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# Better match formulas for 401(k) plans

- Every year, U.S. employers contribute around $250 billion to their employees' retirement accounts, and many employer-sponsored retirement plans adhere to a safe harbor match formula. A retirement plan's match formula determines how much money workers receive and how much employers spend on the plan, but are the commonly used match formulas designed well?
- We evaluated current match formulas and found two potential drawbacks: Many workers don't take full advantage of their employer match, and the majority of employer match dollars accrue to employees who already contribute beyond the match cap.
- Better match formulas pair nonelective contributions with a "stretched match," which is a lower match rate paired with a higher match cap. The potential gains from adopting better match formulas are significant and broad based. Updating the match formula of every retirement plan in our sample to a savings-maximizing equivalent formula would ensure that every eligible worker receives a retirement contribution and could increase the average employee saving rate by around 0.4 percentage points of pay, all without an increase in employer costs.
- Moving the most popular safe harbor-adhering plans to their savings-maximizing alternatives could generate an additional $6.7 billion in employee retirement contributions at no additional cost to employers and without increasing inequality in employer contributions. We propose a new safe harbor match formula: a nonelective contribution of at least 2% plus a 25% match of employee contributions up to 8% of pay, with automatic enrollment and immediate vesting.


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## Introduction

Every year, U.S. employers contribute around $250 billion to their employees' retirement accounts, mostly in the form of matching contributions. These matches tie an employee's total compensation to their saving decisions: Contribute more, and your employer will contribute more. Around 100 million workers are eligible.

The specific match formula an employer uses matters. It determines how much employees benefit from saving, how employer dollars are distributed across the workforce, and how much the plan costs. Yet despite the scale of these programs, there has been remarkably little evaluation of whether current formulas are well designed.

Formula evaluation matters for policy and for firms. Around 30% of firms for which Vanguard has data use a standardized safe harbor match formula, which exempts the retirement plan from federal nondiscrimination testing. The basic structure and match parameters of these formulas have seen little change over the past 20 years, and they have never been evaluated against cost-equivalent alternatives.

In a companion academic paper Carranza et al. (2026), we developed a framework for evaluating match formulas. We combined administrative records for 1.8 million Vanguard retirement plan participants with a purpose-built survey that asked workers how they would respond to match formulas that do not currently exist (see page 4 for a summary of our approach). We documented that almost 60% of matching dollars accrued to the 43% of workers who contributed above the match cap, which is the level above which the employer stops matching. The match itself was unlikely to be the main driver of the workers' saving choices relative to other factors, like retirement goals or tax incentives, because these workers had already saved beyond the level eligible for a match. At the same time, many lower-income workers did not participate at all and received no employer contribution, because many popular formulas require an employee to contribute in order to get a match. Taken together, these results suggest there is significant room to improve existing match formulas and increase employee savings. We used administrative and survey data to explore alternative match formulas and found that pairing a nonelective contribution with a stretched match (a match with a lower match rate and a higher cap) could increase employee participation and savings without increasing employer costs.

## Current match formulas

Before evaluating alternatives, it is worth describing employer contributions and documenting what current match formulas actually achieve. Match formulas vary widely in their overall structure, but key elements include:

- The match rate (for example, 50% or 100%) applied to employee contributions;
- The cap on contributions eligible for a match (for example, up to 6% of pay);
- The number of tiers, with some plans offering a higher match rate on initial contributions and a lower rate thereafter; and
- Nonelective contributions, which employers contribute regardless of employee action.

Matching contributions are available in 86% of plans and to 96% of all Vanguard plan participants, while nonelective contributions are present in 46% of Vanguard plans and for 47% of Vanguard plan participants (Clark, 2025). Most plans choose very high matching rates. Arnoud et al. (2021) reported that, as of 2017, around half of plans that provide a match do so at 100%, and around 85% of plans match at least 50% from the first dollar an employee contributes. Employer match formulas may influence whether an employee takes full advantage of the match and the associated employer costs. Other plan design features like automatic enrollment, vesting schedules eligibility rules, and withdrawal options also shape participation and saving behavior.

Two facts about employer match formulas in practice stand out.

**Many workers don't take full advantage of their employer match.** **Figure 1a** shows the share of workers who contribute enough to receive their full employer match, by income. Lower-income workers are less likely to take full advantage of the match. Even among workers earning $150,000 or more, roughly 20% do not save enough to capture the full match. Higher-income workers are more likely to participate and to contribute at higher rates, so the distribution of employer match dollars is more concentrated than the distribution of wages. In about 67% of plans, the top 20% of earners receive a larger share of employer contributions than their share of pay (Greig et al., 2024).

**Most match dollars go to workers who would have saved anyway.** One rationale for offering an employer match is to create a financial incentive for employees contributing below the cap to raise their saving rates and capture the match. A match does not, however, create a financial incentive to save more for those already saving above the match cap.

Consider an employee who contributes 10% of her salary when her employer matches up to 6%. The match does not create an incentive for her to save more, because she is already contributing beyond the amount eligible for the match.

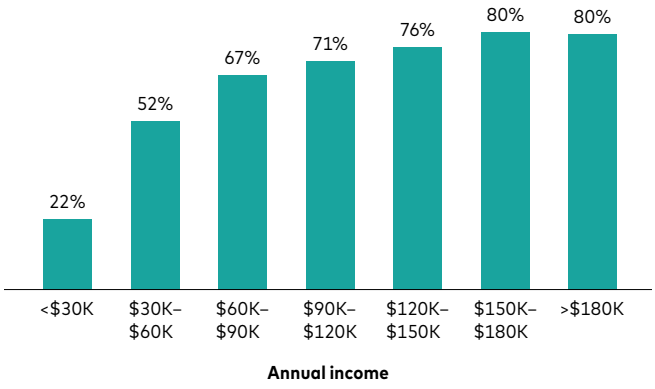
In Vanguard plans, over 40% of workers contribute more than their match caps, but this group receives almost 60% of total employer match dollars (**Figure 1b**). Even though the goal of a match is to encourage more saving from more workers, most of the match money is going to workers who already save beyond the match cap.

These patterns suggest that many people do not take full advantage of employer matches despite the strong financial incentives to do so, while many others contribute sufficiently high amounts that the match is unlikely to be the key driver of their saving decisions. Next, we explore opportunities to address both of these populations through better match formulas.

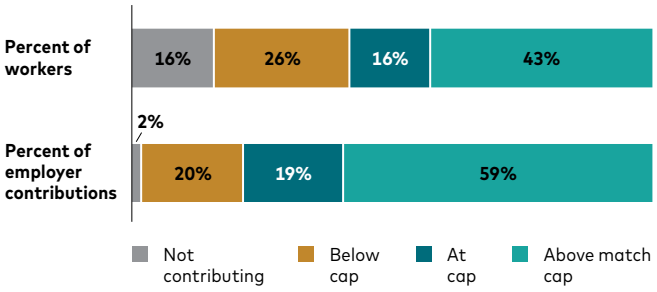
FIGURE 1

**Many workers do not receive the full match despite strong financial incentives to do so, and many match dollars go to workers already saving above the match cap**

a. Percent of match maximizers, by income




b. Distribution of employee and employer contributions relative to match cap




**Notes:** Figure 1a shows the proportion of workers in the administrative data who fully take up the match they are offered. Our estimation accounts for the fact that some workers may be unable to take up the full match due to federal tax limits; these workers are categorized as taking up their full offered match. Ranges are mutually exclusive and collectively exhaustive. The first column includes values up to $30,000; intermediate columns include values greater than their lower bound and up to their upper bound (for example, $30K–$60K represents values greater than $30,000 up to $60,000); and the final column includes values greater than $180,000. Figure 1b divides the distribution of workers into groups of those who do not participate, those who participate but save less than the match cap, those who save at the match cap, and those who save above the match cap. The figure also shows the proportion of match dollars going to workers in each of those four groups. Results are based on the administrative population in the Vanguard data in 2023. Figures may not total 100% due to rounding.

**Our approach to evaluating a range of match formulas**

We examined saving patterns under a range of match formulas, including those that have never been implemented. We could not use administrative data to observe what workers would do under plans that do not exist. Real-world variation in match formulas is limited, and firms that adopt different formulas also differ in other ways that may relate to their employees' saving behavior. It can therefore be misleading to simply compare saving behavior across firms and attribute any differences to their match formulas.

We addressed this challenge by using a combination of economic modeling and survey data. We developed a simple model of how workers tend to respond to match incentives, built around three testable behavioral assumptions. We then surveyed Vanguard plan participants, asking them how much they would contribute under a range of hypothetical match formulas, including formulas that are rare or nonexistent in practice. Combined with the model, these responses allowed us to predict saving behavior under a very wide range of match formulas.

We used the survey to assess how much respondents would save for retirement under four different match scenarios:

**A.** No match;

**B.** Unlimited matching at match rates of 25%, 50%, and 100%;

**C.** A randomly assigned match rate of 25%, 50%, or 100% on all contributions up to 6% of an employee's pay; and

**D.** No match, but with a nonelective employer contribution of 10%.

We used scenarios A and B to predict matching contributions under alternative match formulas with different match caps (for more details on the prediction model used, see Carranza et al., 2026). We used scenario C, which reflects common match formulas in retirement plans, to validate whether survey responses were consistent with respondent behavior in the administrative data and to assess how respondents would tend to react to different match rates. We used scenario D to evaluate whether workers tend to contribute less when employers provide nonelective contributions (that is, contributions not made as a match). Collectively, we validated that the survey responses in combination with our prediction model replicated the saving patterns that we saw in the administrative data.

Finally, we know from the administrative data that some eligible workers do not participate in their employer's retirement plan. When a match is introduced, some of these nonparticipants may begin to contribute. To estimate the magnitude of this response, we used an adjustment algorithm based on our administrative data to account for nonparticipants when measuring changes to saving behavior and inequality in contributions.

## Key findings

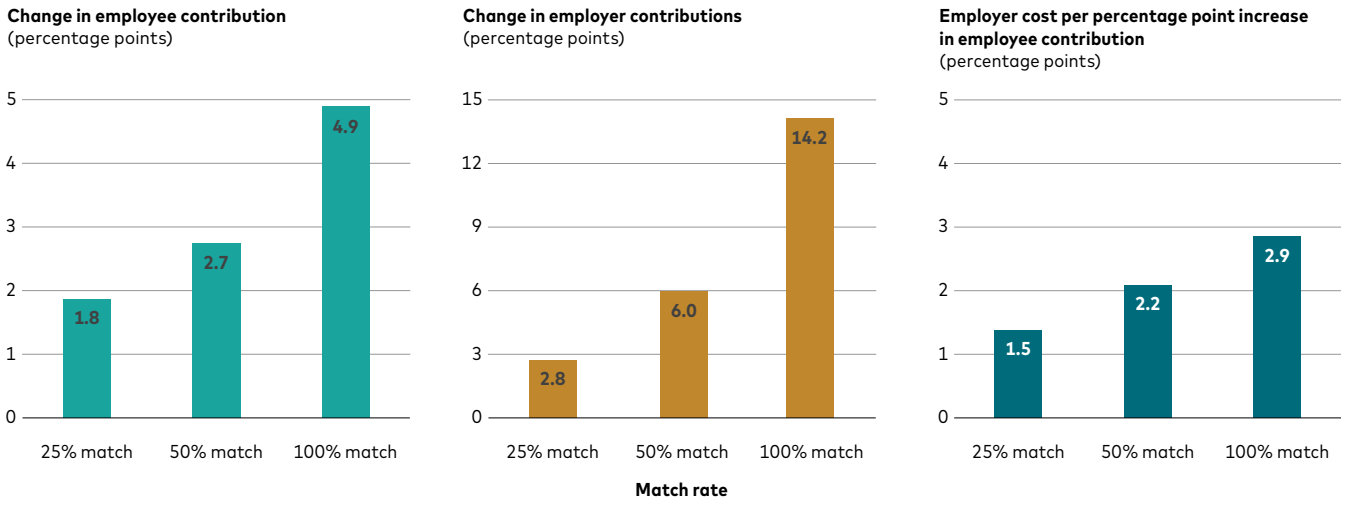
We documented four key findings from the survey and administrative evidence.

**1. Low match rates are more cost-effective because saving behavior only modestly responds to match rates.** According to the survey responses, if an employer were to introduce an unlimited match, workers would save more, but the response would not scale proportionally with the level of the match (**Figure 2**). Survey respondents reported saving an average of 9.3% without any employer match. Introducing a match caused workers to save more (shown in the first chart), but quadrupling the match (for example, from a 25% rate to a 100% rate) did not come close to quadrupling workers' saving rates—the boost in saving rates increased by just 2.7 times, from 1.8 percentage points to 4.9 percentage points. This means that high match rates are expensive relative to the additional savings they generate (shown in the third chart). If the goal is to encourage saving, lower match rates deliver substantially greater value per dollar spent. In a 25% match rate scenario, it costs employers 1.5% of payroll per additional 1 percentage point of induced employee savings. In a 100% match rate scenario, each additional 1 percentage point of employee savings costs employers 2.9% of payroll.

FIGURE 2

### Lower match rates are the more cost-effective incentive

Impact of introducing an unlimited employer match, by match rate

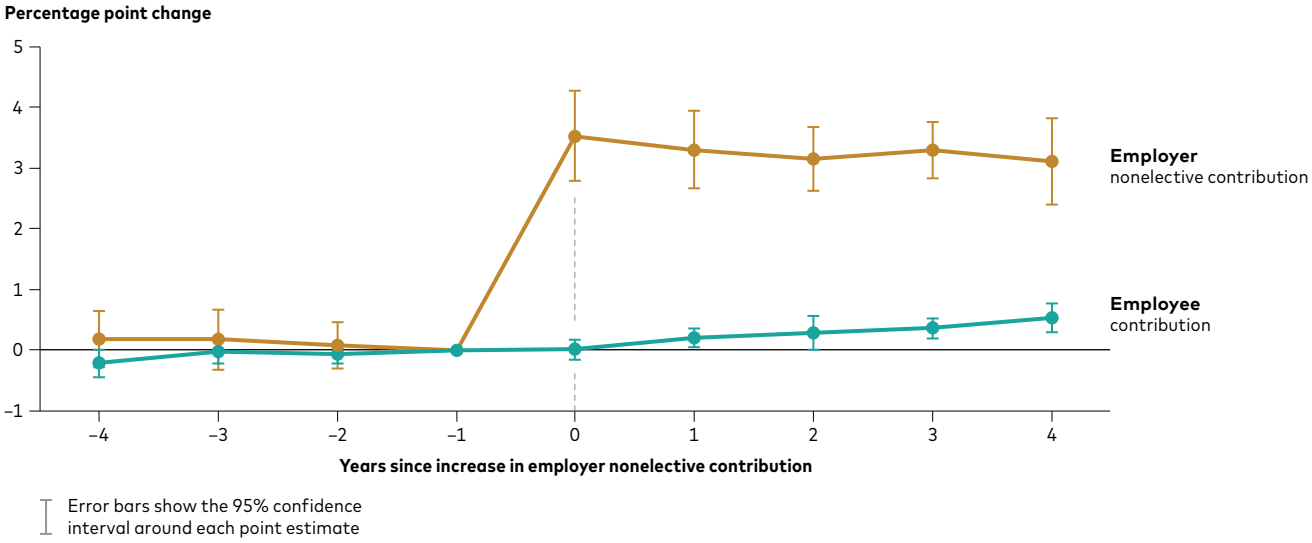



**Notes:** The first chart shows the estimated average treatment effect of introducing unlimited employer matching at different match rates, calculated as the average difference between saving under the match and saving under no match, controlling for participant fixed effects. Survey respondents reported saving an average of 9.3% without any employer match. The second chart shows the percentage point increase in employer cost for the unlimited match policy as a share of payroll, and the third chart shows the employer cost for the unlimited match policy per percentage point increase in employee saving rates.

**2. Nonelective contributions do not crowd out worker savings.** Nonelective contributions are employer payments made to all eligible employees regardless of whether they save themselves. They ensure that every eligible worker receives a retirement contribution. One might worry that giving workers unconditional contributions would cause them to reduce their own contributions, but our evidence shows otherwise. In our survey, workers who receive a hypothetical 10% nonelective contribution report slightly higher personal saving than those who receive nothing. In the administrative data, we studied actual increases in nonelective contributions across 20 plans and found a similar pattern: Worker saving did not fall; in fact, on average, it rose slightly for existing workers and for new hires (**Figure 3**). This is an important finding because it means that nonelective contributions are a genuine addition to workers' retirement wealth and are not a substitute for contributions workers would have made on their own. This finding also aligns with evidence documented by Card and Ransom (2011), Chetty et al. (2014), and Davis, Mukherjee, and Zhong (2024).

FIGURE 3

**Nonelective contributions do not crowd out employee saving**



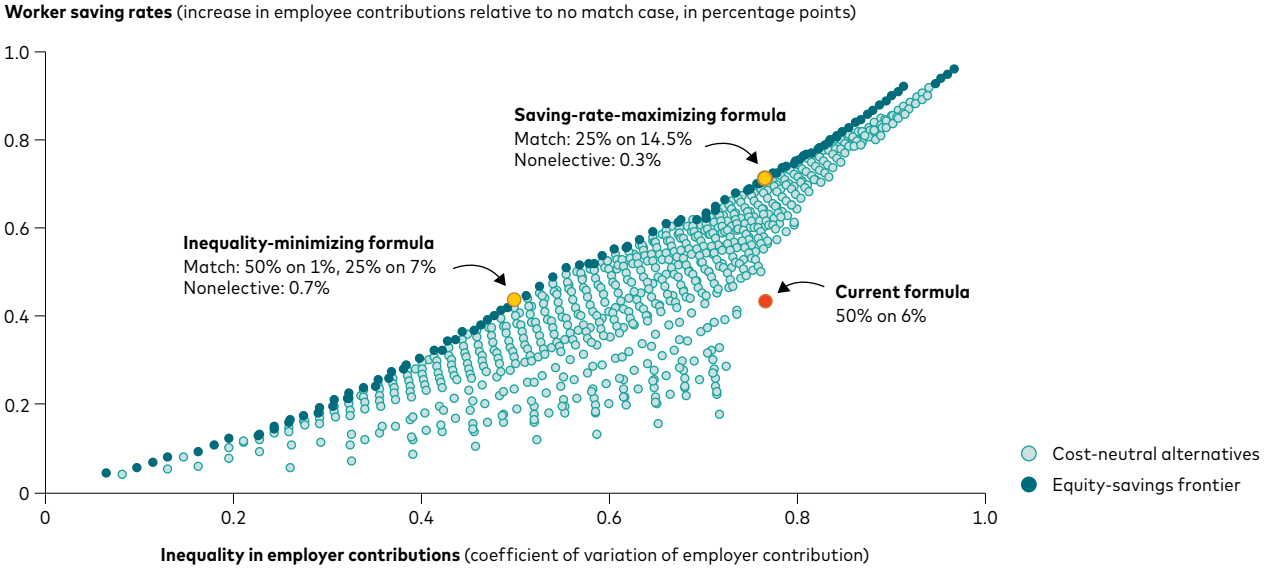

**Notes:** This figure shows how employer and employee contributions change in response to an increase in employer nonelective contributions. The sample includes large retirement plans observed from 2010 to 2023 that implemented an increase to nonelective contributions. The estimates compare changes within the same plans over time while accounting for worker characteristics such as age, income, and tenure.

**3. Better match formulas pair a nonelective contribution with a "stretched match."** Because nonelective contributions do not crowd out employee saving, employers can direct some of their budget toward a nonelective contribution for all employees without reducing retirement account saving rates. This would mechanically increase participation (defined as the fraction of workers making a retirement contribution) by approximately 36 percentage points for plans with voluntary enrollment and 5 percentage points for plans with automatic enrollment. Because saving rates respond only modestly to match rates, lower match rates extended to a higher match cap can generate worker saving rates comparable to the high match rates selected by most current plans at a lower cost. The combination of these two elements—a nonelective employer contribution and a stretched match—ensures full participation in the plan and can generate higher worker saving rates without increasing employer costs.

For any given employer budget, we find plans along a "frontier" (shown as the darker blue dots in **Figure 4**) that either increase worker saving rates (shown along the vertical axis) or decrease inequality (shown along the horizontal axis) for the same cost. Plans on the frontier have a nonelective contribution and a stretched match that has a low match rate and a high match cap. But there are a range of match formulas along this frontier, and each employer needs to decide which point along the frontier best meets their plan objectives. Allocating more dollars to nonelective contributions increases, to a greater extent, the total savings of workers who were previously not participating at all but has little effect on overall worker savings. In contrast, allocating more dollars to a stretched match further incentivizes workers who were already participating to save at higher rates.

FIGURE 4

**Many cost-equivalent match formulas would increase savings, decrease inequality, or both**




**Notes:** This figure compares employer match formulas that all have the same total cost as that in a typical plan design (a 50% match of up to 6% of pay), shown in red and labeled as "current formula." Each of the other circles represents an alternative cost-equivalent formula. The horizontal axis shows how unequal employer contributions are across workers, measured by the coefficient of variation, while the vertical axis shows the increase in worker saving rates. The upward-sloping pattern highlights the trade-off between boosting saving rates and reducing inequality. The darker blue dots form the frontier, tracing the set of best-performing formulas along this trade-off. Two examples are highlighted with labels along the frontier line in yellow: one that increases saving rates the most without increasing inequality and one that reduces inequality the most without lowering average saving rates.

We found that all 10 of the most widely used matching formulas in our sample, and 22 of the top 25, lie well inside the frontier. That is, for each of these formulas, an alternative exists that both raises average saving rates and reduces inequality in employer contributions, all at the same cost to the employer. Consider a 50% match on the first 6% of pay, which is a common match formula. A cost-equivalent alternative that does not increase our measure of employer contributions (the coefficient of variation in employer contribution rates, defined as the ratio of the standard deviation to the mean of employer contribution rates) would introduce a small nonelective contribution (0.3%) and pair it with a stretched match of 25% on up to 14.5% of pay. A cost-equivalent alternative that maintains worker saving rates while decreasing inequality in employer contributions would include a more generous nonelective contribution of 0.7% and have a two-tier match of 50% up to 1%, and then stretch the 25% match to a more modest cap of 7% of pay.

**Figure 5** shows these comparisons for the five most common match formulas for voluntary versus automatic enrollment plans. Our companion academic paper (Carranza et al., 2026) further shows results for the 25 most common formulas. While the specific magnitudes differ across plans and between voluntary and automatic enrollment settings, the pattern is consistent across the formulas we considered: Better match formulas include a nonelective contribution and a stretched match.

FIGURE 5

**Better match formulas pair nonelective contributions with a stretched match**

| | | Goal: Increasing worker saving rates | | | Goal: Decreasing inequality | | |
|---|---|---|---|---|---|---|---|
| | | Recommended formulas | | Impact | Recommended formulas | | Impact |
| | **Current plan** (safe harbor status: SH) | **Non-elective** | **Match** | **Increase in worker saving rates (ppt change)** | **Non-elective** | **Match** | **Decrease in inequality (% change in CV)** |
| **No auto-enrollment** | 100% on 3%, 50% on 5% (SH) | 0.5% | 50% on 2.25%, 25% on 20% | 0.6 | 1.5% | 50% on 1%, 25% on 6.5% | –55% |
| | 50% on 6% | 0.3% | 25% on 14.5% | 0.3 | 0.7% | 50% on 1%, 25% on 7% | -35% |
| | 100% on 1%, 50% on 6% | 0.6% | 25% on 19% | 0.4 | 0.9% | 50% on 1%, 25% on 7.75% | –40% |
| | 100% on 5% (SH) | 0.5% | 50% on 7%, 25% on 19.75% | 0.7 | 2.0% | 50% on 1%, 25% on 7.25% | –61% |
| | 50% on 4% | 0.1% | 50% on 1%, 25% on 7.25% | 0.2 | 0.4% | 50% on 1%, 25% on 4.5% | –32% |
| **Auto-enrollment** | 100% on 3%, 50% on 5% (SH) | 1.3% | 50% on 2.5%, 25% on 10% | 0.4 | 2.1% | 50% on 1%, 25% on 6.5% | –42% |
| | 50% on 6% | 0.3% | 50% on 2.5%, 25% on 9% | 0.2 | 1.0% | 50% on 1%, 25% on 7% | –29% |
| | 100% on 1%, 50% on 6% (SH) | 0.9% | 50% on 1.5%, 25% on 10% | 0.2 | 1.2% | 50% on 1.75%, 25% on 7.5% | –29% |
| | 100% on 5% (SH) | 1.3% | 50% on 6.5%, 25% on 10% | 0.5 | 2.9% | 50% on 1.25%, 25% on 7% | –52% |
| | 50% on 4% | 0.2% | 50% on 1.5%, 25% on 4.5% | 0.2 | 0.6% | 50% on 1%, 25% on 4.5% | –30% |

**Notes:** This table presents better match formulas for the five most common match formulas under both voluntary enrollment and automatic enrollment plans. Specifically, it lists the cost-equivalent match formulas that either increase employee saving rates without increasing inequality in employer contribution rates (in other words, increase worker saving rates) or decrease inequality in employer contribution rates without decreasing employee saving rates (in other words, decrease inequality). Worker saving rates are measured in percentage points (ppts). Inequality is measured as the percentage change in the coefficient of variation (CV) in employer contribution rates.

**Source:** Carranza et al. (2026).

**4. The potential gains in retirement readiness from moving to better match formulas are significant and broad-based.** To give a sense of the magnitudes involved, for the nonautomatic enrollment case, we estimate that moving each of the 25 plans in our sample to its savings-maximizing alternative would increase average employee saving rates in the population of our study by approximately 0.4 percentage points, without raising employer costs or increasing inequality. These gains in savings would be broad-based and driven by the nonelective contribution, which, based on our estimates, would increase the share of workers receiving contributions by 36 percentage points in plans without automatic enrollment and by about 5 percentage points in plans with automatic enrollment. We estimate that nonparticipants in the voluntary enrollment case would see an increase in total contributions of 0.4 percentage points, and participants an increase of 0.5 percentage points due to the stretched match incentive to save more. The gains to retirement savings from better match formulas tend to be larger in plans with voluntary enrollment because the introduction of a nonelective contribution induces a larger increase in participation.

## Implications for plan and policy design

These findings have direct implications for plan and policy design.

**Plan sponsors should consider redeploying match dollars to reach more workers and boost worker saving rates.** Plan sponsors may have different objectives and constraints when they design their retirement plan. Some may aim to win the war for talent, promote employee financial wellness and retirement security, or contain costs. Others need to adhere to collective bargaining agreements or maintain parity with a legacy retirement plan. In recommending better formulas, we are not necessarily advocating for employers to match more or less than they already are, just differently. A formula involving a nonelective contribution paired with a stretched match can redeploy the same employer dollars to reach more workers, boost employee contributions, and ultimately generate more retirement wealth.

Among the reasons why plan sponsors may want to adopt better match formulas, two stand out:

- **Achieve the goal of having all workers make a positive retirement contribution.** Increasing participation has long been a goal of the retirement industry and public policy; now, more than half of employers automatically enroll their employees in retirement plans (Clark, 2025). Nonelective contributions can reinforce, or serve as an alternative to, automatic enrollment as a strategy to achieve 100% plan participation. Today, roughly 70% of private sector workers have access to a defined contribution plan, but only 50% choose to participate (U.S. Bureau of Labor Statistics, 2025). Match formulas that include a nonelective contribution would help to close that gap.
- **Increase retirement readiness.** By ensuring that all workers participate in the plan and nudging workers to save more, better match formulas could encourage more people to adequately save for retirement, potentially enabling them to retire sooner or more securely. To put these gains in context, the Vanguard Retirement Outlook estimated that just 42% of Americans are on track for retirement, and lower income workers and those without access to a defined contribution plan are considerably less likely to be on track (Greig et al., 2025). Introducing nonelective contributions would ensure that all workers with access to a plan participate and at least nominally save for retirement, even if those savings are only generated through employer contributions.

**We propose a new safe harbor prototype.** Many employers anchor their plans to safe harbor designs, which exempt employers from needing to satisfy nondiscrimination testing requirements. This itself is a policy framework intended to promote saving and limit inequality. And yet, most common plans, including nearly all safe harbor designs, have cost-equivalent alternatives that generate more savings without increasing inequality or reduce inequality without reducing savings. These plans feature match rates that are too high, applied over contribution ranges that are too narrow to incentivize saving for many workers.

We estimate that moving the most popular safe harbor formulas to their savings-maximizing alternatives on the frontier would substantially raise employee retirement contributions. Extrapolating beyond Vanguard-administered plans to a broader sample of more than 30,000 plans based on employer Form 5500 regulatory filings suggests that moving safe harbor formulas to their savings-maximizing alternatives would raise employee contributions in these plans by 7.5%, or about $6.7 billion a year, without increasing employer costs or inequality. This dollar amount estimate is likely a lower bound because the formulas in the sample account for only about half of aggregate contributions. This exercise suggests that safe harbor reform could generate billions of dollars in additional retirement contributions at no additional cost to employers and without increasing inequality in employer contributions.

To this end, we propose a safe harbor prototype that is 1) approximately cost-neutral compared to existing safe harbor designs, 2) easy for participants to understand, and 3) consistent with Secure 2.0 expectations of automatic enrollment for all new plans. We propose a new safe harbor match formula consisting of at least a 2% nonelective contribution, plus a match of 25% to up to 8% of pay, automatic enrollment, and immediate vesting (**Figure 6**).[1] Our estimates suggest that a cost-neutral alternative relative to existing safe harbor plans would include a nonelective contribution of 1% to 2%, and that a modestly more generous 2% nonelective contribution would improve outcomes further, with the added benefit of greater simplicity for savers. Participants taking full advantage of the match would save 8% of their pay and receive at least 4% of their pay in employer contributions (at least 2% nonelective and 2% matching), for a total of at least 12%. This would create a policy nudge for workers to save at rates in line with retirement savings targets from industry advice and leading retirement systems (such as that of Australia, which is 12%).

FIGURE 6

**We propose a new safe harbor match with a nonelective contribution and a stretched match**

| | | Current safe harbor plans | | | |
|---|---|---|---|---|---|
| **Feature** | **Proposed safe harbor prototype** | **Basic** | **Enhanced (example)** | **Qualified automatic contribution arrangements** | **Nonelective** |
| **Employer contribution formula** | ≥2% nonelective 25% up to 8% | 100% of first 3%, 50% up to 5% | 100% of 4% | 100% of first 1%, 50% up to 6% | 3% nonelective |
| **Automatic enrollment** | Yes | No | No | Yes | No |
| **Vesting** | Immediate | Immediate | Immediate | 2-year vesting | Immediate |

**Notes:** An enhanced safe harbor is one that provides at least as large a match as the basic safe harbor at every deferral point. Other conditions also apply.

**1** Carranza and Goodman (2025) showed that vesting requirements increase inequality in net employer contributions, insofar as forfeitures are concentrated among lower-income workers. They also showed that vesting does not increase worker retention.

## Conclusion

Employer-matched retirement contributions are one of the largest financial incentives most American workers encounter. This benefit shapes how much people save for retirement and how employer dollars are distributed across the workforce, yet match formulas have received surprisingly little scrutiny.

We found that current match formulas, including those encouraged by federal safe harbor rules, are poorly targeted. These match formulas provide large contributions to workers who tend to contribute more with or without a match, while providing little to workers who contribute less or not at all. Cost-neutral alternatives exist that could substantially increase saving rates, reduce inequality in employer contributions, or both.

The common thread in all the better-performing plans is a shift away from high match rates on a narrow band of contributions and toward a combination of two features: a nonelective contribution that provides a floor for all eligible workers and a lower match rate extended over a wider contribution range.

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