee does remember)

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
1	0.00	0.00	0.10	2.00	3.92	6.44	8.68
2	0.00	0.00	0.68	2.41	4.36	7.05	9.60
3	0.00	0.00	1.01	2.66	4.63	7.40	9.96
4	0.00	0.00	1.23	2.84	4.84	7.78	10.40

Automatic Enrollment (assuming employee does not remember)

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
1	0.00	0.00	0.08	1.95	3.85	6.36	8.53
2	0.00	0.00	0.65	2.35	4.27	6.92	9.43
3	0.00	0.00	0.97	2.59	4.53	7.28	9.80
4	0.00	0.00	1.20	2.77	4.75	7.65	10.21

Source: EBRI/ERF Retirement Security Projection Model,® versions 100205a1 and 100205a7. See text for explanations of models and assumptions.

Figure 7
Auto-Enrollment (With 2009 Formulae) vs. Voluntary Enrollment (With 2005 Formulae):
Post-2009 401(k) "Accumulations" as a Multiple of Final Earnings for Those Currently Ages 25–29
(assuming no cashouts)

Panel A: Total Accumulations

Voluntary Enrollment

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
1	0.00	0.00	0.00	0.74	3.00	6.88	10.32
2	0.00	0.00	0.05	1.56	4.74	9.20	13.03
3	0.00	0.00	0.38	2.60	6.42	11.60	16.16
4	0.00	0.00	1.00	4.44	9.31	15.97	21.99

Automatic Enrollment

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
1	0.00	0.00	1.30	5.68	9.78	14.99	19.71
2	0.00	0.00	2.27	6.46	10.54	16.32	21.24
3	0.00	0.00	2.91	6.84	11.00	16.77	21.90
4	0.00	0.00	3.27	7.01	11.21	17.29	22.79

Panel B: Accumulations Attributable to Employer Contributions Only

Voluntary Enrollment

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
1	0.00	0.00	0.00	0.34	1.47	3.37	5.08
2	0.00	0.00	0.02	0.72	2.17	4.26	6.17
3	0.00	0.00	0.16	1.15	2.76	5.02	7.01
4	0.00	0.00	0.39	1.69	3.42	5.88	8.12

Automatic Enrollment

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
1	0.00	0.00	0.57	2.27	4.17	6.74	9.07
2	0.00	0.00	0.94	2.59	4.53	7.29	9.83
3	0.00	0.00	1.16	2.76	4.74	7.56	10.13
4	0.00	0.00	1.30	2.87	4.88	7.82	10.43

Source: EBRI/ERF Retirement Security Projection Model,® versions 100205a5 and 100205b5. See text for explanations of models and assumptions.

Figure 8
Employees Currently Ages 25–29:
Median 401(k) Accumulation Multiples for Auto-Enrollment With 2009 Plan Formulae
as a Function of Salary Quartile and Number of Years Eligible for a 401(k) Plan
(Total balances, baseline assumptions)
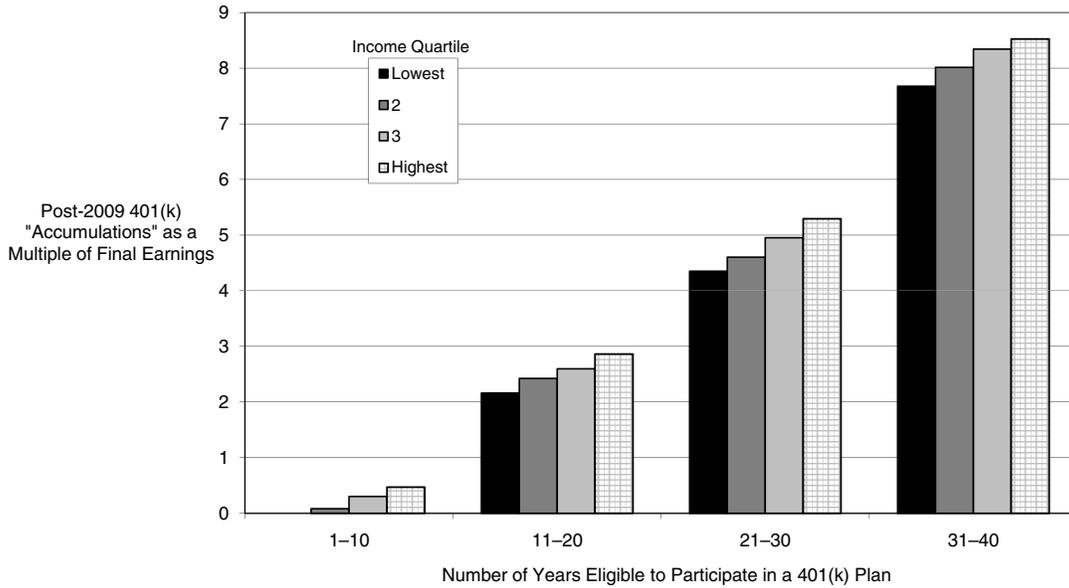
Source: Source: EBRI/ERF Retirement Security Projection Model,® version 100205a4 . See text for explanations of models and assumptions.

Figure 9
Employees Currently Ages 25–29:
Median 401(k) Accumulation Multiples for Auto-Enrollment With 2009 Plan Formulae
as a Function of Salary Quartile and Number of Years Eligible for a 401(k) Plan
(Balances attributable to employer contributions, baseline assumptions)

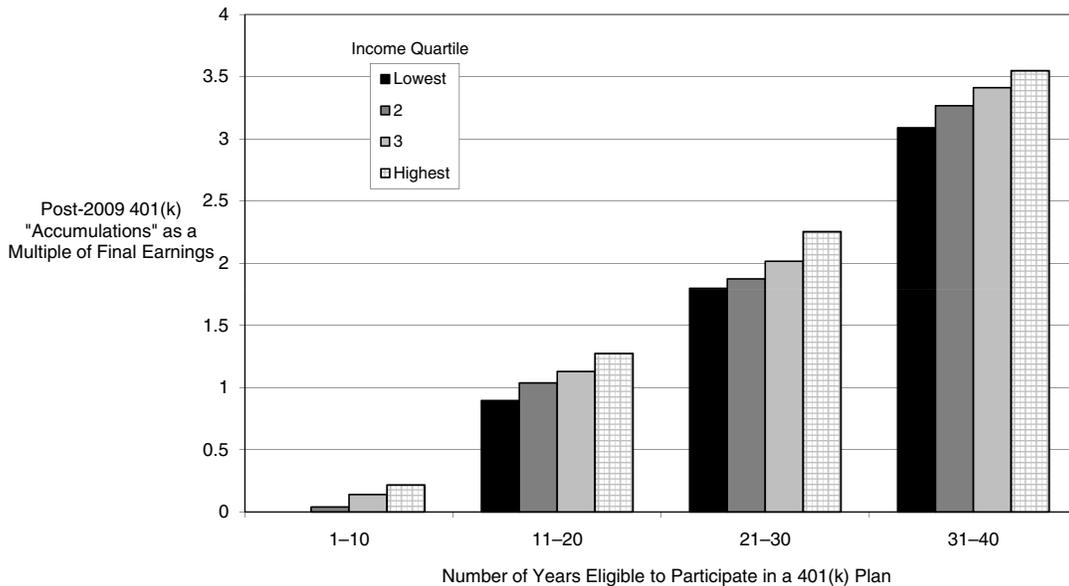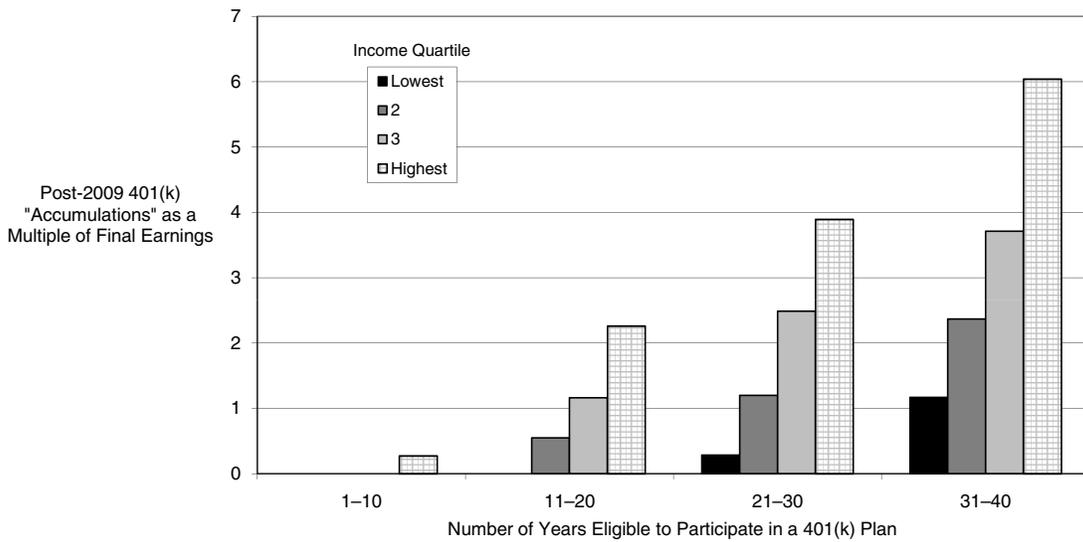Source: Source: EBRI/ERF Retirement Security Projection Model,® version 100205a4. See text for explanations of models and assumptions.

Figure 10
Employees Currently Ages 25–29:
Median 401(k) Accumulation Multiples for Voluntary-Enrollment With 2005 Plan Formulae
as a Function of Salary Quartile and Number of Years Eligible for a 401(k) Plan
(Total balances, baseline assumptions)

Post-2009 401(k) "Accumulations" as a Multiple of Final Earnings

Income Quartile
- Lowest
- 2
- 3
- Highest

Number of Years Eligible to Participate in a 401(k) Plan

Source: EBRI/ERF Retirement Security Projection Model,® version 100205b4. See text for explanations of models and assumptions.

Figure 11
Employees Currently Ages 25–29:
Median 401(k) Accumulation Multiples for Voluntary-Enrollment With 2005 Plan Formulae
as a Function of Salary Quartile and Number of Years Eligible for a 401(k) Plan
(Balances attributable to employer contributions, baseline assumptions)

Post-2009 401(k) "Accumulations" as a Multiple of Final Earnings

Income Quartile
- Lowest
- 2
- 3
- Highest

Number of Years Eligible to Participate in a 401(k) Plan
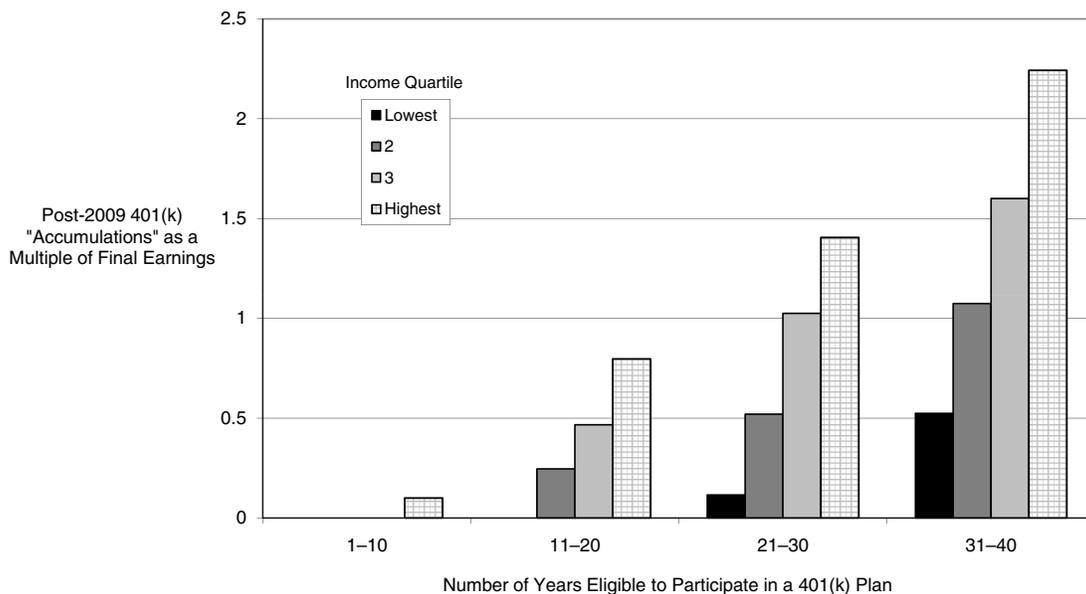
Source: EBRI/ERF Retirement Security Projection Model,® version 100205b4. See text for explanations of models and assumptions.

for AE in the highest income quartile, 44 percent in the third quartile, 30 percent in the second quartile but only 15 percent in the lowest-income quartile. Similar results hold across all non-zero median cells for other eligibility categories.[36]

It is obvious from Figure 1 that much of the increase in employer contribution rates for the 401(k) plans analyzed is due to the subsample of employers that had either frozen or closed their defined benefit plans to new employees. Figure 12 uses the same baseline assumptions as Figure 4 but limits the simulations to approximately one-quarter of the plans that had frozen or closed their defined benefit plans to new employees between 2005 and 2009, inclusive. Overall, the AE medians for this subsample are approximately 12 percent higher than the full sample of AE plans (cf. Figure 12 with Figure 4). However, the VE medians are considerably smaller: Ignoring the lowest-income quartile (whose median for the subsample drops to zero), the VE medians for this group range from 38–55 percent lower than the full sample.

An obvious hypothesis (yet to be tested) to explain this is that many of these employers appear to have had very generous defined benefit plans that were meant to be the primary retirement plan for their employees. As a result, the 401(k) plans were designed (historically) to be supplemental and it was not until the defined benefit plans were frozen or closed to new employees that the plan sponsors increased their contribution rates to the defined contribution plans to provide a quid pro quo for the modification in the defined benefit accruals.[37]

Conclusions

Although the automatic enrollment phenomena for 401(k) plans has been demonstrated to have substantial potential benefits for some employees (especially the young and low income), previous attempts to quantify this analysis have been hindered by lack of information with respect to how plan sponsors would respond to a likely increase in participation among their eligible employees. If they were to seek some type of modification in plan design generosity to provide the same overall aggregate contribution amount, one might expect that certain parameters (such as the match rate) would decrease. At least one study (as previously discussed) has used proxies to the employer match rate to suggest that this may have already taken place among large defined contribution plan sponsors.

However, this *Issue Brief* coded actual plan information on both actual auto-enrollment and actual match rate information both before and after adoption of auto-enrollment from 225 large 401(k) plan sponsors and found that just the opposite had taken place. The average change was positive in each of the following three categories:

- The first-tier match rate.
- The effective match rate.
- The average total employer contribution rate.

The plan-specific information was used to parameterize the generic model used in EBRI's 2008 analysis of the likely impact of the PPA provisions for automatic enrollment to determine how much better or worse off workers would be under AE plans vs. VE plans. Given the well-known behavioral response of increasing participation (especially for the young and low-income employees) combined with the increased generosity parameters for the defined contribution plans for the sponsors sampled in this study, the direction of the changes shouldn't be a surprise. However, the magnitude of the changes in expected retirement accumulations from 401(k) plans are larger than what EBRI had simulated in 2008.

Of course, this is only one part of the total retirement income picture for many of the employees who participated in the plans analyzed in this study. The impact of the defined benefit plan modifications for these employees ranged from zero (either because the 401(k) plan sponsor didn't have one in 2005 or didn't change the one it had) to a total plan freeze or closing to new employees. EBRI is in the process of updating its RSPM model to add the defined benefit modifications to the defined contribution changes to produce a net change in the impact of the employees' combined retirement wealth as well as changes in their probability of having adequate retirement income. The results are expected to be published as a later *EBRI Issue Brief* this year.

Figure 12
Auto-Enrollment (With 2009 Formulae) vs. Voluntary Enrollment (With 2005 Formulae):
Post-2009 401(k) "Accumulations" as a Multiple of Final Earnings for Those Currently Ages 25–29
(Limited to plan sponsors that have frozen or closed the DB plan to new employees between 2005 and 2009, inclusive)

Panel A: Total Accumulations

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
Voluntary Enrollment							
1	0.00	0.00	0.00	0.00	1.36	4.63	7.70
2	0.00	0.00	0.00	0.51	2.71	6.39	9.69
3	0.00	0.00	0.00	1.19	4.03	8.35	12.38
4	0.00	0.00	0.35	2.67	6.63	12.38	17.38
Automatic Enrollment							
1	0.00	0.00	0.27	5.63	10.23	15.81	20.77
2	0.00	0.00	1.92	6.69	11.15	17.34	22.80
3	0.00	0.00	2.89	7.29	11.80	17.99	23.46
4	0.00	0.00	3.49	7.64	12.20	18.80	24.76

Panel B: Accumulations Attributable to Employer Contributions Only

Salary Quartile	5th Percentile	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
Voluntary Enrollment							
1	0.00	0.00	0.00	0.00	0.00	1.39	2.75
2	0.00	0.00	0.00	0.00	0.21	1.79	3.24
3	0.00	0.00	0.00	0.00	0.44	2.08	3.52
4	0.00	0.00	0.00	0.00	0.75	2.53	4.09
Automatic Enrollment							
1	0.00	0.00	0.15	2.62	4.88	7.78	10.41
2	0.00	0.00	0.95	3.12	5.35	8.59	11.46
3	0.00	0.00	1.37	3.42	5.69	8.93	11.82
4	0.00	0.00	1.63	3.60	5.92	9.30	12.35

Source: EBRI/ERF Retirement Security Projection Model, ® versions 100205a6 and 100205b6. See text for explanations of models and assumptions.

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Endnotes

[1] See Holden and VanDerhei (2002).

[2] This literature is reviewed in Appendix II in U. S. Government Accountability Office (2007).

[3] Copeland and VanDerhei (forthcoming).

[4] Holden and VanDerhei (2005).

[5] VanDerhei (2006a).

[6] Technically, this assumes that future 401(k) eligibility is a function of current eligibility as defined later in the *Issue Brief*.

[7] See VanDerhei and Copeland (2003).

[8] See Holden and VanDerhei (2005).

[9] Similar figures for the high-income quartile were 52 percent under the 3 percent contribution rate and money market investment and 63 percent for the 6 percent contribution rate and the life-cycle investment.

[10] See DiCenzo (2007).

[11] See Choi, Laibson, Madrian, and Metrick (2005 and 2006).

[12] See Benartzi and Thaler (2004).

[13] See Helman, VanDerhei, and Copeland (2007).

[14] See Figure 2 of VanDerhei (2007) for the distribution of employee responses to the question.

[15] It could be argued that the distribution of responses to this question is biased upward given that it was only asked of employees already choosing to contribute to a 401(k) plan. Employees who would have been eligible nonparticipants in a voluntary enrollment system may indeed exhibit a less pronounced tendency to allow contributions to continue to escalate if their employer chooses to sponsor a 401(k) plan with automatic enrollment.

[16] The Department of Labor issued final regulations for Qualified Default Investment Alternatives (QDIAs) on October 24, 2007 to provide, inter alia, employers who adopt automatic enrollment plans a safe harbor from fiduciary risk when selecting an investment for participants who fail to elect their own investment. Sec. 404(c)(5)(A) of ERISA provides that, for purposes of Sec. 404(c)(1) of ERISA, a participant in an individual account plan shall be treated as exercising control over the assets in the account with respect to the amount of contributions and earnings which, in the absence of an investment election by the participant, are invested by the plan in accordance with regulations prescribed by the Secretary of Labor.

[17] See VanDerhei (2007b).

[18] The percentage of defined benefit plan sponsors that indicated that they had already increased or planned to increase their employer match and/or nonmatching employer contribution to a defined contribution plan varied from 62 percent for those that had frozen the defined benefit plan in the last two years to 81 percent for those that planned to close the plan for new members in the next two years.

[19] As hypothesized in VanDerhei (2007b), some employers that have discontinued accruals in the defined benefit plans may want to continue to have a very large percentage of their eligible employees participating each year. As shown in many industry studies, the participation rates among eligible young and low-income employees are significantly higher in general under 401(k) plans with an automatic enrollment feature.

[20] Similar levels applied to those defined benefit plans that were to be closed or frozen in the next two years.

[21] It is important to keep in mind that many of the plans will use a multi-tier formula (which is another reason why using simple averages of employer-to-employee contributions is problematic).

[22] The effective match rate is a measure of the total amount of employer's contribution via the matching formulae for the employee IF the employee contributes enough to receive the full match. This simultaneously controls for the match rate, the maximum amount matched, and the possibility of multiple-tiered formula. For example, an employer that matches 100 percent of the first 1 percent of compensation and 50 percent of the next 5 percent would have an effective match of: $1*1+.5*5 = 3.5$ (percent of compensation).

[23] This is the sum of the effective match rate and the nonelective contribution rate.

[24] See VanDerhei and Copeland (2004).

[25] For details, see VanDerhei and Copeland (2003).

[26] The 2001 Panel of the Survey of Income and Program Participation (SIPP), conducted by the U.S. Census Bureau, follows the same households for a three-year period, asking various questions on their economic and demographic status. Survey participants are interviewed at four-month intervals about a core set of demographic and economic issues. In addition, topical modules ask more specific questions about important economic issues. Topical Module 7, fielded in January–April 2003, asked questions about workers' participation in retirement and/or pension plans. For more information about SIPP, see www.bls.census.gov/sipp/

[27] Board of Trustees of the Federal Old-Age and Survivors Insurance and Disability Insurance Trust Funds. *2009 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Disability Insurance Trust Funds* (May, 2009).

[28] See Ippolito (1997) for a detailed description of the literature.

[29] There is a third case, that of complete dependence, that is not used in this report. This case would approximately have x=1 and y=0; however, y will need to be greater than 0 in many cases to account for the fact that z is an increasing function of age.

[30] Job turnover rates were estimated from the 2004 Survey of Income and Program Participation (SIPP) Topical Module 7.

[31] Although all the cashout probabilities in this simulation model are based on VE plans, Hewitt Associates (2009) evaluates the behavior of 170,000 individuals who terminated from their employer between January 1, 2008 and September 30, 2008. They report that when the results were analyzed by the size of the balance accrued, there was no indication that automatic enrollees are any more apt to cash out than active enrollees.

[32] See Yakoboski and VanDerhei (1996); Choi, Laibson, Madrian, and Metrick (2005 and 2006); and Nessmith, Utkus, Young (2007).

[33] The baseline rates of return are 8.9 percent for equity and 6.3 percent for fixed income. The alternative rates of return in Figure 5 are 4.45 percent for equity and 3.8 percent for fixed income. For information on the standard deviation, correlation matrix, and rationale for choice of these assumptions, see Park (2009).

[34] In addition to the obvious impact of lower return assumptions, this result is influenced by the higher likelihood of a cashout for lower balances at job change as well as the differential asset allocation for participant direction for VE plans and the predominantly life-cycle asset allocation in AE plans.

[35] This result is far less dramatic than the differentials simulated in VanDerhei (2007a). However, in that case, all AE plans were assumed to follow the PPA safe harbor designs and any 401(k) participant with at least one year of tenure would have a positive difference of between 1 and 7 percent of compensation from changing from the "start over" to the "maintain contribution rate" scenario. In the current case, the process is much more complicated. The fact that there are different default contribution rates in the AE universe studied in this *Issue Brief* as well as only a fraction of which included automatic escalation of employee contributions would mitigate the impact of the simulated increase.

[36] Comparing the accumulations attributable to employer contributions for VE plans with the AE plans (see Figures 9 and 11) shows similar results.

[37] See VanDerhei (2006b) for additional detail on the level of additional employer contributions that would be required to defined contribution plans to financially indemnify defined benefit participants for plan freezes.

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