

# Evidence on Auto-Enrollment Retirement Plan Efficacy from OregonSaves

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## Abstract

We analyze employee choices and the evolution of account balances in OregonSaves, the first US state-sponsored retirement program for private-sector workers lacking an employer-sponsored plan. During enrollment, 37% opt out, 36% start to save, and 27% do neither. Employees with low earnings tend to opt out after 1-2 contributions and, among all contributors, fewer than 40% are contributing after one year. The average account balance of \$698 implies an effective annual savings rate as low as 1.1%. While OregonSaves is generating savings for thousands, the overall savings rate reflects the challenge of serving workers with low wages and high turnover.

*Keywords: retirement saving; automatic enrollment; low-wage worker; job turnover*

*JEL Codes: D14, J26, H75*

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Approximately half of all private-sector employees in the United States lack access to employer-sponsored retirement plans, and the fraction is much higher for less-educated and lower-paid workers (Gale and John 2018; John et al. 2022). While those lacking access to an employer-sponsored plan have the option of contributing to an individual retirement account (IRA), the vast majority do not do so.<sup>1</sup> In turn, this has given rise to what has been termed a “retirement savings crisis” with analysts debating the value of private retirement savings for low-income employees who receive the highest income replacement rates from Social Security.<sup>2,3</sup> A growing number of state legislatures has responded by introducing state-based retirement plans seeking to increase private retirement savings through a combination of increased access and automatic enrollment.<sup>4</sup> This paper analyzes employee choices and the evolution of account balances in OregonSaves, the first state-sponsored retirement plan for private-sector workers who lack company-provided retirement plans.

Oregon launched the first state-sponsored plan in 2017, followed by Illinois in 2018, and California in 2019, and followed thereafter by at least 13 other states and two cities.<sup>5</sup> The growing popularity of these plans begs the question of whether they can meaningfully increase savings of the lower-wage workers they target. We use administrative data from OregonSaves to characterize the types of jobs held by these workers, determine which factors drive individual opt out decisions

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<sup>1</sup> The 2014 Summary of Income and Program Participation (SIPP) finds only 22.1% of employees working at firms without retirement plans had opened IRAs, and only 7.6% were actively contributing. See Online Appendix Table 1.

<sup>2</sup> See Miller et al. (2015) and rebuttals by Biggs (2015, 2016, 2019a, 2019b) and Biggs and Schieber (2015); also see Bee and Mitchell (2017).

<sup>3</sup> The CBO (2019: p. 18) found that the “replacement rate based on all earnings from age 22 through age 61 is 80 percent for workers born in the 1960s whose lifetime earnings fall in the lowest earnings quintile, more than double the 34 percent for workers whose earnings fall in the highest quintile.”

<sup>4</sup> Carlin et al. (2013) argued that default features (similar to those in OregonSaves) that reduce search costs are likely to be welfare enhancing if participants are sufficiently homogeneous in their preferences.

<sup>5</sup> Connecticut and Maryland launched in 2022 and Colorado and Virginia will do so in 2023. Timelines for Maine, New Jersey, and New York are pending. For a summary of all state-sponsored retirement plans for private-sector employees, including the small number that lack automatic enrollment, see Center for Retirement Initiatives (2022a, 2022b).

and asset accumulation, and quantify the distribution of account balances. Our objective is to shed light on whether the lack of retirement savings among such workers is driven by a lack of access to employer-sponsored plans versus a lack of stable employment and earnings.

OregonSaves' design is representative of other state-sponsored plans. Most private-sector employers not offering retirement savings plans are required to register with OregonSaves and automatically enroll their employees. The program creates a separate Roth IRA for each employee who does not formally opt out during the enrollment window (and is a legal U.S. resident over the age of 17). The default savings rate is 5% of *total* earnings, with automatic escalation of 1% per year, up to a maximum rate of 10%.<sup>6</sup> During our study period, the default investment strategy allocates the first \$1,000 in contributions to a money market fund, and all additional contributions to an age-appropriate target date fund (TDF). Employees are free to opt out at any time, change their savings rate, transfer money across the limited number of investment options, and withdraw money from their accounts. If an individual contributes to OregonSaves through multiple participating employers, all contributions are made to the same account.

In their influential study of one large corporate retirement savings plan, Madrian and Shea (2001) documented a significant increase in 401(k) plan participation rates when the firm adopted automatic enrollment. While it is natural to benchmark our findings against theirs (as we do below), recent studies find that the long-term impact of automatic enrollment on retirement plan balances can be smaller than the short-term impact first documented (Choukhmane 2021; Beshears et al. 2022). This is in part because employees leaving their jobs withdraw plan assets, so the net

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<sup>6</sup> Contributions are made to a Roth IRA, and in our earlier work (Chalmers et al. 2022) we had assumed that contributions were made from after-tax earnings. In fact, employers are instructed to withhold 5% of *before-tax* earnings (<https://www.oregonsaves.com/faqs/is-my-contribution-pre-tax-or-post-tax>). For example, if pre-tax income is \$2,000, the savings rate is 5%, and the tax rate is 20%, employees who contribute 5% (\$100) of pre-tax income to OregonSaves and then pay \$400 in taxes have a take-home pay of \$1,500. If employees contributed 5% of after-tax income, they would pay \$400 in taxes and then contribute \$80 (5% of \$1,600), resulting in take-home pay of \$1,520. In this example, the OregonSaves employee contributes \$100 instead of \$80, which is 6.25% of after-tax earnings.

increase in 401(k) plan assets is better approximated by employers' matching contributions (Beshears et al. 2022).

There are three reasons—even ignoring differences in income levels and job stability—that we expect to see different short- versus long-term outcomes in state-sponsored retirement plans. First, because employees contribute to Roth IRAs, there is no requirement to liquidate account balances following job turnover,<sup>7</sup> so that source of mechanical plan withdrawals is eliminated. Second, participants can withdraw contributions from their accounts without penalty, greatly increasing plan liquidity relative to traditional employer-sponsored plans.<sup>8</sup> This increased liquidity may lead participants to view OregonSaves as more of an emergency savings account than as retirement savings. Third, these state-run plans are able to avoid meeting federal pension regulations because there is no employer matching contribution. Hence what participants receive in exchange for liquidity is no possibility of an employer match.

Our administrative data cover the months from August 2018 to April 2020. Over that period, the number of open accounts with positive account balances grew from 16,217 to 67,731, assets under management grew from \$6.7 million to \$51.0 million, and average account balances grew from \$344 to \$754. According to public data, by April 2022 the number of funded accounts was 114,428, assets under management were \$147.8 million, and the average account balance was \$1,292. These statistics reveal significant growth in OregonSaves during and after our study period, but they do not tell us how many employees can and do regularly contribute to OregonSaves, nor how much of their income is being saved.

By April 2020, 11,088 employers had registered 289,657 employees. Food services (e.g.,

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<sup>7</sup> Hung et al. (2021) describe the rules governing plan distributions following job turnover and find higher turnover rates among employees subject to automatic enrollment than voluntary enrollment.

<sup>8</sup> Briere et al. (2022) showed that increased restrictions on retirement plan withdrawals in French defined contribution plans are associated with decreased participation rates.

full-service and limited-service restaurants), business support (e.g., temporary help services), and health care (e.g., assisted living facilities and home health care) employed the majority of participants.<sup>9</sup> As this list of industries suggests, employees targeted by OregonSaves face low incomes and high turnover (Quinby et al. 2020; Chalmers et al. 2022). For food services, we estimate that average monthly *before-tax* income is \$1,985 and the annualized turnover rate is 48.6%. Within the full sample, those statistics are \$2,365 and 38.3%. Because the employers targeted by OregonSaves operate in a different set of industries than those offering traditional employer-sponsored plans, it is not surprising that the implied annual income of \$28,378 of OregonSaves contributors (assuming stable employment) is far less than the per capita income in Oregon, which is \$50,962 at the beginning of our study period.

The fact that OregonSaves targets employees with low and volatile income leads us to expect much lower participation rates than in studies of employees with access to large 401(k) plans, as in Madrian and Shea (2001). It is standard to measure the participation rate as one minus the opt-out rate, and for those who do not opt out to accumulate assets. However, in our setting, there is a significant gap between the fraction of employees who formally opt out and the fraction who accumulate assets. Using administrative data for September 2019, Quinby et al. (2020) found that 33.5% of employees opted out during the enrollment window, 48.4% had a positive balance, and 18.1% neither opted out nor accumulated any assets. To appear in their sample, an employee must have been registered with OregonSaves by an employer that had already begun to process contributions *and* must have been classified as actively employed. When we focus on employees whose employers are processing contributions during the enrollment window, we find that 37.1% opt out, 35.8% have a positive balance, and 27.1% neither opt out nor accumulate assets. By the

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<sup>9</sup> We infer employee turnover from changes in employment status reported to OregonSaves and impute before-tax income (for the subset of contributors) from data on monthly contributions and savings rates.

end of our study period, only 34.3% of the 226,178 employees working at employers processing contributions have a positive balance. This fraction jumps to 56.1% when we restrict the sample to the 138,465 employees who are still classified as actively employed. This simple comparison reveals that job turnover is a significant impediment to savings. It also reveals that the fraction of employees accumulating assets in OregonSaves is much lower than the 85.9% in Madrian and Shea (2001).

There are several reasons that employees may opt out of OregonSaves: they may have too little disposable income to prioritize retirement savings, believe that they are too old to begin saving, expect their jobs to end soon, or already have retirement savings accounts. Chalmers et al. (2022) analyzed survey data on the reasons that employees opted out of OregonSaves, and they found the two most common answers were “I cannot afford to save at this time” and “I have my own retirement plan.” In the present sample of employees, 12.0% opt out citing a lack of income, and another 9.2% opt out citing existing retirement savings.<sup>10</sup> Moreover, conditional on opting out, employees in industries with lower incomes are more likely to cite a lack of income versus having pre-existing savings.

When we estimate regressions predicting employee-level opt out decisions, we find that opt-out rates are higher in industries with higher income (as imputed from those who contribute), but lower in industries in which employees face more volatile income and in counties with higher unemployment rates. Younger employees are much less likely to opt out. Employees first exposed to OregonSaves through a new employer are also less likely to opt out, which may imply higher participation rates as the program matures. Additionally, we show that workers are much less likely to opt out (and to accumulate any assets) when they experience turnover during their first three

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<sup>10</sup> From Table 2:  $12.0\% = 37.1\% \text{ (column (2))} * 32.4\% \text{ (column (3))}$  and  $9.2\% = 37.1\% \text{ (column (2))} * 24.8\% \text{ (column (4))}$ .

months of eligibility for OregonSaves. As an alternative way of testing whether lower-income employees are less likely to contribute, we compare the income of employees who contribute once or twice to those who contribute three or more times. Unsurprisingly, the incomes of workers who make two or fewer contributions are significantly lower than those of their co-workers. We also find that virtually all variation in savings rates comes from opting out. Among those who do not formally opt out within the first three months, 93.3% accept the default savings rate of 5%, 3.9% set their savings rate to 0%, 2.1% select a savings rate between 0% and 5%, and the remaining 0.7% choose a savings rate above 5%.

The remainder of our analysis focuses on the subgroup of employees who ever contributed to OregonSaves. While the number of accounts with positive balances rises over our study period, the fraction with inflows falls from 67.6% to 34.4%. By contrast, the fraction of accounts experiencing an outflow in any given month remains at around 2.6%. When we focus on the sample of employees who make at least one contribution and follow them forward in event time, we find that only 29% make 12 monthly contributions during their first year. Similarly, only 39% of contributors make a contribution in both month 1 and month 12. While 12% of the remaining 61% elect to opt out during their first year, 30% are classified by their employer as having experienced job turnover, and the other 19% likely experience job turnover not reported to OregonSaves.

These high turnover rates result in skewed account balances. After 12 months, the 10<sup>th</sup> percentile is \$0, the 30<sup>th</sup> percentile is \$101, the median is \$348, the 70<sup>th</sup> percentile is \$854, and the 90<sup>th</sup> percentile is \$1,803. Because our sample is limited to those having at least one contribution, the 10<sup>th</sup> percentile account balance of \$0 reflects inflows followed by outflows. Among the 70% of employees classified by OregonSaves as being active in month 12, the 90<sup>th</sup> percentile is \$2,063; among the other 30% of employees, it is \$775. In aggregate, there are \$58.9 million in inflows and

\$13.6 million in outflows during our study period. Including the \$5.6 million in assets under management in July 2018, we find that 21.0% of plan assets are withdrawn by April 2020. When we estimate regressions predicting outflows, we find that they are primarily driven by opt out decisions (an increase of 42.7 percentage points relative to an unconditional probability of 2.6%). Recent job turnover increases the likelihood of an outflow by less than three percentage points.

We conclude by estimating the effective savings rate within OregonSaves. The average account balance of \$698 measured twelve months after the first contribution is 2.5% of the average annualized income imputed from contributors. If we condition on being actively employed at the end of twelve months, the average account balance increases to \$865 and the effective savings rate increases to 3.0%. Both of these numbers are considerably lower than the average employee contribution rate of 7.3% that Vanguard reports for 2020. Moreover, our estimates ignore the large number of employees who opt out or fail to accumulate assets due to job turnover. Incorporating these employees reduces the effective savings rate to around 1.1%. One conclusion is that a relatively small fraction of the employees targeted by OregonSaves are responsible for the \$147.8 million under management, and that a relatively small fraction of these employees is still contributing after one year. An equally valid conclusion, given the low levels of pre-existing retirement savings within this population, is that the majority of the \$147.8 million reflects net new retirement savings.

## **2. Institutional Framework**

Oregon law requires (most) private-sector firms that do not offer employer-sponsored retirement plans to automatically enroll their employees in OregonSaves.<sup>11</sup> Participating employees contribute to Roth IRAs, a structure adopted to shield employers from fiduciary

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<sup>11</sup> The program's official designation is the Oregon Retirement Savings Plan; see Belbase and Sanzenbacher (2018) and Bradford (2017) for additional discussion.



obligations under ERISA and to guarantee that employers are not required to make any employer contributions under the plan.<sup>12,13</sup> Using Roth IRAs allows participants to withdraw contributions (but not investment returns) without a tax penalty, allowing OregonSaves to function as both a liquid savings account and a retirement savings plan. While the default savings rate in OregonSaves is 5% of earnings, participants can select any (integer) savings rate between 0% and 100%. The default automatic-escalation feature increases the savings rate by one percentage point in January of each calendar year, up to a maximum of 10 percent. During our study period, the first \$1,000 deposited into the participant's OregonSaves account is invested in a money market fund by default, with all subsequent contributions invested in an age-appropriate TDF.<sup>14</sup> Participants are free to change how their contributions are invested, to transfer balances between the money market fund, the TDF suite, and a S&P 500 index fund, and to make withdrawals.

The OregonSaves program was rolled out to employers in seven waves. The first wave consisted of firms volunteering to be in the pilot program, followed by six compulsory waves of decreasing employer size. The largest firms (100+ employees) began the compulsory registration period on October 1, 2017. The deadline for employers with 5 to 9 employees was November 15, 2019, which was the last deadline to fall within our study period. The deadline for the smallest firms (4 or fewer employees) was originally set for May 12, 2020, but it was delayed in response to the COVID-19 pandemic and is currently scheduled for 2023.

Firms were allowed to register employees prior to their 'official' wave and, because

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<sup>12</sup> While participants technically have the option to open a Traditional IRA instead of the (default) Roth IRA, by the end of our study period, only 22 of the 193,080 open accounts are Traditional IRAs.

<sup>13</sup> Scott and Hines (2020) survey OregonSaves employers and find that approximately 80% of them report no out of pocket costs associated with the program.

<sup>14</sup> The TDF is chosen assuming a retirement age of 65. From November 8, 2021, OregonSaves only holds contributions in the money market fund for 90 days after the participant's initial contribution. After 90 days, the money market fund balance is transferred to the age-appropriate TDF, and all subsequent contributions are invested directly in the TDF. See <https://oregonsaves.com/assets/docs/program-description.pdf>, (page 8, downloaded April 3, 2022).

penalties for noncompliance have yet to take effect, some (reluctant) firms still may not have registered.<sup>15</sup> Once registered, employers submit employee names, Social Security numbers, and dates of birth to OregonSaves, which starts the 30-day enrollment period. If an employee does not opt out during the first 15 days, OregonSaves attempts to verify her identity and, if successful, opens the Roth IRA on her behalf at the end of the 30-day window. Thereafter, employers can begin directing employee contributions to the OregonSaves-created accounts; they can also update employees' savings rates and employment statuses with OregonSaves. Because OregonSaves accounts are tied to employees rather than any specific employer, there is no mechanical link between job turnover and withdrawals (similar to what was reported by Hung et al. 2021).

### **3. What Types of Jobs are Targeted by OregonSaves?**

OregonSaves is intended to increase retirement savings by significantly increasing the fraction of private-sector employees with access to a workplace retirement savings plan. In this section, we broaden the evidence in Chalmers et al. (2022) showing that employees covered by OregonSaves have low incomes and high turnover rates, and we present new evidence that they work in a different mix of industries than employees with access to traditional employer-sponsored 401(k) and 403(b) retirement plans.

Table 1 presents summary statistics, by industry, calculated using individual-level monthly administrative data for all workers having access to OregonSaves through April 2020. Our sample includes workers who opted out of OregonSaves during their enrollment window (or later),

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<sup>15</sup> Firms with their own retirement plan are exempt from the mandate to offer OregonSaves. All other employers are required to register. But the penalties for failing to register, to have been implemented January 2020, were postponed due to the pandemic and still have not been implemented. According to Senate Bill 164, "the Commissioner of the Bureau of Labor and Industries may assess against an employer who has engaged in an unlawful practice under section 2 of this 2019 Act a civil penalty in an amount up to \$100 for each employee who is eligible to participate in the plan developed under ORS 178.205, not to exceed an aggregate amount of \$5,000 in a calendar year." Senate Bill 164 was signed into law by Governor Kate Brown on May 22, 2019. See <https://olis.leg.state.or.us/liz/2019R1/Downloads/MeasureDocument/SB164/Enrolled>.

stopped contributing before the end of our study period, or have yet to contribute. The dataset includes employee-level information on age, savings rate, and employer codes, as well as account-level information on monthly contributions, withdrawals, and asset allocation.<sup>16</sup> Monthly incomes are imputed from monthly contributions and savings rates (for those employees active with a single employer). The data also include employer-level information on industry, firm size, and location, and the date on which each employer first directs employee contributions to OregonSaves.<sup>17</sup>

*Table 1 here*

By the end of our study period, 11,088 employers had registered their employees with OregonSaves, but only 5,537 employers (49.9%) had processed any contributions to OregonSaves. The likelihood that any given employer had processed contributions is strongly correlated with firm size, however. Of the 289,657 employees registered with OregonSaves (including those who opted out), 226,178 employees (78.1%) are working (or had worked) at employers that had processed OregonSaves contributions for at least one employee. Column (5) reports that 138,465 employees are classified by the administrator as eligible for OregonSaves and actively working at an employer that is processing contributions in April 2020.<sup>18</sup> This represents the maximum number of employees who could have contributed to OregonSaves in April 2020 (if no one opted out).

Table 1 lists industries in decreasing order of the total number of employees uploaded to OregonSaves. Industry classifications are determined using the first two digits of the six-digit North American Industry Classification System (NAICS), which we observe for 96.4% of

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<sup>16</sup> In this section, our unit of observation is the employer-employee pair. Because individual employees can be enrolled into OregonSaves by multiple employers, they can be assigned multiple employee identification codes; however, each person can only have one OregonSaves account.

<sup>17</sup> Our administrative data include information entered by employers, employees, and the record keeper. To minimize data entry errors, we remove approximately 800 individual accounts due to errors such as age being outside the range of 18 to 100. All of the statistics that we report reflect these filters.

<sup>18</sup> Employees are eligible to participate when the initial 30-day enrollment window closes and their identities are verified.

employers. The largest number of OregonSaves participants are employed in food services, business support, health care, and retail trade, while the smallest number are employed in management, finance and insurance, and mining, oil, and gas.

The five NAICS codes with the largest number of active employees at the end of April 2020 are “Full-service restaurants,” “Limited-service restaurants,” “Temporary help services,” “Hotels and motels, except casino hotels,” and “Farm labor contractors and crew leaders” (see Online Appendix Table 2). These employer labels underscore the fact that OregonSaves is serving employees in low-income, high-turnover industries. After-tax income for the average OregonSaves contributor is \$2,365, with a median of \$1,883, and an interquartile range (IQR) of \$1,960. The observed annualized turnover rate is 38.3%.<sup>19</sup> Within food services, average after-tax monthly earnings are \$1,985, and the annualized turnover rate is 48.6%. The implied annual income of \$28,378 (assuming stable employment) is far less than the per capita income in Oregon, which ranges from \$50,962 in 2018:Q3 to \$58,309 in 2020:Q2.<sup>20</sup>

The highest monthly incomes are for workers in construction (4.6% of employees) and finance (0.1%); these industries also have the lowest turnover rates. More generally, the correlation between industry-level earnings and industry-level annualized turnover rates is -0.47, implying that turnover is higher in jobs in lower-income industries. We also report the within-employee standard deviation of monthly after-tax earnings, calculated at the employee level using all months with positive contributions. The average standard deviation is \$892, or around one-third of the

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<sup>19</sup> The administrator includes a flag indicating whether an employee is active or inactive in month  $t$ . For over 93% of the employee-months classified as inactive, we observe a reason that the employee is inactive. We set monthly turnover equal to one if the employee was “active” in month  $t-1$  but classified as “terminated,” or on “seasonal layoff,” or “out of business” in month  $t$  (where the unit of observations is now employee-employer-month). The classification of employees’ job status is provided to the administrator by employers. To the extent that employers fail to update job status in a timely manner, our estimated turnover rates will understate actual turnover rates. See section 6.2 for evidence that many employers are not providing OregonSaves with timely data on employee turnover.

<sup>20</sup> Estimate from <https://apps.bea.gov/iTable/iTable.cfm?reqid=70&step=1&acrdn=2> after choosing SQINC1, Oregon, Per capita personal income (dollars), and the years 2018, 2019, and 2020.

average monthly earnings of \$2,365. Finally, we present average monthly earnings data from the Oregon Employment Department (OED), derived from lagged quarterly data. The OED data include all employees within an industry, regardless of whether the employer registered for OregonSaves. The correlation between our imputed income measure and the OED income measure is 0.82 when we exclude the missing industry category (and 0.74 when we include it).

Next, we compare the industries of employers served by OregonSaves to the industries of Oregon employers that offer ERISA-covered retirement plans. We obtain data on a total of 1,597 ERISA-covered plans in Oregon from IRS Form 5500. These plans had 544,295 active participants during 2020. By comparison, the estimated number of active employees in OregonSaves in April 2020 is 163,368.<sup>21</sup> Figure 1 plots the fraction of participants working within each broad industry separately for OregonSaves and the Oregon-headquartered ERISA-covered plans, and it reveals large differences in industry composition. For example, 37.9% of OregonSaves participants work in Food Services, compared to only 2.3% of participants in traditional plans. For manufacturing, the market shares are 4.9% and 20.0%, respectively.

*Figure 1 here*

Even these broad industry comparisons may understate the different types of jobs performed by participants in OregonSaves versus ERISA-covered plans. Consider health care, which is the third-largest industry in OregonSaves and the largest industry in the ERISA-covered plans. The top five NAICS categories for health care in OregonSaves are “Assisted living facilities for the elderly” (18.9%), “Services for the elderly and disabled” (17.2%), “Home health care

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<sup>21</sup> Within each industry, we multiply the total number of employees from Table 1 by one minus the industry-specific opt out rate from Table 2, and sum across employers with non-missing NAICS. This results in more employees than the 138,465 reported in column (5) of Table 1 because it abstracts from turnover by OregonSaves employees during our study period. Because the correlation between the numbers of employees in column (4) of Online Appendix Table 3 and column (5) of Table 2 is 0.994, however, none of our conclusions change if we use the series that captures turnover (but does not capture opt out).

services” (11.2%), “Child day care services” (10.9%), and “Residential disability facilities” (7.5%). In the Form 5500 sample, the top five categories are “Hospitals” (46.8%), “Nursing & Residential Care Facilities” (21.1%), “Offices of Physicians (except Mental Health Specialists)” (8.9%), “Individual and Family Services” (4.6%), and “HMO Medical Centers” (4.4%). The only overlap in industry categories relates to residential care facilities.

#### **4. Cross-sectional Evidence on OregonSaves Participation Rates**

In this section, we study employees’ decision to participate in OregonSaves. Because the typical OregonSaves-covered worker earns low and volatile income, we would not expect participation rates under automatic enrollment to match those in other studies of 401(k) plans such as Madrian and Shea (2001). Instead, we highlight the challenge of measuring participation rates when there is a large gap between the fraction of employees who choose not to opt out and the fraction with a positive account balance. Then, we use participant-level data to ask which employee and employer characteristics are associated with opting out versus accumulating assets.

##### **4.1 Summary Statistics on Participation, Account Status, and Account Balances**

Table 2 summarizes evidence on each employee three months after her initial month of eligibility. The industry-level estimates are limited to employee-employer pairs where the employer has processed at least one OregonSaves contribution.<sup>22</sup> We report totals both for this subset of employers and for the broader sample of employers. Column (2) reports that, across all employers, 40.9% of employees formally opt out of OregonSaves within their first three months.<sup>23</sup> Within the sample of employees whose employers began processing contributions, the formal opt-

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<sup>22</sup> We define eligibility as the first month in which she would become eligible to contribute to OregonSaves if she has not opted out, is actively employed, and has her identity successfully verified. The total number of employees reported in column (1) is lower than Table 1 column (4) because the relevant month for some employees is before August 2018 or after April 2020. In Online Appendix Table 5, we report the month-three opt-out rate separately for each month between August 2018 and April 2020. It is slightly higher at the end of our study period than at the beginning.

<sup>23</sup> Chalmers et al. (2022) estimate an opt-out rate of 41.5% within the full sample of 289,657 employees.

out rate is 37.1%. Both opt-out rates are significantly higher than the 14.1% opt-out rate for the large-firm employees subject to automatic enrollment in Madrian and Shea (2001). The OregonSaves opt-out rate also varies significantly across industries; for example, the correlation between the industry-level opt-out rate and the mean industry-level OregonSaves-contributor earnings is 0.73 (Table 1). While this strong positive correlation is broadly consistent with existing evidence that lower-paid employees are more likely to accept default investment options (as in Chalmers and Reuter 2020; and Mitchell and Utkus 2021), it runs counter to the view that low retirement savings rates prior to OregonSaves were driven by the lack of stable income. It also contrasts with the result from Madrian and Shea (2001) that lower income is associated with higher opt-out rates (e.g., 20.5% for those earning less than \$20,000 in 1999 versus 5.8% for those earning more than \$80,000; see their Table IV).

*Table 2 here*

Our survey of employees who formally opted out of OregonSaves found that 32.4% of those who opt out say that they cannot afford to save, while 24.8% say that they already have a retirement plan (Chalmers et al. 2022). The cross-industry correlation between “can’t afford to save” and mean earnings is -0.17, while the cross-industry correlation between “already have a plan” and mean earnings is -0.01.<sup>24</sup> In other words, conditional on opting out, employees in lower-paying industries are more likely to cite a lack of income but no more likely to cite a pre-existing retirement account.

The next three columns shift the focus from opt out rates to account status. Although 62.9% of employees choose to participate (i.e., not to opt out) during their first three months of eligibility, only 35.8% of (all) employees have a positive account balance at the end of three months. Another

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<sup>24</sup> In Online Appendix Table 4, which does not require that the employer has begun to process contributions, the correlations are -0.46 and 0.15, respectively.

1.8% have an account balance of zero, while the remaining 62.3% lack an open account.<sup>25</sup> The gap between participation rates and fraction of employees with positive account balances is a striking feature of OregonSaves, which we return to in the next section and throughout our paper.

The remaining columns report that, across the 59,343 accounts with a positive balance after three months of eligibility, the mean account balance is \$268, the median is \$192, and the IQR is \$265. The mean account balance ranges from a low of \$192 for arts and entertainment to a high of \$462 for professional and scientific. Unsurprisingly, the cross-industry correlation between mean account balances and mean industry earnings is 0.92, consistent with employees in higher-paying industries making larger monthly contributions.

## 4.2 Participation Rates

It is difficult to estimate the steady-state participation rate for a young savings program like OregonSaves. The enrollment deadline for the smallest employers is scheduled for 2023; many existing employers have yet to process a single contribution; and many employees working at employers who have begun processing contributions appear not to be accruing assets.<sup>26</sup> Using data for September of 2019, Quinby et al. (2020) computed participation rates of between 48% and 67% in OregonSaves.

We offer three distinct measures of program participation in Figure 2, using data through April 2020. We follow Quinby et al. (2020) in focusing on employees at employers that have begun processing OregonSaves contributions. Because we are interested in understanding the role that turnover plays, however, we do not exclude employees classified as inactive by OregonSaves. The

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<sup>25</sup> Employees cannot have an open account until their identity is verified (a process that we do not observe). Employees are less likely to have an open account if they opt out, are no longer employed when the employer begins directing contributions to OregonSaves, or work at an employer that has not begun directing contributions to OregonSaves.

<sup>26</sup> Online Appendix Table 6 shows that the likelihood that an employer begins to process OregonSaves contributions increases monotonically from 18.6% in the month of registration to 74.6% one year later. It also shows that formal opt-out rates are lower at firms where employers are processing contributions.



solid blue line is equal to one minus the fraction of (active or inactive) employees who do not formally opt out during the first three months of potential eligibility. The data point for each month is based on the decisions of the cohort of employees whose three months of eligibility end that month (see the last column of Online Appendix Table 5). Based on this time series, the average participation rate is 64.1%, but it varies between 55.5% and 74.6%. The implicit assumption behind this figure is that anyone who does not formally opt out will accumulate assets, which sets aside the possibility that employees will fail to accumulate assets because they experience turnover or will choose to set their savings rate to 0% without formally opting out.

*Figure 2 here*

The dotted red line in Figure 2 plots the **feasible participation rate**, defined as the number of employees who *ever* have a positive account balance (over our study period) divided by the number of active eligible employees working at employers processing contributions by the end of the month.<sup>27</sup> Thus, the feasible participation rate represents the proportion of current employees that could, with near certainty, show up as participants in OregonSaves if they have not formally opted out or otherwise set their savings rate to 0%. The feasible participation rate is 62.4% at the end of our study period. If we limited the numerator to accounts with positive balances, the ratio falls slightly, to 56.1%. In contrast, the dashed green line plots the **global participation rate**, defined as the number of participants with a positive account balance at the end of the month divided by the total number of employees uploaded to the OregonSaves system by employers who had begun processing payroll by the end of the same month. The global participation rate remains well below the other two measures throughout our study period, reaching a maximum of 34.3% in April 2020. The gap between the global and feasible participation rates reflects the cumulative

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<sup>27</sup> Online Appendix Table 7 describes the growth of OregonSaves employers and employees between August 2018 and April 2020; it also contains our calculations of the feasible and global participation rates.

impact of job turnover, opt-out decisions, and withdrawals throughout our study period.<sup>28</sup> Ultimately, each provides an answer to a different question and must be interpreted with care.

In Madrian and Shea (2001), the participation rate increased 48.5 percentage points (from 37.4% to 85.9%), with even larger increases for females, minorities, younger workers, and lower-income workers. But those workers were all employed by “a large, publicly traded Fortune 500 company in the health care and insurance industry,” with a maximum employer match of 3 percent for those employees contributing at least 6 percent of their salary (p. 1151).<sup>29</sup> It should not be surprising that the overall participation rate is lower within a population with low and volatile income *and* no employer match. When evaluating OregonSaves, it is also important to remember that the baseline participation rate (in terms of pre-existing retirement savings) is likely to be 0% for the vast majority of participants. Therefore, even if the true long-run participation rate proves to be closer to 34.3% than to either of our higher estimates, the marginal impact of OregonSaves on participation in any retirement savings plan is likely to exceed 30%.

### **4.3 Factors Associated with Opting Out**

In Table 3, we leverage our administrative data to ask which employee and employer characteristics predict employee opt out. We seek to understand how opt out decisions vary with age (negatively correlated with years until retirement), the level and volatility of incomes within the industry, local economic conditions, and job turnover. We are also interested in understanding whether opt out rates fall with repeated exposure to OregonSaves (which would have implications

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<sup>28</sup> Ideally, we would remove any employees whose identities could not be verified from the denominator because it is not possible for these employees to appear in the numerator with positive account balances. However, OregonSaves does not attempt to verify the identities of those employees who opt out within 15 days and we were not provided with any data on the outcome of the identity verification process.

<sup>29</sup> It is also worth noting that the default investment option in Madrian and Shea (2001) was a money market fund and that acceptance of default investment options tends to be higher when the default is a target date fund series (Mitchell and Utkus 2021). Vanguard (2022) reported that participation rates in plans with automatic enrollment were 93% versus 66% in plans without automatic enrollment; the vast majority of Vanguard’s plans offer TDFs, balanced funds, or managed accounts as defaults.

for steady-state opt-out rates), and whether employees working at an employer when it registered for OregonSaves behave differently than employees who joined the employer several months later (under the theory that existing employees are more likely to notice the decrease in take-home pay).

*Table 3 here*

The dependent variable in each regression equals 100 if employee  $i$  opted out of OregonSaves within three months of her initial eligibility date, and zero otherwise. This scaling allows us to interpret coefficients as changes in percentage points. Employee-level controls include age indicators (omitted category is age 18-25); account holder location indicators (omitted category is urban); an indicator variable signifying that the employee was hired three or more months after the employer joined OregonSaves; a variable indicating whether the employee had encountered OregonSaves at a prior employer; and a variable indicating whether the employee was terminated by the end of month  $t$ . We also use the account-level mailing address to control for the average county unemployment rate over the prior three months (which limits our sample to employees with mailing addresses in Oregon and Washington). Employer-level independent variables include a measure of firm size (the natural logarithm of the number of employees in the month that the employer enrolled) and indicator variables indicating whether the employer joined OregonSaves during the voluntary pilot phase, whether the employer registered after the OregonSaves deadline based on firm size (a possible measure of employer reluctance), and whether the employer processed contributions for at least one employee by the end of month  $t$ . Industry-level controls include the median monthly after-tax earnings of contributors within the same 6-digit industry in month  $t-1$  and the median within-employee standard deviation of monthly income for workers employed in the same 6-digit industry in month  $t-1$ . (Summary statistics for all variables appear in Online Appendix Table 8.) Standard errors are clustered by 6-digit industry.

Columns (1) and (2) of Table 3 present our baseline estimates, with column (2) adding 6-digit NAICS fixed effects to the year-month fixed effects applied in every column. Column (3) drops the industry fixed effects but adds a control for the fraction of co-workers who opted out through month  $t-1$ , which is likely to reflect a combination of employee preferences and employer influence. Column (4) replaces the industry fixed effects in column (2) with employer fixed effects; it also drops the time-invariant employer characteristics.<sup>30</sup>

Across all four columns, we find that the likelihood of opting out increases sharply with age. This may reflect the fact that older employees are more likely to have accumulated retirement savings earlier in life, or it may reflect a perception that, as one nears retirement age, the benefit of opening a retirement account declines. Regardless, because the youngest employees are the least likely to opt out, they would appear to have the best shot at accumulating retirement assets.

We continue to find that industries with higher average incomes have higher opt out rates. The fact that the estimate attenuates when including industry or employer fixed effects confirms that this correlation is driven by income level differences across industries, rather than variation in income levels within industries (or firms) over our study period. Perhaps more interestingly, we find that industries with more volatile incomes have higher opt out rates, and that this correlation holds in both the cross-section and the time-series. We also find that employees living in counties with higher (lagged) unemployment rates have higher opt out rates, perhaps because the local unemployment rates contain additional information about peoples' levels of economic uncertainty. While the correlation between industry-level incomes and opt outs is puzzling, the other patterns are reassuring, to the extent that they reflect a rational decision to prioritize current consumption (for which the marginal utility is high) over savings.

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<sup>30</sup> Additional specifications are reported in Online Appendix Table 9; these give rise to similar inferences.

Employees who are exposed to OregonSaves for the second (or third) time are between 2.5 and 5.5 percentage points less likely to opt out, which suggests that the steady-state participation rate may be slightly higher than the current participation rate.<sup>31</sup> Employees hired three or more months after the employer registered with OregonSaves are between 7.8 and 14.2 percentage points less likely to opt out. One interpretation, consistent with our conjecture above, is that new employees are less likely to notice the 5% reduction in their after-tax income, because they lack a pre-OregonSaves benchmark. (A countervailing force, documented below, is that we also find much higher turnover rates for new employees.)

Employees who experience turnover within their first three months of eligibility for OregonSaves are between 14.4 and 17.8 percentage points less likely to opt out. While it is not surprising that an employee who leaves an employer would not bother to opt out from the prior employer's retirement plan, the large estimates confirm that some of the gap between participation rates and positive balances is driven by job turnover.

With respect to employer characteristics, we find lower opt out rates at larger firms, and at the small number of firms that volunteered to participate in the pilot program. In column (3), where we include the fraction of employees opting out at an employer in the prior month, we find a large significantly positive coefficient, and the R-squared jumps from 0.104 to 0.275. One interpretation is that employees are influenced by their co-workers' opt out decisions; another, non-mutually exclusive, interpretation is that employers are driving the opt-out rate directly, perhaps by highlighting what they perceive to be problems with the program.

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<sup>31</sup> The marginal effects in Table 3 are much smaller than the raw differences in opt-out rates, which are 41.7% for employees at their first OregonSaves-registered employer, 30.4% for the small number of employees at their second OregonSaves-registered employer, and 28.1% for the even smaller number of employees at their third OregonSaves-registered employer.

#### 4.5 Predicting Positive Account Balances Conditional on Not Opting Out

Figure 2 highlights the substantial fraction of participants who neither formally opt out from OregonSaves nor accumulate any retirement assets. To shed light on this gap, we analyze whether participants have positive OregonSaves account balances using specifications that mirror those in Table 3 (results are reported in Online Appendix Table 10). The dependent variable equals 100 if an employee has a positive account balance three months after her initial eligibility date, and zero otherwise. We limit the sample to employees who have not formally opted out and who work at employers processing contributions.<sup>32</sup>

Several findings are worth highlighting. First, there is a strong age gradient with respect to opting out, but conditional on not opting out, the likelihood of a positive balance is flat, except for the very youngest and the very oldest. Second, while employees joining an employer that previously registered with OregonSaves are less likely to opt out, they are also less likely to accumulate any assets during the first three months. Third, while larger employers and pilot participants have lower opt-out rates, conditional on not opting out, they also have much lower chances of having positive account balances, raising questions about withdrawals. Fourth, consistent with employee or employer peer effects, the fraction of co-workers with positive account balances strongly predicts any participant having a positive account balance. Fifth, conditional on not opting out, employees who experience job turnover are significantly less likely to have accumulated any assets. The fact that many employees neither opt out nor contribute because of job turnover highlights the limitation of evaluating OregonSaves based on participation rates that do not account for turnover.

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<sup>32</sup> We are excluding some employees with positive account balances. However, the fraction of employees who do not opt out and have a positive balance at the end of three months is 52.5%, while the fraction of employees who opt out during the first three months and still have a positive balance at the end of three months is only 7.6%.

#### 4.6 Do Employees with Lower Earnings Make Fewer Contributions?

An important performance metric for OregonSaves is the extent to which employees who cannot afford to save quickly exit from the plans. Evidence in Tables 2 and 3 suggest that employees in higher-income industries are more likely to opt out, but this analysis suffers from a lack of income data for those who opt out during the enrollment window. In Table 4, we compare the imputed monthly after-tax incomes of employees who make one or two monthly contributions before opting out to the imputed monthly after-tax incomes of employees who make three or more contributions. Our identifying assumption is that some lower-income employees do not realize that they were automatically enrolled in OregonSaves until they begin to notice withholdings. Within our sample, we have 7,660 employees who make exactly one monthly contribution, 4,887 who make exactly two monthly contributions (in consecutive months), and 41,449 who make three or more monthly contributions (also in consecutive months).

*Table 4 here*

The dependent variable in each regression is the employee's imputed after-tax monthly income and the independent variables of interest are dummy variables indicating whether the participant makes exactly one or exactly two monthly contributions; the omitted category is participants who go on to make three or more contributions. The sample is limited to the first one or two contributions made by each participant (and excludes anyone who experiences job turnover). In column (1), we see that participants with lower income are much more likely to opt out after only one or two contributions. The average imputed monthly income of employees who only make one contribution before opting out is \$1,462.03 (equals \$2,128.04 plus -\$666.00) versus \$2,128.04 for those who make three or more contributions. Our preferred specification in column (3) introduces employer-by-date fixed effects, which allows us to compare the imputed monthly

incomes of workers who do and do not quickly opt out of OregonSaves within the same employer and month. We find that employees who opt out quickly earn between \$381.90 and \$611.07 per month less than co-workers who make three or more contributions. (Additional specifications, with consistent findings, appear in Online Appendix Table 11.)

Although not the main focus of our analysis, the results in Table 4 also provide several other interesting correlations between salary and job traits. Monthly salary increases and then decreases with age, peaking at ages 46-55. New employees earn less, as do employees in counties with higher unemployment rates, and employees working at larger firms. Consistent with selection into the pilot program, employers that participated in the pilot program pay more.

## **5. Acceptance and Persistence of Default Savings rates**

Research using on samples of higher-income participants finds that default savings rates are both widely accepted and persistent (e.g., Madrian and Shea, 2001). By contrast, in this section, we briefly explore the distribution and persistence of savings rates in the lower-income population served by OregonSaves. To the extent that this population has a higher marginal utility from each after-tax dollar earned, conditional on participating, we might expect to observe significant intensive margin variation in savings rates.<sup>33</sup>

Table 5 focuses on employees three months after their initial month of eligibility. Column (1) presents the distribution of contribution rates for all employees, including those who formally opt out of the program, for whom the savings rate is coded as 0%. Over 98% of employees have a savings rate of either 0% or 5%. When we exclude employees who formally opted out, in column (2), we see that 93% of participants have the default savings rate of 5%, and another 4% informally

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<sup>33</sup> For instance, Carroll et al. (2009: 1668) point to the benefit of active decision-making with respect to savings rates under the assumption that desired savings rates likely vary across employees regardless of their financial literacy levels. Yet, given evidence on the depth of financial illiteracy, they conclude that “[w]ell-chosen defaults are likely to be superior to active decisions in the asset allocation domain.”



opted out by setting their savings rate to 0%. In other words, the vast majority of the cross-sectional variation in savings rates after three months is driven by the opt out decision.

*Table 5 here*

OregonSaves savings rates are also highly persistent in the time series. In Online Appendix Table 12, we show that for 95.2% of employee-employer-months, there is no change in the savings rate from one month to the next. Of the remaining observations, 2.5% involve changes plausibly related to automatic escalation (i.e., increases from 5% to 6% or from 6% to 7%), 1.9% involve participants informally opting out by changing their savings rate to 0%, and only 0.4% involve other types of changes. Online Appendix Table 13 reports the fraction of participants that increase or decrease their contribution rate each month between September 2018 and April 2020. Here we confirm rate increases are clustered in January, when automatic escalation occurs.<sup>34</sup> Again, while we find that opt-out rates are significantly higher than in studies of 401(k) plans having higher-paid and more stable employees, virtually all of the variation is coming from the extensive margin.

## **6. Evolution of Account Balances**

Next, we study the evolution of OregonSaves account balances. Assets under management in the plan increased from \$6.7 million to \$51.0 million over our study period and continue to increase, reaching \$147.8 million in April 2022.<sup>35</sup> Between August 2018 and April 2020, there were \$58.9 million in inflows and \$13.6 million in outflows, implying that 77.0% of inflows are retained. Given the target population, the vast majority of these retained assets are likely to reflect net new retirement savings.

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<sup>34</sup> Additional analysis of the impact of automatic escalation in the OregonSaves case is presented by Zhong (2021), who shows that when the default saving rate rose by one percentage point, about half of the workers who had previously been saving at the default rate either opted out of the program or switched to a non-default rate.

<sup>35</sup> We report these and other aggregate statistics in Online Appendix Table 14.

## 6.1 Account-level balances, flows, and asset allocations

Table 6 focuses on account-level balances, inflows, and outflows. The number of open accounts increases more than 300% (from 19,078 to 77,007), while the number of open accounts with positive balances increases 280% (from 17,830 to 67,731). Across the 67,731 open accounts with positive balances, the average balance in April 2020 was \$754.<sup>36</sup> Of course, this statistic is averaging across participants who began contributing to OregonSaves on a wide range of dates. The average net inflow in April 2020 is \$92, excluding zeros, and the average inflow is \$121, also excluding zeros. Outflows are far less common, occurring in around 2.6% of accounts each month, but they are much larger in magnitude. The average outflow in April 2020 was \$590. More generally, the average amount withdrawn in month  $t$  is equal to 80% of the participant's account balance in month  $t-1$  plus any inflows in month  $t$ .

*Table 6 here*

Perhaps the most striking pattern in Table 6 is the contrast between the relatively stable fraction of accounts with any outflows and the declining percentage of accounts with any inflows. The fraction of accounts with inflows declines from 67.6% in August 2018 to 48.5% in January 2020, well before COVID-19 hit U.S. labor markets, to 34.4% in April 2020, when lockdowns came into effect. The general decline in the fraction of accounts with inflows is to be expected, since accounts enter our sample when an employment relationship begins and remain open without additional inflows when an employee is terminated or quits. However, because OregonSaves accounts are portable, the decline in inflows must reflect some combination of active workers choosing to stop contributing to OregonSaves, workers exiting the labor force, or workers

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<sup>36</sup> Between April 2020 and April 2022, the number of open accounts with positive balances increased 69% (from 67,731 to 114,428) and the average account balance increased 71% (from \$754 to \$1,292). By way of comparison, in May 2022, CalSavers had 283,000 funded accounts with an average balance of \$820 (Wessel 2022).

transitioning to employers that do not participate in OregonSaves. We focus on the reasons that employees stop contributing in the next section.

In the last two columns, we report asset allocation statistics. Although 58.1% of OregonSaves' plan dollars are invested in the money market fund in April 2020 (see Online Appendix Table 14), when we place equal weight on each account, the fraction rises to 86.2%. In other words, the typical participant has limited exposure to equity markets. The average fraction allocated to the S&P 500 index fund is below 1% throughout our study period. These statistics reflect widespread acceptance of the default investment strategy during our study period, which allocates the first \$1,000 to the money market fund and all additional contributions to the TDF corresponding to a retirement age of 65. Investing in the index fund requires an active choice, as does investing less than \$1,000 in the money market fund. Whether it is ideal for participants to hold \$1,000 in risk-free assets before gaining exposure to equity markets is an open question.

## **6.2 How Quickly do Participants Stop Contributing and Why?**

Figure 3 focuses on employees who made at least one contribution to OregonSaves and whose contribution history we can observe for at least 6, 12, or 18 months. For each horizon, we plot the fraction of these participants making the given number of contributions. By construction, 100% of the participants make at least one contribution. Panel A focuses on all contributors. In the sample where we observe six months of data, the probability of at least three contributions in six months is 77%, while the probability of six consecutive contributions is 48%. The probability of at least six contributions increases to 60% in the sample where we observe 12 months of data, but the probability of 12 consecutive contributions is only 29%. These patterns suggest that a significant fraction of contributors (who account for less than 40% of all employees) is either opting out during their first year in the program or experiencing turnover.

*Figure 3 here*

Figure 3 Panel B is similar, except that it distinguishes between employees working at an employer when it registered with OregonSaves (“existing”) versus those who joined three or more months later (“new”). As noted previously, new employees may find the 5% deduction from their pre-tax earnings to be less salient than existing employees, leading to less attrition from the program. Yet as we saw in Table 4, new employees also earn significantly less. The effect of lower income appears to dominate: across all three horizons, the curves for new employees are below those of existing employees. For example, only 19% of new employees make 12 monthly contributions in their first year, versus 33% of existing employees. One possibility is that new employees are more likely to be part-time or seasonal employees, which we cannot observe.

Many of the patterns documented above raise the question of whether declining inflows (as a percent of open accounts) are due to contributors opting out or experiencing turnover. We attempt to answer this question in Figure 4. To do so, we sort contributors into four categories: those who are active but set their savings rate to 0% (dark blue); those who are listed as inactive (lighter blue); those who are listed as active and have a positive savings rate but who do not make a contribution (dark grey); and those who are active, have a positive savings rate, and make a contribution (light grey). We interpret the dark grey bar as capturing employee turnover not reported to OregonSaves. In the month of the initial contribution, 98% of contributors are classified as active with a positive savings rate and 2% are classified as inactive. By month 12, 12% have opted out, 30% are definitely inactive, another 19% are likely inactive, and only 39% remain active contributors. In other words, fewer than 40% of the employees who make at least one contribution into OregonSaves in the early part of our study period are still contributing one year later. While the decision to opt out after contributing into the program plays an important role, the majority of

the attrition appears to be driven by job turnover.

*Figure 4 here*

### **6.3. Dispersion in Account Balances**

We document dispersion in account balances in Table 7; the unit of observation is account-month, and the sample is limited to the 23,617 participants who make at least one contribution into OregonSaves between August 2018 and May 2019. While the fraction of accounts in which the employee is classified as active by at least one OregonSaves-covered employer falls from 97.0% in month 1 to 69.9% in month 12, the fraction of accounts with a positive account balance does not fall below 90.0%. The right panel reveals considerable dispersion in account balances. In month 12, the median value of \$348 (including zeros) is much lower than the overall mean of \$698 (also including zeros). The 10<sup>th</sup> percentile converges to \$0 (due to withdrawals), the 30<sup>th</sup> percentile rises briefly and then converges to \$101 (also due to withdrawals), and the median converges to \$350. Only the 70<sup>th</sup> and 90<sup>th</sup> percentiles, equaling \$854 and \$1803, respectively, appear to be growing throughout the full 12 months. In other words, fewer than half of all contributors appear to have a growing balance at the end of their first year in the program.

*Table 7 here*

When we decompose the left panel of Table 7 into participants who are and are not classified as being active in month  $t$ , we find much lower average account balances among the inactive, but the likelihood of having a positive account is still 87.7% in month 12 among the inactive (Online Appendix Table 15). Performing a similar decomposition on the right panel, we find considerably higher account balances among the active employees, but substantial dispersion in account balances for both samples (Online Appendix Table 16). Finally, we ask whether the evolution of account balances differs across age categories. We find that the youngest employees

are the least likely to be actively employed in month 12 and they also have the lowest account balances (Online Appendix Table 17). So, while the youngest employees are the least likely to opt out of OregonSaves, their ability to accumulate assets is limited by their lower earnings and higher turnover rates.

#### **6.4 Predicting Inflows and Outflows**

To understand the factors associated with participant inflows and outflows, we estimate two linear probability models in Table 8. Column (1) predicts any inflows in month  $t$ , while column (2) predicts any outflows. As in earlier tables, the dependent variables equal either 100 or zero. Since outflows are much lumpier than inflows, the unconditional likelihood of outflows is only 2.6%, while the unconditional likelihood of inflow is 55.4%. (Recall that the typical outflow is equal to around 80% of the lagged account balance.) We limit the sample to the 59,043 accounts for which the first contribution is August 2018 or later, and then follow each account for 18 months or until April 2020, whichever comes first. (We observe the average account for 10 months.)

*Table 8 here*

To quantify the impact of turnover on flows, we include indicator variables that capture whether the employee is classified as being actively employed in month  $t$ , whether she terminates in month  $t$ , and whether she terminates in month  $t-1$ . To quantify the impact of opt out decisions on flows, we include additional indicators that capture whether the employee set her savings rate equal to 0% in month  $t$  and whether she set her savings rate equal to 0% in month  $t-1$  or earlier. We include age category fixed effects (reference category is age 18-25); fixed effects that capture the number of months since the initial contribution fixed effects; calendar year-month fixed effects; and 6-digit NAICS industry fixed effects (which we do not report). Standard errors are clustered on 6-digit NAICS industry.

As expected, employment status is a significant predictor of inflows. Being classified as active increases the likelihood of any inflow by 56.2%, nearly equal to the unconditional average of 55.4%. For those who terminate during month  $t$ , the coefficient is 27.5%, likely reflecting inflows by some employees within the month prior to the job turnover. Predictably, setting the savings rate to 0% is also associated with a reduced probability of any inflows. The large negative coefficient on having set the savings rate to 0% in a prior month largely offsets the coefficient on active. Controlling for employment status, we find that the likelihood of any inflow is decreasing in months since the initial contribution, even controlling for our direct measures of turnover and opt out. These coefficients capture turnover not being reported to OregonSaves. The most striking pattern with respect to the calendar year-month fixed effects is the decline of 17.4% in April 2020. It is conceivable that this reflects a significant loss of earnings due to COVID-19, one not yet captured by the employment status variable.

The linear probability model does a much poorer job of predicting outflows. While the R-squared in Column (1) is 0.43, it is only 0.11 in Column (2). The main predictor of outflows in month  $t$  is the decision to set the savings rate equal to 0% in month  $t$ . The coefficient is 42.7% and the R-squared drops from 0.11 to 0.01 when the variable is excluded. While the coefficients on turnover in month  $t$  or  $t-1$  are both positive and statistically significant, they are an order of magnitude smaller. All else equal, the likelihood of any outflow increases with months since the initial contribution. Younger participants are also slightly more likely to withdraw contributions than older participants.<sup>37</sup>

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<sup>37</sup> Quinby, et. al. (2020) use data for September 2018 to September 2019 to classify OregonSaves participants into full-year contributors, part-year contributors, active non-savers, job changers, and full-year inactives. They find the probability of outflows is highest among the subset of job changers, followed by part-year and full-year contributors.

## 7. Effective Savings Rates

We conclude our analysis by comparing the effective savings rate within OregonSaves to two other benchmarks. If the opt out rate were 0%, everyone accepted the default savings rate of 5%, and there were no outflows, the effective net savings rate for each employee would be 5%. In Table 9, we estimate average effective savings rate for employees working in each industry.

*Table 9 here*

The first column contains the average imputed monthly income for each industry (copied from Table 1). The next four columns report the average account balances (including zeros) in months 6 and 12 for employees who are and are not classified as being actively employed in those months. The average first-year account balances for active employees ranges from \$547 for business support to \$1,551 for wholesale trade. To estimate the average effective savings rate *for the subset of contributors*, we divide account balances in month 12 by 12 times average monthly earnings. Across all contributors, the average rate is 2.5%, or half the default savings rate; it ranges from 1.2% for management to 3.0% for education. The second lowest rate is 1.8% for business support, which reflects temporary help agencies. Overall, we find that, because of attrition due to turnover, opting out after the enrollment window, and withdrawals, the average contributor is saving 2.5% of average pay. One downside to this calculation is that, by annualizing contributor incomes, it penalizes employees whose income disappears following job turnover. If we focus only on contributors still classified as being actively employed in month 12, the average savings rate increases to 3.0%; as discussed above, we also lose 30% of contributors. In both samples, it is important to remember that the counterfactual retirement savings rate is near 0%.

Neither estimate factors in the large number of employees who opt out. In column (8), we calculate effective savings rates assuming that the fraction of participants who choose to opt out



during the first three months (column (2) of Table 2) save 0% and everyone else has the effective savings rate in column (6). The average effective savings rate falls to 1.5%. Finally, in column (9), we attempt to incorporate the large number of employees who neither opt out nor accumulate assets. To this end, we assume that the fraction of participants who lack an open account during the first three months (column (5) of Table 2) save 0%, and everyone else has the effective savings rate in column (6). The overall average effective savings rate then falls to 1.1%.

Not surprisingly, even the 3.0% effective savings rate is far below the rates observed in ERISA-covered plans. According to data from Vanguard's (2022) 2020 survey of participants, the average employee contribution rate is 7.3% and the average employee plus employer contribution rate is 11.3% (see their Figure 33). Of course, employer matches are not permitted in OregonSaves.

Our estimates may be more useful when evaluating proposals to introduce similar plans in other states or nationwide. In September 2021, Richard Neal, Democratic Representative from Massachusetts and Chair of the House Ways and Means Committee, estimated that a national automatic-enrollment retirement plan built around a 6% savings rate and automatic escalation could generate \$7.3 trillion in net new savings in 10 years and boost the number of individuals having IRAs by 63 million (Croce 2021). If we assume that one-third of the incremental savings would accrue to the 63 million new savers, the implied average account balance in 10 years is \$38,624. By comparison, if we take our \$698.28 estimate for contributors at the end of one year, multiply it by 1.2 (to capture the higher baseline savings rate), allow the nominal value of contributions to grow by 3% per year, and assume a constant nominal annual rate of return of 10%, we end up with \$14,961 per account at the end of 10 years, which is meaningful, but much smaller than the policymaker's prediction. Accordingly, we conclude that the study that Mr. Neal cites assumed much higher earnings, much higher returns, or both. It is also worth noting that the

estimate of 63 million new savers is based on an assumed participation rate of 80%, which is considerably higher than the fraction of employees in our sample that accrue any savings.<sup>38</sup>

While there is value in expanding the fraction of private-sector employees with access to automatic-enrollment retirement plans, our estimates point to far more modest participation rates and account balances. Our account balance estimates are certainly closer to the experience of the National Employment Savings Trust (NEST) in the United Kingdom established in 2008. As of May 2022, NEST had 11.3 million funded accounts and \$29.5 billion in assets under management, implying an average balance of \$2,613 per funded account.<sup>39</sup>

## 8. Conclusion

We analyze participation decisions and the evolution of account balances in OregonSaves, the first state-sponsored auto-IRA in the United States. We find that the program serves employees across a range of industries, but primarily those paying low wages and experiencing high turnover. The average participating employee in our sample earns \$2,365 per month (approximately \$28,380 per year, close to the federal poverty line in 2022 for a family of four people),<sup>40</sup> has a within-person standard deviation of monthly earnings of \$945, and an annual job turnover rate of 38.2%. Consistent with these job attributes, OregonSaves participation rates under automatic enrollment are significantly lower than in other settings. However, when assessing participation rates of between 34.3% and 62.4%, it is important to recall that OregonSaves is aimed at workers lacking access to traditional employer-sponsored retirement plans. Only 11% of the employees targeted by OregonSaves claim to already have retirement savings (half the 22% level in the nationally-

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<sup>38</sup> The estimated number of new savers comes from a non-circulated study produced by American Retirement Association. In email correspondence on September 21, 2021, Nevin Adams of the American Retirement Association reported that the assumed participation rate was 80%.

<sup>39</sup> The NEST statistics are from Wessel (2022). We converted assets of 24.2 billion GBP to 29.5 billion USD using an exchange rate of 1.22 USD per GBP from July 31, 2022.

<sup>40</sup> See U.S. Department of Health and Human Services (2022).

representative SIPP; see Online Appendix Table 1). For everyone else, the counterfactual retirement savings rate is near 0%.

In part, the leading reason for opting out is that employees cannot afford to save, especially for those in industries with lower earnings. Opt-out rates rise with the local unemployment rate and the volatility of industry income. In a sense, these opt out choices are reassuring because they are likely to reflect optimal decisions to prioritize current consumption (for which the marginal utility is high) over savings. Relatedly, we observe modest withdrawals following job turnover, which is more common among younger workers, and, during April 2020, we observe a large drop in contributions, which we attribute to COVID-19-related job losses and economic uncertainty.

Regardless of the participation rates, we find that OregonSaves is generating savings for a substantial number of participants. Over 67,700 participants accumulated more than \$51 million dollars through April 2020, resulting in an average account balance of \$754. We also see much higher participation rates among younger workers. This could be because this group is likely less financially literate and less familiar with retirement savings than older workers, and hence they find that automatic enrollment eliminates search cost associated with learning about and enrolling in an IRA. Employees exposed to the OregonSaves program for the second or third time are also more likely to continue participating in OregonSaves, as they have previously learned about OregonSaves. Because we find very little variation in savings rates, dispersion in account balances is driven by variation in salaries and job tenure. Finally, we find that older workers and workers in industries with higher income levels perceive less benefit to participating in OregonSaves, as they are likely to have existing retirement plans or personal savings.

Overall, we conclude that OregonSaves has meaningfully increased employee savings for a fraction of low-income workers who can afford to save but lack access to auto-enrollment plans.

Nevertheless, we have also identified limits to what automatic-enrollment savings plans can achieve when expanded to workers in industries and firms with low wages, volatile wages, and high turnover rates. Specifically, there is reason to expect that at least part of the liquid savings generated by employee contributions were drawn down to smooth consumption during the pandemic. This is not to undermine the value of the saving program; rather it highlights the key role that OregonSaves accounts are playing for lower-paid workers in times of earnings and employment volatility.<sup>41</sup> What is less clear is whether these accounts will eventually grow into important vehicles for retirement saving.

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<sup>41</sup> Beshears et al. (2019) discuss combining retirement savings with emergency savings in an auto-enrollment plan.

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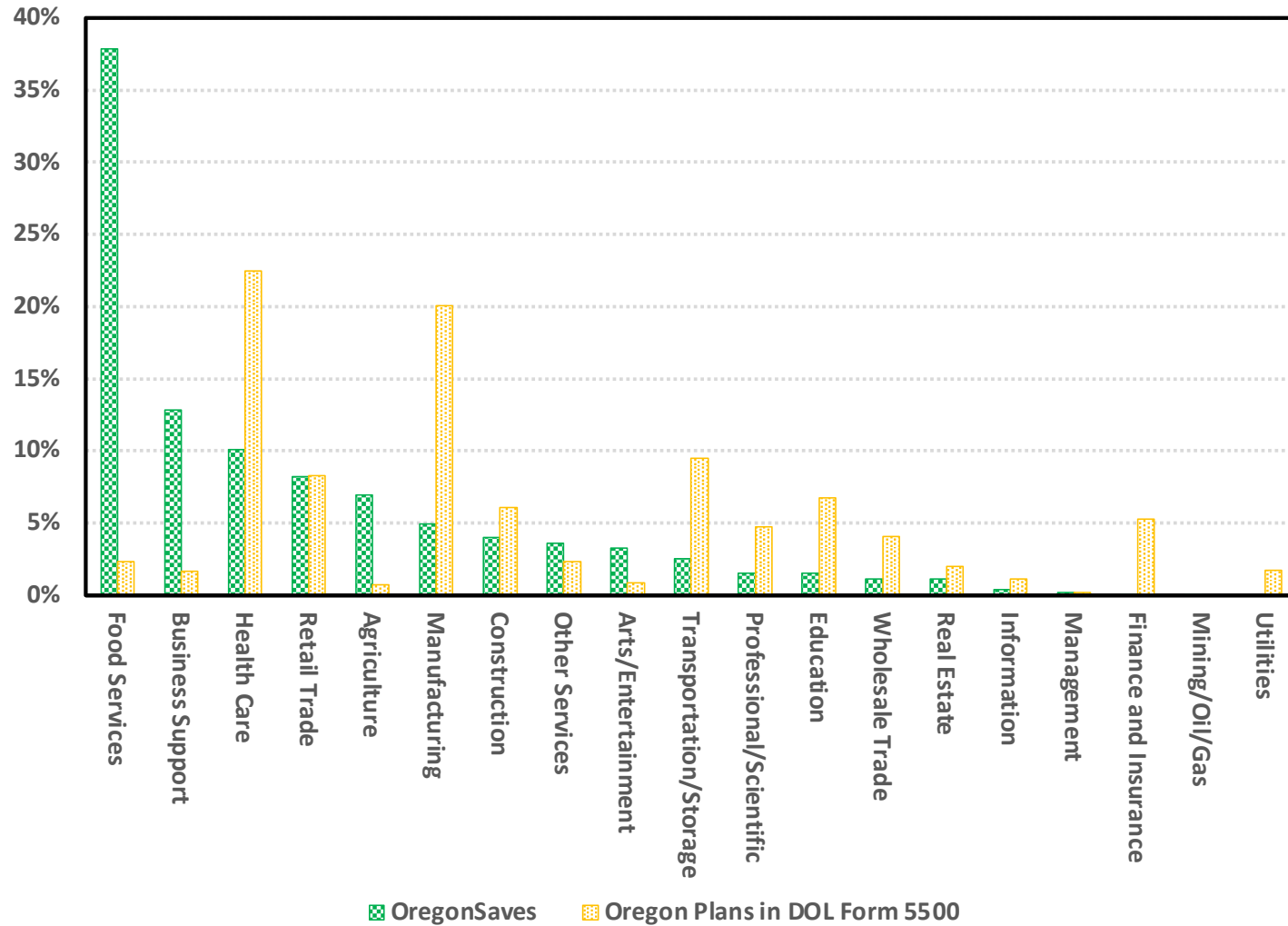
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### Figure 1: Comparing the Fractions of Participants by Industry in OregonSaves and ERISA-Covered Plans

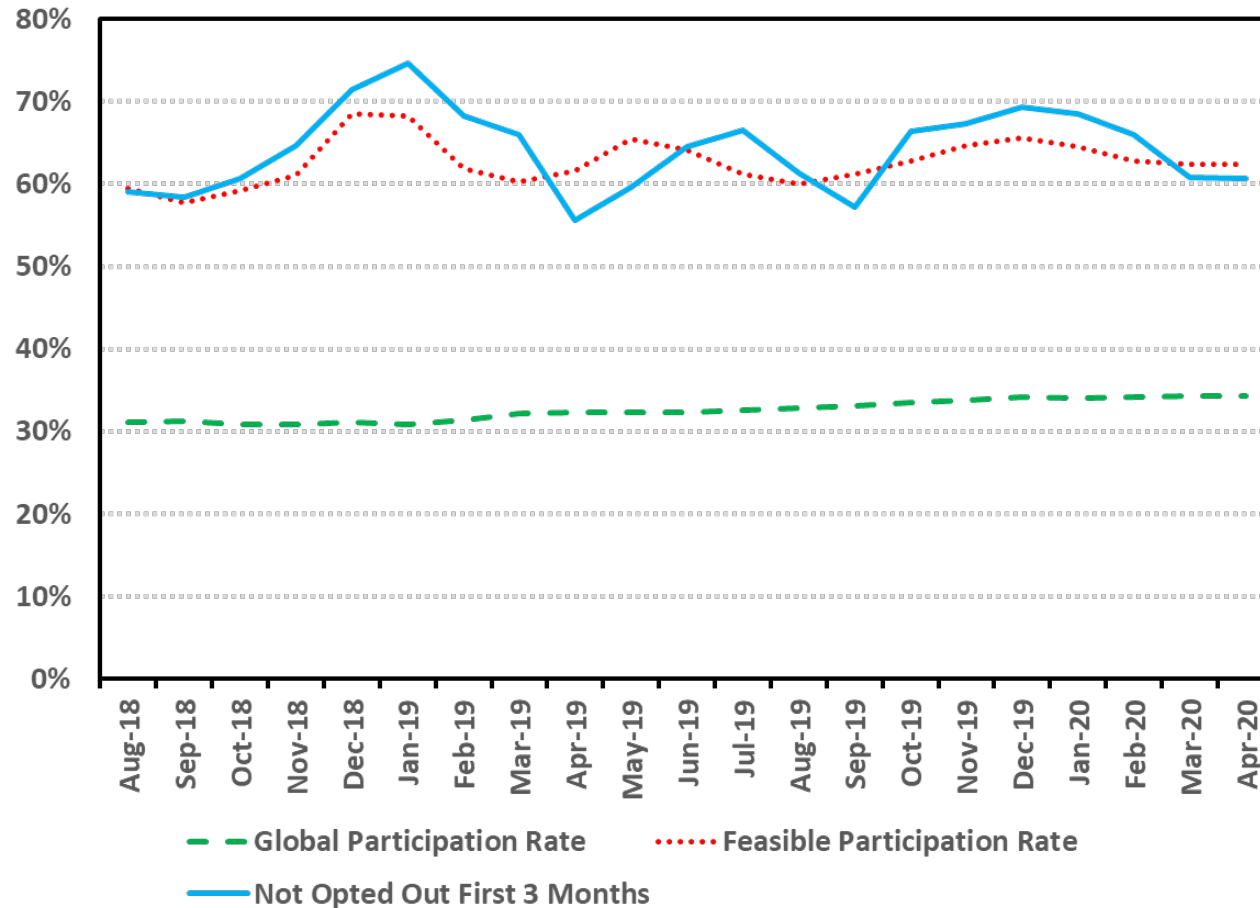
In this figure, we plot the fraction of participants working within each broad industry separately for OregonSaves and ERISA-covered retirement plans for firms headquartered in Oregon. For OregonSaves, we adjust the total number of employees for industry-specific opt-out rates. See column (4) of Online Appendix Table 3. Data for the number of active participants in the 1,597 ERISA-covered retirement plans comes from Department of Labor Form 5500. See column (8) of Online Appendix Table 3.





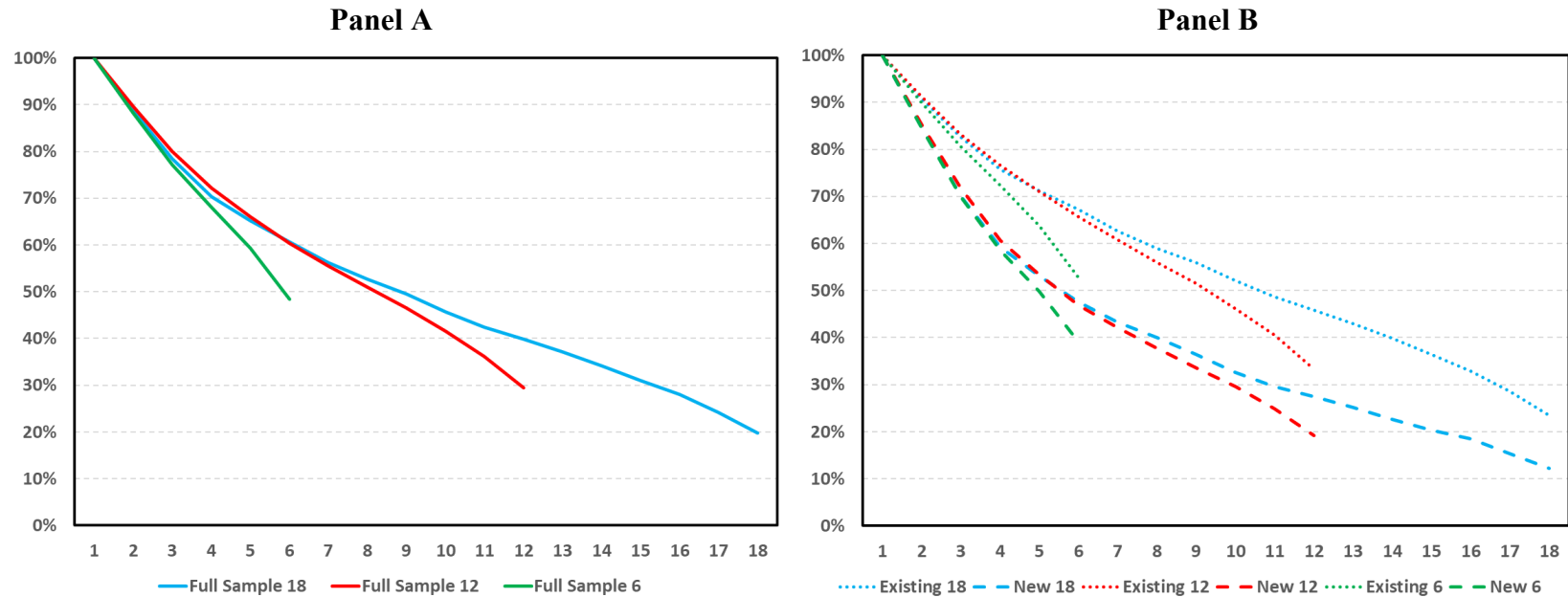
### Figure 2: Different Measures of Participation Rates, August 2018 – April 2020

In this figure, we focus on employees working at employers that have begun processing OregonSaves contributions. The solid blue line is equal to one minus the fraction of (active or inactive) employees who do not formally opt-out during the first three months of potential eligibility. The dotted red line measures the Feasible Participation Rate, defined as the number of employees who ever have a positive account balance (over our study period) divided by the number of active, eligible employees working at employers processing contributions by the end of the month. The dashed green line measures the Global Participation Rate, defined as the number of participants with a positive account balance at the end of the month divided by the total number of employees entered into the OregonSaves system by employers who had begun processing payroll by the end of the same month. Source: authors' calculations.



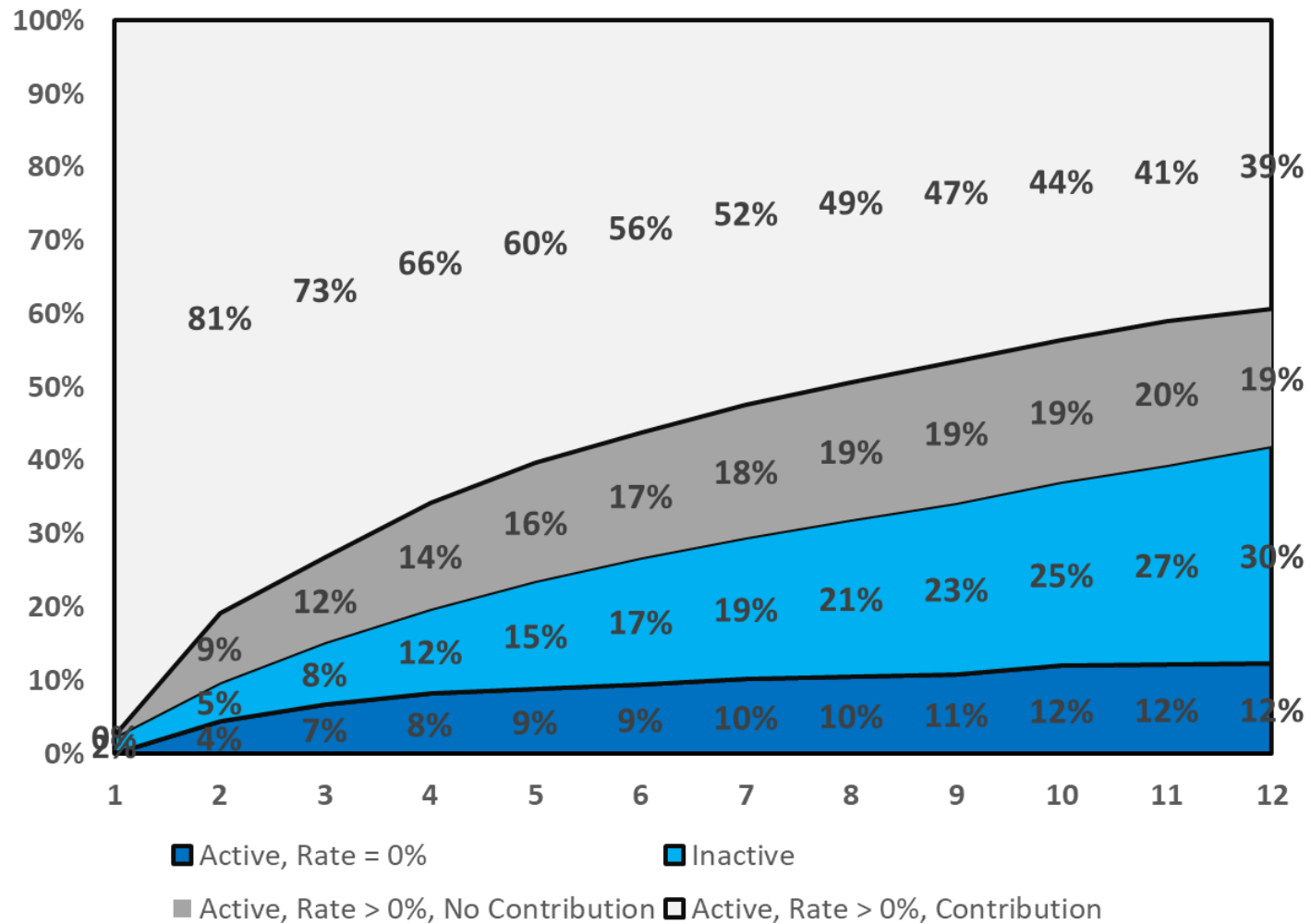
### Figure 3: Frequency of Contributions During the First Six, Twelve, and Eighteen Months

In this figure, we present employees who made at least one contribution into OregonSaves and whose contribution history we can observe for at least 6, 12, or 18 months. For each horizon, we plot the fraction of these participants making a certain number of contributions. By construction, 100% of the participants make at least one contribution. Panel A focuses on all contributors. In the sample where we observe at six months of data, the probability of at least three contributions in six months is 77%, while the probability of six consecutive contributions is 48%. The probability of at least six contributions increases to 60% in the sample where we observe 12 months of data, but the probability of 12 consecutive contributions is only 29%. These patterns suggest that a significant fraction of contributors (who account for less than 40% of all employees) is either opting out during their first year in the program or experiencing turnover. Figure 3 Panel B is similar except that it distinguishes between employees who were working at an employer when it registered with OregonSaves (“existing”) and those who joined three or more months later (“new”). As we discussed previously, new employees may find the 5% deduction from their after-tax earnings to be less salient than existing employees, leading to less attrition from the program. On the other hand, as we saw in Table 4, new employees also earn significantly less. The effect of lower income appears to dominate. Across all three horizons, the curves for new employees are below those of existing employees. For example, only 19% of new employees make 12 monthly contributions in their first year versus 33% of existing employees. One possibility is that new employees are more likely to be part-time or seasonal employees.



#### Figure 4: Reasons that Contributors Stop Contributing During Their First Twelve Months

The unit of observation is account-by-month, and the sample is limited to the 23,617 participants who make at least one contribution into OregonSaves between August 2018 and May 2019. We sort contributors into four categories: those who are active but set their savings rate to 0% (dark blue); those who are listed as inactive (lighter blue); those who are listed as active and have a positive savings rate but who do not make a contribution (dark grey); and those who are active, have a positive savings rate, and make a contribution (light grey). Only 39% of contributors make a contribution in both month 1 and month 12.



**Table 1: Growth of OregonSaves, August 2018 – April 2020**

We provide employee-level summary statistics, by industry, for the full sample of employees covered by OregonSaves. Columns (1) and (2) report the number of employers within each broad industry classification and the number of employers that have processed at least one contribution into OregonSaves by the end of April 2020. Column (3) reports the total number of employees within the 11,088 employers. Columns (4) limits the sample to employees whose employers are processing contributions. Column (5) further limits the sample to employees that are classified as eligible to contribute and actively employed. Rows are sorted on the values in column (3). Statistics in columns (6) and (7) are reported for the sample of employees in column (3). Age is defined as the calendar year in which the employee first appears in the administrative data minus the stated year of birth. We annualize the monthly turnover rate, where turnover equals one if the employee was "active" in month t-1 but classified as "terminated", "seasonal layoff" or "out of business" in month t (unit of observation is employee-month). Monthly earnings are estimated at the employee-month level as total monthly contributions divided by current savings rate (e.g., \$100 / 5% = \$2000). Monthly earnings can only be estimated for the subset of contributors. We further limit the sample to individuals with a single active employee-employer relationship. We report the mean and median imputed monthly income within each industry. We also report the within-employee standard deviation of monthly earnings, calculated at the employee level using all months with positive contributions within each employee-employer pair (except for the first month, which may reflect less than a full month's labor, and the last month, if the last month coincides with opting out of the program or setting the savings rate to 0%); the unit of observation is employee rather than employee-month. Finally, we report the average monthly earnings based on lagged quarterly earnings and hours worked data from the Oregon Employment Department, which is provided at the NAICS6-county level. These data cover all employees at both OregonSaves-participating and non-OregonSaves-participating employers. The correlation between the industry-level average monthly incomes in column (8) and column (11) is 0.7352. Source: Authors calculations.

Industry	All Employers		Employee's Employer & Active & Employer			Average Age	Annualized Average Monthly Turnover	Imputed Monthly Earnings				Average OED Monthly Earnings
	All Employers	Processing Contrib.	All Employees	Processing Contrib.	& Employer Contrib.			Mean	Median	IQR	Within Employee Std Dev	
	(1)	(2)	(3)	(4)	(5)							
Food Services	2,523	1,453	91,342	76,790	42,359	32.1	48.6%	1,985	1,617	1,560	747	1,855
Business Support	571	302	32,930	27,656	18,184	36.8	30.7%	2,047	1,700	1,807	865	2,600
Health Care	837	453	26,893	23,341	13,047	37.9	46.5%	2,242	1,860	1,740	850	2,523
Retail Trade	1,322	615	25,509	18,900	11,425	37.4	38.8%	2,381	1,883	1,760	858	2,504
Agriculture	687	299	21,593	13,690	9,144	38.9	22.2%	3,130	2,680	2,280	1,282	2,684
Manufacturing	708	376	16,510	13,086	8,219	39.2	39.2%	3,053	2,580	2,067	1,162	3,535
Construction	1,066	463	13,344	7,963	6,067	39.2	20.0%	4,040	3,540	2,620	1,414	4,219
Other Services	909	375	12,375	8,391	5,544	39.1	34.5%	2,472	2,057	2,000	892	2,771
Arts/Entertainment	324	186	8,770	6,956	5,036	35.1	28.6%	1,638	1,100	1,860	633	1,850
Transportation/Storage	250	113	6,472	3,326	2,258	41.6	22.6%	3,011	2,640	2,180	1,135	3,903
Professional/Scientific	459	205	5,376	4,020	2,846	39.4	29.2%	3,844	2,920	3,180	1,579	5,922
Education	236	152	4,704	4,014	2,910	39.0	31.6%	1,983	1,380	2,220	805	2,574
Wholesale Trade	265	105	4,403	3,010	1,957	41.0	33.8%	3,892	3,200	2,460	1,381	4,759
Real Estate	330	138	4,255	2,833	2,178	42.8	24.8%	3,379	2,833	2,480	1,269	3,748
Information	94	57	1,249	977	737	38.4	30.1%	3,276	2,720	2,940	1,131	4,826
Management	18	8	576	515	242	30.9	66.8%	2,897	2,120	2,660	1,058	5,983
Finance and Insurance	75	13	417	116	108	45.8	7.7%	4,165	2,900	1,440	2,264	5,897
Mining/Oil/Gas	12	3	144	44	25	47.9	21.8%	3,721	3,900	1,520	772	4,980
Missing	402	221	12,795	10,550	6,179	33.8	56.1%	2,445	1,940	1,860	865	5,495
All	11,088	5,537	289,657	226,178	138,465	36.2	38.3%	2,365	1,883	1,960	892	2,506

**Table 2: OregonSaves Opt-Out Rates and Initial Account Balances by Industry**

In this table, the unit of observation is employee  $i$  three months after the date on which the employee would be eligible to contribute to OregonSaves (where the eligibility date is set under the assumptions that her identify is verified and she remains employed). We limit the sample to the subset of employee-employer observations for which the employer has processed at least one OregonSaves contribution. Industries appear in the same order as in Table 1. We report the number of employees in column (1). The focus on each employee during this particular month explains the reduced sample size relative to Tables 1 and 2. Column (2) reports the fraction of these employees who have formally opted out of OregonSaves within three months of eligibility. Columns (3) and (4) condition the sample on having opted out and report the fraction that list the reason for opting out as "I can't afford to save at this time" or "I have my own retirement plan", respectively. Columns (5), (6), and (7) report the fractions of all employees without an account (which is where the vast majority of employees who opt out fall), with an account balance of \$0, or with a positive account balance. The remaining columns focus on the subset of employees with positive account balances after three months of eligibility and report the mean, median, and interquartile range of their account balance three months after being eligible.

Industry	Employees (1)	Formal opt out (2)	Conditional on Opt Out		Account status			Conditional on Account > \$0		
			Cannot afford (3)	Existing plan (4)	None (5)	\$0 (6)	> \$0 (7)	Mean (8)	Median (9)	IQR (10)
Food Services	55,696	30.0%	36.7%	21.3%	58.2%	2.1%	39.7%	\$ 228	\$ 172	\$ 215
Business Support	18,436	33.6%	33.4%	19.0%	70.1%	1.4%	28.5%	\$ 230	\$ 167	\$ 278
Health Care	16,047	36.5%	38.2%	24.6%	56.7%	2.3%	41.0%	\$ 239	\$ 184	\$ 236
Retail Trade	13,600	43.0%	32.9%	25.6%	61.4%	2.1%	36.5%	\$ 253	\$ 199	\$ 241
Agriculture	10,195	42.5%	23.9%	14.2%	83.3%	0.7%	16.0%	\$ 355	\$ 306	\$ 362
Manufacturing	9,191	47.7%	30.5%	27.5%	64.6%	1.5%	33.9%	\$ 334	\$ 276	\$ 330
Construction	6,277	47.0%	25.0%	28.7%	63.8%	1.9%	34.3%	\$ 452	\$ 396	\$ 427
Other Services	6,825	45.0%	31.7%	33.9%	57.6%	1.8%	40.6%	\$ 285	\$ 222	\$ 265
Arts/Entertainment	5,337	36.1%	25.2%	39.5%	59.5%	1.2%	39.3%	\$ 190	\$ 110	\$ 194
Transportation/Storage	2,625	44.6%	33.8%	29.6%	59.6%	2.8%	37.6%	\$ 358	\$ 317	\$ 346
Professional/Scientific	3,549	50.1%	24.2%	33.6%	68.7%	1.3%	30.0%	\$ 461	\$ 306	\$ 431
Education	3,551	47.1%	22.6%	40.5%	61.7%	1.2%	37.1%	\$ 229	\$ 136	\$ 269
Wholesale Trade	2,126	52.6%	29.0%	24.6%	69.0%	1.5%	29.4%	\$ 415	\$ 327	\$ 349
Real Estate	2,042	50.0%	27.0%	32.3%	59.5%	2.4%	38.1%	\$ 372	\$ 296	\$ 372
Information	858	51.6%	33.9%	27.8%	60.0%	1.2%	38.8%	\$ 293	\$ 207	\$ 370
Management	283	39.2%	30.6%	27.9%	65.7%	0.7%	33.6%	\$ 270	\$ 186	\$ 275
Finance and Insurance	81	53.1%	34.9%	34.9%	59.3%	0.0%	40.7%	\$ 437	\$ 304	\$ 327
Mining/Oil/Gas	32	68.8%	9.1%	45.5%	65.6%	0.0%	34.4%	\$ 378	\$ 392	\$ 647
<i>Missing</i>	5,809	28.3%	36.7%	23.0%	56.8%	2.6%	40.6%	\$ 279	\$ 194	\$ 259
All (Processing Contributions)	162,560	37.1%	32.4%	24.8%	62.3%	1.8%	35.8%	\$ 263	\$ 193	\$ 264
All (Appendix Table 4)	221,907	40.9%	30.3%	26.0%	71.8%	1.4%	26.7%	\$ 268	\$ 192	\$ 265

**Table 3: Predicting Opt Out from OregonSaves**

In this table, we estimate linear probability models to predict opt out from OregonSaves. The unit of observation is employee  $i$ . The dependent variable equals 100 if employee  $i$  has formally opted out of OregonSaves three months after her initial eligibility date, and zero otherwise. Employee-level independent variables include age category dummy variables (omitted category is ages 18-25); account holder location dummy variables (omitted category is account holder lives in an urban Oregon zip code); a dummy variable indicating whether the employee was hired 3 or more months after the employer registered with OregonSaves; a dummy variable indicating whether the account is linked to a prior OregonSaves employment spell; and a dummy variable indicating if the employee was terminated during this three month period. Employer-level independent variables include the fraction of co-workers who formally opted out of OregonSaves through month  $t-1$  and firm size (natural logarithm of one plus the number of employees when the employer registered), as well as dummy variables indicating whether the employer joined OregonSaves during the pilot phase, whether the employer registered after the OregonSaves deadline based on firm size, and whether the employer has processed payroll for at least one employee through month  $t$ . Industry-level independent variables include median employee income within the industry (or industry-county) in month  $t-1$  and the median within-employee standard deviation of imputed income within the industry (or industry-county) in month  $t-1$ . We also include the average county-level unemployment rate in months  $t-3$  to  $t-1$ . All columns include year-month fixed effects. Column (1) is our baseline specification. Column (2) adds 6-digit NAICS fixed effects to the baseline specification, while column (3) adds the employer-level opt out measure, and column (4) adds employer fixed effects. Standard errors cluster on six-digit NAICS industry. Statistical significance at the 1-percent, 5-percent, and 10-percent levels is indicated by \*\*\*, \*\*, and \*, respectively.

	Predicting opt out 3 months after eligibility			
	(1)	(2)	(3)	(4)
Age 26-35? (t)	4.51 *** (0.98)	3.81 *** (0.67)	3.57 *** (0.43)	3.65 *** (0.58)
Age 36-45? (t)	7.28 *** (0.96)	5.86 *** (0.58)	4.85 *** (0.44)	5.29 *** (0.63)
Age 46-55? (t)	10.34 *** (1.10)	8.29 *** (0.86)	5.96 *** (0.56)	6.61 *** (0.76)
Age 56-65? (t)	19.66 *** (1.40)	16.96 *** (1.13)	13.04 *** (0.72)	13.80 *** (0.95)
Age 66-75? (t)	31.24 *** (1.59)	27.76 *** (1.17)	22.75 *** (0.95)	24.05 *** (1.17)
Age > 75? (t)	36.21 *** (2.51)	32.15 *** (2.10)	25.67 *** (2.04)	27.04 *** (2.21)
Account holder in rural Oregon? (t)	-1.52 * (0.80)	-1.56 ** (0.63)	-1.33 *** (0.48)	-0.23 (0.50)
Account holder lives outside Oregon? (t)	-2.79 (2.41)	-1.67 (2.01)	-0.08 (1.04)	0.96 (0.95)
Hired after employer joins OregonSaves (t)	-14.24 *** (1.91)	-10.49 *** (1.11)	-9.84 *** (0.84)	-7.75 *** (0.91)
OregonSaves job number 2+ (t)	-5.48 *** (1.06)	-3.84 *** (0.78)	-3.31 *** (0.80)	-2.52 *** (0.48)
Employee terminated? (t)	-14.39 *** (1.97)	-14.40 *** (2.07)	-14.37 *** (1.19)	-17.75 *** (1.09)
Average county unemployment rate (t-3 to t-1)	1.57 ** (0.64)	1.22 ** (0.58)	0.18 (0.26)	-0.16 (0.41)
Fraction of coworkers who formally opted out (t-1)			79.09 *** (1.65)	
Ln (number of employees at enrollment)	-2.00 ** (0.96)	-2.65 *** (0.76)	-0.32 (0.40)	
Pilot employer? (t)	-8.31 *** (2.23)	-11.81 *** (2.32)	-1.40 (1.45)	
Employer registered late? (t)	-1.86 * (0.97)	-0.37 (0.77)	-0.24 (0.56)	

Employer processed payroll? (t)	-0.24 (1.92)	-1.61 (1.78)	1.39 ** (0.58)	4.92 (3.43)
Median imputed industry-county income (t-1)	1.50 *** (0.38)	0.31 (0.30)	-0.09 (0.13)	0.50 (0.47)
Median within-EE SD of income within industry-county (t-1)	2.37 *** (0.84)	1.65 ** (0.70)	0.23 (0.21)	7.97 *** (2.58)
Limited to accounts in OR or WA?	Yes	Yes	Yes	Yes
Year-month FE?	Yes	Yes	Yes	Yes
NAICS6 Industry FE?	--	Yes	--	--
Employer FE?	--	--	--	Yes
N	161,937	161,937	161,804	163,088
Adj. R2	0.0964	0.1201	0.2427	0.2772
Mean Dependent:	40.01	40.01	40.01	39.96

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**Table 4: Comparing Imputed Monthly Incomes based on Number of Contributions**

In this table, the dependent variable is imputed after-tax monthly income. We compare the monthly income of employees who make exactly one contribution and exactly two contributions to OregonSaves to those of employees who make more than two contributions. By necessity, the sample is limited to employees working at employers that have already begun processing contributions into OregonSaves. We limit the sample to the month of the initial contribution and, for employees who make multiple contributions, the following month. For consistency with other tables, we also limit the sample to employees with account addresses in Oregon or Washington. In column (1), the coefficient on "Only one contribution" is identified using 7,660 observations (7,660 unique employees), the coefficient on "Only two contributions" is identified using 9,774 observations (4,887 unique employees), and the omitted category consists of 82,898 observations (41,449 unique employees). Imputed income in month  $t$  is set to missing if the employee opts out during month  $t$  or experiences turnover during month  $t$ . All columns include year-month fixed effects. Column (2) adds employee-level and employer-level controls. Column (3) introduces 19,780 employer-by-month fixed effects. Standard errors cluster on NAICS6 industry. Statistical significance at the 1-percent, 5-percent, and 10-percent levels is indicated by \*\*\*, \*\*, and \*, respectively.

	Imputed After-Tax Monthly Income		
	(1)	(2)	(3)
Only one contribution	-666.00 *** (57.60)	-539.51 *** (49.88)	-611.07 *** (37.30)
Only two contributions	-589.95 *** (35.97)	-455.61 *** (31.96)	-381.90 *** (30.70)
Age 26-35 (t)		433.07 *** (32.18)	323.70 *** (29.89)
Age 36-45 (t)		691.26 *** (55.49)	545.53 *** (40.38)
Age 46-55 (t)		797.22 *** (69.63)	632.49 *** (51.04)
Age 56-65 (t)		657.72 *** (80.72)	535.07 *** (62.17)
Age 66-75 (t)		163.93 * (95.33)	200.01 *** (65.02)
Age > 75 (t)		-373.80 *** (113.54)	41.02 (98.59)
Account holder in rural Oregon? (t)		-113.02 *** (39.24)	-54.59 * (30.76)
Account holder live outside Oregon? (t)		568.33 *** (118.70)	110.12 (71.96)
Hired after employer joins OregonSaves (t)		-402.76 *** (50.58)	-407.57 *** (63.43)
OregonSaves job number 2+ (t)		-127.29 *** (42.80)	-54.09 * (28.72)
Average county unemployment rate (t-3 to t-1)		-199.34 *** (28.15)	-60.12 ** (27.68)
Ln (number of employees at enrollment)		-77.93 ** (36.08)	
Pilot employer? (t)		240.63 ** (104.51)	
Employer registered late? (t)		19.57 (64.88)	



Constant	2128.04 *** (80.11)	2875.89 *** (183.44)	2131.30 *** (113.25)
Limited to ERs that processed contrib.?	Yes	Yes	Yes
Limited to accounts in OR or WA?	Yes	Yes	Yes
Limited to consecutive months?	Yes	Yes	Yes
Year-month FE?	Yes	Yes	Yes
Industry FE?	--	--	--
Employer FE?	--	--	--
Employer-by-year-month FE?	--	--	Yes
Employee controls?	--	Yes	Yes
Employer controls?	--	Yes	--
N	100,332	99,364	99,732
Adj. R2	0.0153	0.0507	0.3951

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**Table 5: Distribution of OregonSaves Contribution Rates**

In this table, we describe the distribution of OregonSaves contribution rates. We focus on the sample of employees three months after the initial eligibility date, with one observation per employee. Because employees who opt out have a contribution rate of 0%, column (2) excludes employees who have formally opted out.

Current Rate	Employee three months after initial eligibility date			
	All (1)		Not Opted Out (2)	
<b>0%</b>	<b>95,908</b>	<b>43.22%</b>	<b>5,151</b>	<b>3.93%</b>
1%	972	0.44%	972	0.74%
2%	888	0.40%	888	0.68%
3%	792	0.36%	792	0.60%
4%	94	0.04%	94	0.07%
<b>5%</b>	<b>122,316</b>	<b>55.12%</b>	<b>122,316</b>	<b>93.26%</b>
6%	69	0.03%	69	0.05%
7%	104	0.05%	104	0.08%
8%	85	0.04%	85	0.06%
9%	5	0.00%	5	0.00%
10%	517	0.23%	517	0.39%
11% - 15%	75	0.03%	75	0.06%
16% - 20%	24	0.01%	24	0.02%
21% - 30%	22	0.01%	22	0.02%
31% - 40%	4	0.00%	4	0.00%
41% - 50%	15	0.01%	15	0.01%
51% - 99%	0	0.00%	0	0.00%
100%	14	0.01%	14	0.01%
All	221,907		131,150	

**Table 6: Account-Level OregonSaves Summary Statistics by Month**

The sample is limited to open accounts in month  $t$ . The unit of observation is the account of participant  $i$ . We report the number of open accounts, the number of open accounts with a positive balance at the end of month  $t$ , the average account balance at the end of month  $t$  (excluding zeros), the fraction of accounts with any inflow, any outflow, or both an inflow and an outflow during month  $t$ , the average net flow, inflow, and outflow during month  $t$  (excluding zeros), the average fraction of account balances invested in the State Street Institutional Liquid Reserve Fund, the default investment option for the first \$1,000 in OregonSaves contributions, and the average fraction of account balances invested in the State Street Equity 500 Index Fund.

Date	Number of open accounts (1)	Open account & positive balance (2)	Average account balance (excl. 0) (3)	% Accounts with any inflow (4)	% Accounts with any outflow (5)	% Accounts with both inflow and outflow (6)	Average net flow (excl. 0) (7)	Average inflow (excl. 0) (8)	Average outflow (excl. 0) (9)	Average % Liquid Reserve (10)	Average % S&P Index (11)
Jul 2018	17,183	16,217	343.89	67.6%	2.5%	2.0%	85.66	98.81	-340.81	97.4%	0.4%
Aug 2018	19,078	17,830	374.65	65.6%	3.2%	2.3%	84.93	102.98	-354.48	96.8%	0.4%
Sep 2018	20,580	19,158	403.51	60.6%	2.6%	1.9%	82.14	98.64	-371.87	96.2%	0.5%
Oct 2018	21,926	20,256	435.14	58.1%	3.8%	3.0%	89.50	113.64	-357.73	95.4%	0.5%
Nov 2018	23,302	21,413	462.85	56.0%	2.7%	2.1%	79.91	103.38	-470.04	94.4%	0.5%
Dec 2018	24,976	22,883	478.45	54.3%	2.5%	1.8%	82.52	105.13	-479.43	93.8%	0.5%
Jan 2019	28,524	26,054	480.97	55.4%	2.8%	1.9%	85.81	111.04	-480.64	93.3%	0.5%
Feb 2019	32,516	29,770	475.80	55.9%	2.2%	1.5%	83.78	102.92	-457.10	93.0%	0.6%
Mar 2019	36,012	32,984	491.50	58.0%	2.3%	1.8%	92.77	109.83	-419.83	92.7%	0.6%
Apr 2019	38,582	35,173	523.71	55.7%	2.4%	1.7%	94.66	117.36	-504.28	92.3%	0.6%
May 2019	41,048	37,266	546.90	55.2%	2.4%	1.9%	95.02	118.23	-515.05	91.9%	0.6%
Jun 2019	44,803	40,724	559.39	54.1%	2.3%	1.7%	83.46	107.32	-552.00	91.6%	0.6%
Jul 2019	49,410	44,774	569.25	54.4%	2.7%	2.0%	97.21	123.75	-522.81	91.5%	0.6%
Aug 2019	53,237	48,171	592.51	53.4%	2.3%	1.8%	107.12	137.70	-692.48	91.3%	0.6%
Sep 2019	56,211	50,753	617.24	51.0%	2.1%	1.7%	91.24	114.93	-549.30	91.0%	0.7%
Oct 2019	59,025	53,087	650.99	50.5%	2.6%	2.0%	98.71	127.68	-542.57	90.5%	0.7%
Nov 2019	61,633	55,311	679.29	47.6%	2.1%	1.6%	91.75	118.00	-590.69	90.2%	0.7%
Dec 2019	65,372	58,619	698.68	48.9%	2.5%	2.0%	93.53	122.91	-564.09	89.9%	0.7%
Jan 2020	70,063	62,424	701.66	48.5%	2.9%	1.9%	82.67	119.71	-604.44	89.7%	0.7%
Feb 2020	73,257	65,020	706.32	47.0%	3.6%	2.8%	91.56	141.13	-622.93	88.2%	0.8%
Mar 2020	75,496	66,717	700.15	45.6%	3.0%	2.2%	91.19	132.60	-613.27	87.0%	0.8%
Apr 2020	77,007	67,731	753.79	34.4%	1.6%	0.7%	91.67	120.94	-590.11	86.2%	0.8%

**Table 7: Evolution of Account Balances in Event Time**

In this table, the unit of observation is account  $i$  in month  $t$ . We limit the sample to the 23,617 accounts for which the first contribution is made between August 2018 and May 2019. This filter allows us to track each account over its first twelve months. The fraction of participants classified by (one or more of their employers) as active at the end of month  $t$  falls from 96.8% to 69.9%. We report the fraction of open accounts with positive balances, with any inflows during the month, with any outflows during the month, and the average account balance at the end of the month (including zeros). We also report the 10th, 30th, 50th, 70th, and 90th percentiles of the OregonSaves account balance.

Months	% active	% with positive balance	% with inflow	% with outflow	Average balance (incl. 0)	Account balance percentile				
						10th	30th	50th	70th	90th
1	97.0%	99.7%	99.9%	0.5%	84	14	36	58	92	170
2	94.1%	98.3%	83.4%	2.6%	163	24	75	127	191	326
3	90.9%	97.1%	75.6%	2.2%	238	25	101	189	289	489
4	87.8%	96.0%	67.9%	2.5%	308	24	114	239	381	654
5	84.8%	95.2%	62.1%	2.2%	371	22	121	278	466	813
6	82.2%	94.4%	58.0%	2.5%	430	19	122	307	545	969
7	80.1%	93.5%	54.1%	2.4%	484	15	121	327	615	1,118
8	78.0%	92.9%	51.1%	2.4%	534	13	119	341	677	1,259
9	76.2%	92.1%	48.4%	2.4%	581	10	115	349	727	1,406
10	74.4%	91.5%	45.5%	2.7%	625	7	112	354	773	1,549
11	72.3%	90.7%	42.8%	2.9%	661	4	106	352	814	1,678
12	69.9%	90.0%	41.3%	2.9%	698	0	101	348	854	1,803

**Table 8: Predicting Any Monthly Inflows and Outflows**

In this table, we estimate linear probability models to predict any monthly inflows and outflows. The unit of observation is the account of employee  $i$  in month  $t$ . We limit the sample to accounts for which the first contribution is August 2018 or later, and follow each account for 18 months or until April 2020, whichever comes first. The dependent variable in column (1) equals 100 if there is any inflow into the account in month  $t$ , and zero otherwise. Similarly, the dependent variable in column (2) equals 100 if there is any outflow from the account in month  $t$ , and zero otherwise. We include dummy variables to capture whether the employee is listed as being actively employed, whether they were terminated during month  $t$ , whether they were terminated during month  $t-1$ , whether they set the saving rate to 0% during month  $t$  (which reflect either a formal opt out decision or a direct change to the saving rate), and whether the saving rate is still equal to 0%. We include age category fixed effects (omitted category is ages 18-25); months since the initial contribution fixed effects; date fixed effects; and 6-digit NAICS industry fixed effects (not reported). Standard errors cluster on 6-digit NAICS industry. Statistical significance at the 1-percent, 5-percent, and 10-percent levels is indicated by \*\*\*, \*\*, and \*, respectively.

	Any inflow in month $t$ ?			Any outflow in month $t$ ?		
	(1)			(2)		
Active? (t)	56.22	(2.68)	***	1.70	(0.13)	***
Terminated this month? (t)	27.54	(2.03)	***	2.69	(0.28)	***
Terminated last month? (t)	-2.49	(0.80)	***	1.29	(0.13)	***
Set saving rate to 0% this month? (t)	-6.78	(1.66)	***	42.72	(1.51)	***
Saving rate still equal to 0%? (t)	-53.83	(2.57)	***	0.65	(0.12)	***
Age 26-35? (t)	3.56	(0.42)	***	0.44	(0.08)	***
Age 36-45? (t)	5.59	(0.51)	***	0.52	(0.07)	***
Age 46-55? (t)	7.26	(0.54)	***	0.16	(0.11)	
Age 56-65? (t)	8.75	(0.81)	***	0.08	(0.16)	
Age 66-75? (t)	7.03	(1.67)	***	-0.04	(0.23)	
Age > 75? (t)	5.38	(2.13)	**	-0.09	(0.39)	
Months 3-6? (t)	-9.61	(1.27)	***	0.59	(0.11)	***
Months 7-12? (t)	-17.23	(2.34)	***	1.15	(0.16)	***
Months 13-18? (t)	-18.41	(2.97)	***	1.51	(0.23)	***
Oct 2018	-2.00	(4.02)		-0.52	(1.01)	
Nov 2018	-0.26	(1.68)		-0.61	(1.00)	
Dec 2018	-2.48	(2.30)		-0.72	(1.00)	
Jan 2019	-4.68	(2.97)		-0.03	(1.00)	
Feb 2019	-4.49	(2.32)	*	-0.76	(0.98)	
Mar 2019	-0.29	(2.07)		-0.72	(0.96)	
Apr 2019	-2.52	(2.46)		-0.84	(0.97)	
May 2019	-2.06	(2.01)		-0.82	(0.99)	
Jun 2019	-4.67	(1.83)	**	-0.90	(1.00)	
Jul 2019	-4.57	(2.02)	**	-0.59	(0.99)	
Aug 2019	-4.85	(1.81)	***	-0.85	(1.01)	
Sep 2019	-5.75	(1.87)	***	-1.03	(0.98)	
Oct 2019	-5.15	(1.94)	***	-0.46	(0.99)	
Nov 2019	-7.50	(1.91)	***	-0.93	(1.00)	
Dec 2019	-5.91	(1.95)	***	-0.55	(1.00)	

Jan 2020	-6.65	(2.00)	***	-0.38	(0.99)
Feb 2020	-6.22	(2.09)	***	1.00	(0.96)
Mar 2020	-5.62	(2.28)	**	-0.27	(1.05)
Apr 2020	-17.37	(4.01)	***	-1.33	(1.00)
N	508,573			508,573	
R2	0.4274			0.1080	
Mean dependent	55.39			2.56	

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**Table 9: OregonSaves Asset Accumulation by Industry**

In this table, we report average account balances in months 3, 6, 9, and 12 for employees who contribute at least once into OregonSaves (initial contribution occurs in month 1) and who we observe for at least 12 months. Industries appear in the same order as in Table 1. Mining/Oil/Gas is omitted because none of those employers enrolled in OregonSaves twelve or more months before April 2020. Finance and Insurance is omitted because the number of contributors is less than 10. Column (1) reports the average imputed income for each industry (estimated as the contribution amount divided by the contribution rate). Columns (2) through (5) report average account balances for all employees with at least one contribution. Columns (4) and (5) condition on active employment in months 6 and 12, respectively. Columns (6) through (9) report "effective savings rates". Column (6) scales the "Month 12" account balance for active contributors by 12 times the average imputed monthly income in the industry. This is the effective savings rate among all active contributors. Column (7) performs a similar calculation without conditioning on active employment in month 12. Column (8) multiplies the effective savings rate for all contributors by one minus the formal opt out rate in the industry (column (2) from Appendix Table 6), which is the effective savings rate among the set of employees who do not opt out. Column (9) multiplies the effective savings rate for all contributors by one minus the fraction on employees who do not have an account (column (5) from Appendix Table 6), which is the effective savings rate among employees for whom an account is opened within three months of being registered with OregonSaves.

Industry	Average Imputed Income (1)	All Active Contributors		All Contributors		Effective Savings Rate			
		Month 6 (2)	Month 12 (3)	Month 6 (4)	Month 12 (5)	All Active Contributors (6)	All Contributors (7)	Contributors + Opt Outs (8)	Contributors + Opt Outs + Missing Acct (9)
Food Services	1,985	411	731	366	586	3.1%	2.5%	1.7%	1.0%
Business Support	2,047	332	547	297	441	2.2%	1.8%	1.2%	0.5%
Health Care	2,242	443	768	393	608	2.9%	2.3%	1.4%	1.0%
Retail Trade	2,381	513	954	445	741	3.3%	2.6%	1.5%	1.0%
Agriculture	3,130	656	1,208	612	1,052	3.2%	2.8%	1.6%	0.5%
Manufacturing	3,053	676	1,281	615	1,033	3.5%	2.8%	1.5%	1.0%
Construction	4,040	901	1,545	846	1,376	3.2%	2.8%	1.5%	1.0%
Other Services	2,472	534	1,032	481	836	3.5%	2.8%	1.6%	1.2%
Arts/Entertainment	1,638	347	611	320	521	3.1%	2.6%	1.7%	1.1%
Transportation/Storage	3,011	641	1,280	569	980	3.5%	2.7%	1.5%	1.1%
Professional/Scientific	3,844	789	1,382	729	1,219	3.0%	2.6%	1.3%	0.8%
Education	1,983	452	827	415	715	3.5%	3.0%	1.6%	1.1%
Wholesale Trade	3,892	856	1,551	758	1,208	3.3%	2.6%	1.2%	0.8%
Real Estate	3,379	696	1,325	666	1,206	3.3%	3.0%	1.5%	1.2%
Information	3,276	546	1,261	526	1,080	3.2%	2.7%	1.3%	1.1%
Management	2,897	369	619	281	425	1.8%	1.2%	0.7%	0.4%
Missing	2,445	517	898	494	777	3.1%	2.6%	0.8%	0.9%
All	2,365	479	865	430	698	3.0%	2.5%	1.5%	1.1%

## Online Appendix

### **Evidence on Auto-Enrollment Retirement Plan Efficacy from OregonSaves**

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This Online Appendix describes the analyses that we reference but could not incorporate into the paper text, for the sake of brevity.

#### **A.1. Survey of Income and Program Participation**

To shed light on how workers having access to OregonSaves compare to all workers lacking access to a pension plan, Appendix Table 1 presents the fraction of individuals without access to a pension plan or an IRA from the nationally representative 2014 Survey of Income and Program Participation (SIPP; data come from the Social Security Administration Supplement Dataset). Panel A shows the percent of SIPP survey respondents not included in an employer-based retirement program such as a defined benefit plan, a 401(k) plan, or a 403(b) plan. Panel B presents the percent of workers having an IRA, of all workers lacking access to a company-sponsored retirement plan. Panel C compares socioeconomic characteristics of workers having access to OregonSaves versus those not included in a retirement plan in the SIPP.

#### **A.2. Industry Coverage of OregonSaves**

Throughout the paper, we highlight that OregonSaves serves employees operating in lower-wage, higher-turnover industries. In this section, we contrast the industry coverage of OregonSaves with that of traditional defined contribution (DC) retirement plans, and we list the most common 6-digit industry codes within each industry served by OregonSaves.

Appendix Table 2 reports the most popular 6-digit NAICS industries served by OregonSaves employers within each of our broad 2-digit industry classifications. When the broad



industry consists of more than five distinct NAICS codes, we report the top five based on the number of active employees at the end of April 2020. When the broad industry consists of five or fewer NAICS codes, we include them all. The most popular broad industries in OregonSaves are Food Services, Business Support, and Health Care. The most popular categories in Food Services, Business Support, and Health Care are “full-service restaurants,” “temporary help services,” and “assisted living facilities.,” respectively.

Appendix Table 3 compares the industry coverage in Figure 1 of OregonSaves to DC plans that filed a Form 5500 with the Department of Labor. OregonSaves statistics come from the end of our sample period, April 2020. We limit the DC sample to plans with a *form\_tax\_prd* date that includes 2020 (the vast majority of which are listed as “12/31/2020”). When we multiply the number of employees by industry-specific opt-out rates from Table 2, we estimate that, based on the current set of registered employers, 163,368 employees participate or will participate in OregonSaves. This back-of-the-envelope calculation assumes that all employers will eventually process contributions and, when they do, the opt-out rate will match the existing opt-out rate within each industry. (If we used the numbers that appear in column (5) of Table 1, we obtain very similar patterns; the correlation between the number of employees in column (4) of Appendix Table 3 and column (5) of Table 1 is over 0.99.) It also rules out turnover during the first 12 months. In comparison, we find that there are 544,295 active participants in DC plans headquartered in Oregon.

We sort industry names in each panel based on the total number of employees (column (3)). Panel B scales the values in each row by the total for that row. We find that the industries with the highest shares in OregonSaves, Food Services and Business Support, have far lower shares in Form 5500. More generally, the correlation between the shares of participants in each

broad industry is 0.065 (columns (4) and (8)). Moreover, although Health Care is the third most popular industry in OregonSaves and the most popular industry in the Form 5500 sample, the Form 5500 sample is skewed towards hospitals, which do not appear in the OregonSaves sample. In other words, even when there is overlap in broad industry categories, OregonSaves tends to cover employers operating in different narrow industry categories.

### **A.3. Formal Opt-out Rates**

It is common to measure participation rates as one minus the formal opt-out rate, which captures employees who formally request to opt out of the program but does not capture employees who set their contribution rate to 0% or who leave their employer before making any contributions. Throughout the paper, we focus on the formal opt-out rate three months after the employee would first become eligible to contribute into OregonSaves, to ensure that employees have time to learn about the program and to opt out. In Table 2, we find that 40.9% of employees formally opt out within three months of eligibility, but that the fraction falls to 37.1% when the calculation is limited to participants whose employers have begun to process payroll contributions. Appendix Table 4 is an alternative version of Table 2 that does not impose the employer contribution filter.

Appendix Table 5 calculates a separate opt-out rate for cohorts of employees whose third month of eligibility ends in August 2018, September 2018, ..., and April 2020. The left panel includes all employees and the right panel includes only those employees working at employers that have begun processing contributions. The pooled estimate of 40.9% in the left panel matches the number in the bottom row of Appendix Table 4. The equal-weighted average of the monthly opt-out rates is 38.8%, with a standard deviation of 6.2%. Again, all three statistics are slightly lower in the right panel, when we focus on employers that have begun processing contributions. Interestingly, the cohorts with the two highest opt-out rates in the left panel are those for whom

the third month post eligibility is March 2020 or April 2020, the months when COVID-19 began to disrupt labor markets in the United States. However, the patterns look quite different in the right panel, suggesting that the spikes are being driven by elevated opt-out rates in employers that have not begun to process contributions. We plot one minus the cohort-specific opt-out rates from the right panel as the solid blue line in Figure 2.

#### **A.4. Employer Participation and Employee Participation**

Table 1 reveals that only 5,537 of the 11,088 employers participating in OregonSaves had processed any OregonSaves contributions by the end of April 2020. Employees working at employers that have not processed contributions cannot have a positive account balance (unless they also work or previously worked at an employer that has processed contributions). In Appendix Table 6, we ask when employers begin to process contributions and whether the decision to process contributions is correlated with the fraction of employees at the employer who have formally opted out. The unit of observation is the employer. We follow employers in event time, from one month before we expect they are able to process their first batch of contributions to twelve months after. We find that 47.7% of employers have processed contributions within three months of the earliest expected date and that the fraction increases to 74.6% after twelve months. Again, we find that formal opt-out rates are persistently higher in employers that have not processed contributions, a pattern that may reflect employee-level or employer-level resistance to participating in OregonSaves.

#### **A.5. Growth in OregonSaves and Participation Rates**

Although OregonSaves formerly launched in October 2017, after a brief pilot period, our administrative data cover August 2018 to April 2020. Appendix Table 7 shows the total number of employers and employer-employee pairs covered by the OregonSaves program at the end of

each month during our sample period. Column (1) presents the cumulative number of employers that uploaded employee information to the OregonSaves administrator by the end of each month. Column (2) presents the subset of employers that processed OregonSaves contributions for at least one employee by the end of each month. By the end of April 2020, 11,088 employers had registered their employees with OregonSaves, but only 5,537 (49.9%) had directed any contributions to OregonSaves. Some portion of this gap can be explained by the facts that processing contributions takes time and that many employers registered with OregonSaves towards the end of 2019.

Column (3) reports the cumulative number of employees whose names had been provided by their employers to the OregonSaves program. A total of 289,657 employees have engaged with OregonSaves by the end of our sample period, including employees who formally opt out of the program. Column (4) shows that by April 2020, 226,178 employees are working (or were previously working) at employers that had processed OregonSaves contributions for at least one employee. By comparing columns (1) and (2) in April 2020, we observe that approximately half of all employers have not processed payroll. However, by comparing columns (3) and (4) in April 2020, we see that nearly 80% of all registered employees work at employers that have begun directing employee contributions to OregonSaves, making positive account balances possible.

Column (5) reports the cumulative number of employees classified by the administrator as both eligible to participate and actively working. An employee is eligible to participate if the initial 30-day enrollment window closes and their identity can be verified. The administrator includes a flag indicating whether an employee is active or inactive in month  $t$ . For over 93% of the employee-months classified as inactive, we observe a reason that the employee is inactive (e.g., terminated, seasonal layoff, or deceased). Because the administrator only updates an employee's status when an employer updates it with OregonSaves, the sample of eligible and active employees almost

certainly overstates the number of employees still employed in month  $t$ . Column (6) reports the cumulative number of eligible and active employees whose employers have processed contributions, which is the maximum number of employees who could feasibly contribute to OregonSaves in a given month. Note that neither column (5) nor column (6) conditions on whether the employee has formally opted out. Through April 2022, 60,586 (43.8%) of the 138,465 eligible, active employees at employers processing contributions had opted out.

Column (7) reports the cumulative number of employees with a positive account balance at the end of each month, while column (8) reports the cumulative number of employees with an open account in month  $t$  with a positive account balance during any portion of our sample period (even if the positive balance occurs after month  $t$ ). The difference of 8,728 between columns (7) and (8) in April 2020 represents the number of employee-employer pairs that made contributions into OregonSaves but subsequently withdrew their entire balances.<sup>1</sup>

A common measure of retirement plan efficacy is the participation rate. Madrian and Shea (2001) reported that automatic enrollment in the 401(k) plan of a large relatively high-wage firm resulted in a participation rate of 85.9%, with the largest increases being for younger, lower-income workers. Mindful of the fact that we are measuring participation rates in a set of firms having lower pay and higher turnover, we offer two different measures of participation in Appendix Table 7. The Global Participation Rate is the number of employees with current positive account balances (column (7)) divided by the total number of employees ever entered into the OregonSaves system by employers who processed payroll (column (4)). The Global Participation Rate is 34.3% at the end of our sample period. The Global Participation Rate decreases as more

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<sup>1</sup> Note that the totals in columns (7) and (8) slightly overstate the total number of *unique* accounts. This is because a participant who works for two different employers during our sample period will appear as two employee-employer pairs, but the participant makes all contributions into a single OregonSaves account.

employees formally opt out, as more employees set their savings rate to zero, as more employees become inactive due to job turnover, and as more employees who previously contributed into OregonSaves withdraw their account balances.

The Feasible Participation Rate is defined as the number of employees who have a positive account balance at some point during our sample period (column (8)) divided by the number of active, eligible employees working at employers who already processed contributions (column (6)). Thus, the Feasible Participation Rate measures the proportion of employees that could, with near certainty, show up as participants in OregonSaves since they are active, eligible, and are with an employer directing contributions to OregonSaves. The Feasible Participation Rate is 62.4% at the end of our sample period.

#### **A.6. Predicting Employee Opt Out Decisions and Positive Account Balances**

Appendix Table 8 reports summary statistics for the dependent and independent variables used to estimate the linear probability models in Table 3, Appendix Table 9, and Appendix Table 10. The unit of observation in each of these tables is employee  $i$  working at employer  $j$ . The outcome is measured three months after the employee would first have been eligible to participate in OregonSaves, under the assumptions that she is a legal resident, is still employed, and has not opted out. We exclude employees when this date is before August 2018 or after April 2020. In total, we observe 205,654 employees, although we do not observe all independent variables for all employees. For example, average industry-county income data are provided by the Oregon Employment Department on a quarterly basis, and are missing when the number of employers within an industry-county combination falls below their reporting threshold. In addition, while we calculate the imputed industry income statistics using all available data on imputed income in the prior month, there are months in which we are unable to calculate statistics for some counties and

some county-industry pairs.

Appendix Table 9 predicts the employee opt-out decision. The dependent variable equals 100 if an employee formally opts out within three months of his initial eligibility date, and zero otherwise. The last four columns of Appendix Table 9 match Table 3; they focus on employees located in Oregon or Washington and income statistics imputed at the industry-county level. Additional specifications use different income measures and impose broader (all states) and narrower (Oregon only) geographic filters.

While Table 3 and Appendix Table 9 shed light on the formal participation decision, they do not shed direct light on the accumulation of retirement assets, which is the ultimate goal of OregonSaves. Therefore, in Appendix Table 10, we use a similar set of linear probability models to predict positive account balances. If the vast majority of employees were either to opt out or to have a positive account balance, there would be little to learn from these additional regressions. It turns out, however, that there is considerable dispersion in outcomes: 40.2% opt out and do not have a positive balance, 24.7% do not opt out and have a positive balance, 33.0% neither opt out nor have a positive account balance, and 2.1% opt out but have a positive account balance. These patterns are driven by the fact that inactive employees are much less likely to opt out (22.2% versus 45.8%) and by the fact that some of the employees who do not opt out work at employers that have not begun to process contributions (12.4% of the full sample of 205,654).

The dependent variable in Appendix Table 10 equals 100 if an employee has a positive account balance three months after her initial eligibility date, and zero otherwise. We limit the sample to employees who have not formally opted out. In order to guarantee that a positive account balance is possible, we further limit the sample to employee-employer pairs where the employer has already processed OregonSaves contributions. The independent variables and fixed effects

mirror Table 3, except that column (4) now includes the fraction of employee's coworkers with a positive account balance in the previous month.

The largest negative predictor of a positive account balance is job turnover. These employees either leave their employer before making any contributions, or they withdraw their contributions shortly thereafter. Conditional on not opting out, the youngest employees are the least likely to have a positive balance, but there is no additional gradient with respect to age. Workers exposed to OregonSaves through a second job are less likely to opt out (Table 3) and, conditional on not opting out, more likely to have a positive balance. However, some of the findings in Table 3 and Appendix Table 10 are at odds. For example, employees at larger employers and employers that participated in the pilot program are both less likely to opt out but, conditional on not opting out, also less likely to have a positive account balance. In column (4), we observe that positive account balances are strongly predicted by the proportion of positive balance accounts at the participant's employer in the prior month. As in Table 3, this estimate may reflect peer effects, in concert with transparent or opaque employer influences on employees' participation.

Appendix Table 11 is an extended version of Table 4, which asks whether employees who opt out after making only one or two contributions have lower imputed incomes than their peers. The dependent variable is the imputed monthly income of employee  $i$  in month  $t$ . Columns (3), (4), and (7) replicate the three specifications in Table 4; the other columns contain specifications with different combinations of fixed effects and sets of independent variables. Across all seven specifications, we find strong evidence that employees who stop contributing to OregonSaves after their first or second contribution have significantly lower imputed monthly income than employees in the same industry, in the same employer, or in the same employer and month.



### A.7. Contribution Rates

Table 5 reveals that over 98% of employee contribution rates cluster at either 0% or 5%. In that table, we focus on the sample of employees three months after their initial eligibility date. Appendix Table 12 focuses on active, eligible employees who have not formally opted out through month  $t-1$  and reports the frequency with which employees change (or do not change) their contribution rates between months  $t-1$  and  $t$ . Contribution rates are highly persistent. At the monthly horizon, fewer than 5% of the observations involve a change in contribution rate. The cells (5%, 5%), (6%, 6%), and (0%, 0%) account for 74.3%, 10.4%, and 4.5% of the observations. The fourth-most popular cell is (5%, 6%), which accounts for 2.1% of the observations, and is primarily driven by OregonSaves' automatic escalation feature. The fifth-most popular cell is (5%, 0%), which accounts for 1.7% of the observations, and which reflects both formal opt out decisions and cases where the employee sets the contribution rate to 0% without formally opting out. Note that while there are employees who have a 0% contribution rate in month  $t-1$  and a positive contribution rate in month  $t$ , there are only 60 such events in a sample with 1,128,840 observations.

Appendix Table 13 reports the fraction of employees that increase or decrease their contribution rate for each month between September 2018 and April 2020. The sample is limited to employees with a positive contribution rate in the prior month. The samples in columns (1), (2), and (3) are further limited to employees that do not formally opt out in month  $t$ . The likelihood of increasing the contribution rate is 1.7%, but these changes are concentrated in January, when automatic escalation occurs. While the majority of contribution rate decreases are due to formally opting out, there are also cases where employees decrease their contribution rate without setting them equal to 0% or decrease them to 0% without formally opting out.

### **A.8. Growth in OregonSaves Assets and Aggregate Asset Allocation**

Table 6 and Appendix Table 14 both document growth in OregonSaves. Table 6 presents account-level data between August 2018 and April 2020. The number of open accounts increases from 19,078 to 77,007, and the average account balance increases from \$375 to \$754, but the fraction of accounts with inflows decreases from 65.6% to 34.4%. Because relatively few accounts have balances above \$1,000 on April 2020, the average allocation to the money market fund is 86.2%. As a result, few participants are being exposed to the risks and expected returns associated with equity market exposure.

Appendix Table 14 presents aggregate data for our sample period, calculated using our administrative data, and corresponding aggregate data for August 2020 through April 2022, which comes from public reports issued by the Oregon Retirement System Board.<sup>2</sup> During our sample period, assets under management jump from \$6.7 million to \$51.1 million. Between April 2020 and April 2022, they almost triple, to \$147.8 million. While net flows measured as a percent of lagged assets under management are falling, and total dollar outflows are rising, dollar inflows and dollar net flows are also rising. (The program administrator transitioned from Ascensus to Sunday in November 2021, which may explain the abnormally low inflows during that month.)

We are only able to measure the aggregate allocation to the money market fund during our sample period. We find that it falls from 86.4% to 58.1%. The discrepancy between the aggregate allocation and the average account-level allocation in April 2020 reflects a relatively small number of accounts with relatively large account balances, which are allocated to other investment options.

### **A.9. Employment Status and the Evolution of Account Balances**

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<sup>2</sup> The public reports are available of the Oregon State Treasury website. For example, the report containing values for August and September 2020 can be found here: <https://www.oregon.gov/treasury/financial-empowerment/Documents/ors-board-meeting-minutes/2020/2020-09-Program-Report-OregonSaves-Monthly.pdf>. We were unable to locate reports that cover May 2020, June 2020, and July 2020.

Table 7 describes the growth of account balance over the first 12 months (in event time), conditional on having made a contribution in month 1. The average account balance grows from \$84 to \$698, the median grows from \$58 to \$348, and the interquartile range (75<sup>th</sup> percentile minus 25<sup>th</sup> percentile) grows from \$72 to \$956. In other words, a small number of accounts is accumulating a disproportionate share of the assets. The 10<sup>th</sup> percentile after twelve months is \$0 whereas the 90<sup>th</sup> percentile is \$1,803.

Appendix Table 15 reports statistics from the left panel of Table 7 separately for employees that are and are not classified as being actively employed in month 12. As in Table 7, we limit the sample to the 23,617 contributors that we are able to follow between month 1 and month 12 within our sample period. As can be seen in the “% still active” column, the statistics in the right panel correspond to a growing number of these contributors. Interestingly, while the average account balance is significantly higher for active employees (\$865 versus \$311), the fraction of accounts with a positive balance is similar (90.9% versus 87.7%). This suggests that inactive employees are unlikely to liquidate their accounts, at least not during the first twelve months.

Appendix Table 16 reports statistics from the right panel of Table 7 separately for employees that are and are not classified as being actively employed in month 12. The sample is the same as in Appendix Table 15. The account balance percentiles for active employees are uniformly higher for active employees than inactive employees.

Finally, Appendix Table 17 sheds light on the turnover rates and average account balances of contributors based on their current age. The most interesting pattern is the higher turnover rates for younger employees: 61.3% for those younger than 26 versus 78.2% to 78.8% for those between ages 46 and 75 versus 87.7% for the small number of employees age 76 and above. The higher turnover rates help to explain the lower account balances for younger participants.

### Online Appendix Table 1: Coverage of Pension Plans and IRAs among SIPP Survey Respondents

In this table, we show the fraction of individuals that have a pension plan or an IRA in the Survey of Income and Program Participation (SIPP). Data come from the 2014 Social Security Administration Supplement Data, which is part of the 2014 SIPP. Panel A shows the percent of SIPP survey respondents not included in an employment-based pension plan. Pension Plans include defined-benefit plans, 401(k)s, and 403(b)s. About 30% of SIPP respondents did not have access to an employment-based pension plan in 2014. Panel B focuses on the 30% all workers without access to an employment-based pension plan. We find that 7.5% of workers had an IRA and were actively contributing to their IRA account, and another 14.5% of workers had an IRA but were not actively contributing. The remaining 78% of workers did not have a pension plan or an IRA. Panel C compares selected socioeconomic characteristics between workers covered by OregonSaves and SIPP respondents not included in a pension plan. The average age for both groups is 37. Average monthly earnings are \$2,887 (before-tax) for OregonSaves workers and \$2,933 (before-tax) for SIPP respondents lacking access to a pension plan. Pre-tax earnings for OregonSaves workers are computed using the after-tax earnings imputed from the OregonSaves data, the marginal federal tax rate in 2019, and the marginal state tax rate in Oregon in 2019. Monthly earnings are more volatile for OregonSaves workers than SIPP respondents. Following the previous literature summarized in Hannagan and Morduch (2015), we calculate income volatility as the standard deviation of monthly earnings divided by average monthly earnings. Previous studies found that the income volatility measure is usually between 0.15 and 0.45. To calculate the income volatility for OregonSaves workers who still participated in the OS program in April 2020, we use their imputed monthly earnings records in 2019 to minimize the impact of the COVID-19 on income volatility in 2020. For SIPP respondents, we use their monthly earnings in 2014 reported in the SIPP survey. Source: Authors calculations.

*Panel A: Percent of SIPP survey respondents not included in a pension plan (including defined-benefit plans, 401(k)s, 403(b)s, etc.)*

	N	Percent
Included in a plan	6,928	70
Not included	2,963	30
<b>Total</b>	<b>9,891</b>	<b>100</b>

*Panel B: Of all workers not included in a pension plan, percent of workers having an IRA*

	N	Percent
With an IRA & actively contributing	224	7.5
With an IRA but not actively contributing	432	14.5
Without an IRA	2,307	78
<b>Total</b>	<b>2,963</b>	<b>100</b>

*Panel C: Comparison of socioeconomic characteristics between workers having access to OregonSaves and workers not included in a pension plan in the SIPP sample*

	OregonSaves workers	SIPP workers not included in a pension plan
Year	2020	2014
Sample size	289,657	2,963
Average age	37	37
Average monthly pre-tax earnings (in 2020 dollars)	2,887	2,933
Income volatility	0.40	0.16

## Online Appendix Table 2: Industry Composition.

In this table, we list the NAICS6 descriptions and codes with the most active employees at the end of April 2020 within each of the broad (2-digit) industry classifications. For 2-digit industries with more than five 6-digit industries, we only list the top five. The rightmost columns report the number of active employees within the NAICS6 classification as well as the share of all active employees within the 2-digit industry classification.

2-Digit Industry	Narrow Industry Description	NAICS6	# Active	% 2-Digit
Agriculture	Farm labor contractors and crew leaders	115115	4487	27.3%
Agriculture	Other noncitrus fruit farming	111339	3047	18.6%
Agriculture	All other miscellaneous crop farming	111998	1391	8.5%
Agriculture	Nursery and tree production	111421	1363	8.3%
Agriculture	Berry, except strawberry, farming	111334	1150	7.0%
Arts/Entertainment	Fitness and recreational sports centers	713940	2716	40.7%
Arts/Entertainment	All other amusement and recreation industries	713990	1097	16.4%
Arts/Entertainment	Golf courses and country clubs	713910	666	10.0%
Arts/Entertainment	Amusement arcades	713120	398	6.0%
Arts/Entertainment	Promoters with facilities	711310	329	4.9%
Business Support	Temporary help services	561320	13782	61.1%
Business Support	Janitorial services	561720	2259	10.0%
Business Support	Landscaping services	561730	1827	8.1%
Business Support	Telemarketing and other contact centers	561422	1481	6.6%
Business Support	Security guards and patrol services	561612	1082	4.8%
Construction	New single-family general contractors	236115	1572	14.0%
Construction	Residential remodelers	236118	1125	10.0%
Construction	Residential drywall contractors	238311	987	8.8%
Construction	Residential plumbing and HVAC contractors	238221	651	5.8%
Construction	Residential painting contractors	238321	595	5.3%
Education	Elementary and secondary schools	611110	934	26.1%
Education	Fine arts schools	611610	622	17.4%
Education	Miscellaneous schools and instruction	611699	547	15.3%
Education	Sports and recreation instruction	611620	527	14.7%
Education	Exam preparation and tutoring	611691	348	9.7%
Finance and Insurance	Insurance agencies and brokerages	524210	259	64.4%
Finance and Insurance	All other nondepository credit intermediation	522298	44	10.9%
Finance and Insurance	Miscellaneous intermediation	523910	36	9.0%
Finance and Insurance	Investment advice	523930	15	3.7%
Finance and Insurance	Mortgage and nonmortgage loan brokers	522310	13	3.2%
Food Services	Full-service restaurants	722511	22405	40.1%
Food Services	Limited-service restaurants	722513	17913	32.0%
Food Services	Hotels and motels, except casino hotels	721110	6357	11.4%
Food Services	Snack and nonalcoholic beverage bars	722515	4397	7.9%
Food Services	Drinking places, alcoholic beverages	722410	3075	5.5%
Health Care	Assisted living facilities for the elderly	623312	3199	18.9%
Health Care	Services for the elderly and disabled	624120	2906	17.2%
Health Care	Home health care services	621610	1897	11.2%
Health Care	Child day care services	624410	1842	10.9%
Health Care	Residential disability facilities	623210	1274	7.5%

Information	Motion picture theaters, except drive-ins	512131	278	27.6%
Information	Newspaper publishers	511110	134	13.3%
Information	Software publishers	511210	115	11.4%
Information	Internet publishing and web search portals	519130	97	9.6%
Information	Wired telecommunications carrier	517311	77	7.7%
Management	Managing offices	551114	275	92.3%
Management	Offices of other holding companies	551112	23	7.7%
Manufacturing	Wineries	312130	725	6.4%
Manufacturing	Wood kitchen cabinet and countertop mfg.	337110	686	6.0%
Manufacturing	Commercial bakeries	311812	503	4.4%
Manufacturing	Breweries	312120	484	4.3%
Manufacturing	Perishable prepared food manufacturing	311991	452	4.0%
Mining/Oil/Gas	Other crushed and broken stone mining	212319	57	50.9%
Mining/Oil/Gas	Construction sand and gravel mining	212321	28	25.0%
Mining/Oil/Gas	Clay, ceramic, and refractory minerals mining	212325	21	18.8%
Mining/Oil/Gas	Dimension stone mining and quarrying	212311	6	5.4%
Other Services	Religious organizations	813110	2338	25.1%
Other Services	Beauty salons	812112	1109	11.9%
Other Services	Automotive body and interior repair	811121	660	7.1%
Other Services	General automotive repair	811111	613	6.6%
Other Services	Pet care, except veterinary, services	812910	479	5.1%
Professional/Scientific	Veterinary services	541940	635	15.2%
Professional/Scientific	Process and logistics consulting services	541614	578	13.8%
Professional/Scientific	Offices of lawyers	541110	289	6.9%
Professional/Scientific	Other technical consulting services	541690	268	6.4%
Professional/Scientific	Engineering services	541330	239	5.7%
Real Estate	Residential property managers	531311	1249	35.7%
Real Estate	Lessors of residential buildings	531110	767	21.9%
Real Estate	Offices of real estate agents and brokers	531210	528	15.1%
Real Estate	Lessors of other real estate property	531190	225	6.4%
Real Estate	Miniwarehouse and self-storage unit operators	531130	124	3.5%
Retail Trade	Supermarkets and other grocery stores	445110	1973	11.1%
Retail Trade	Gasoline stations with convenience stores	447110	1491	8.4%
Retail Trade	Convenience stores	445120	1177	6.6%
Retail Trade	Store retailers not specified elsewhere	453998	1159	6.5%
Retail Trade	Used merchandise stores	453310	1105	6.2%
Transportation/Storage	Other airport operations	488119	1257	23.7%
Transportation/Storage	Local messengers and local delivery	492210	727	13.7%
Transportation/Storage	Special needs transportation	485991	417	7.9%
Transportation/Storage	Other support activities for road transport.	488490	410	7.7%
Transportation/Storage	General freight trucking, long-distance TL	484121	392	7.4%
Wholesale Trade	Fruit and vegetable merchant wholesalers	424480	548	17.1%
Wholesale Trade	Wholesale trade agents and brokers	425120	288	9.0%
Wholesale Trade	Other grocery product merchant wholesalers	424490	245	7.6%
Wholesale Trade	Recyclable material merchant wholesalers	423930	214	6.7%
Wholesale Trade	Farm supplies merchant wholesalers	424910	182	5.7%

### Online Appendix Table 3: Comparing OregonSaves Industry Coverage to That in Department of Labor Form 5500

In Panel A, we calculate the number of employers or employees that fall within each of the broad industry codes (based on the first two digits of NAICS). The count data for columns (1), (2), and (3) come from the corresponding columns of Table 1, except that we exclude employers for which NAICS is missing. Rows are sorted on the value in column (3). The count data for column (4) is equal to the count data from column (3) times one minus the industry-specific opt out rate from column (2) of Table 2. The count data for columns (5) through (8) come from 2020 filings of Form 5500. We limit the sample to plans that have at least one "2" in *type\_pension\_bnft\_code* (indicating the presence of a defined contribution plan feature) and use the 6-digit *business\_code* to create comparable 2-digit industry codes. In the Form 5500 data, we distinguish between the number of plans and the total number of active participants. Statistics for columns (6) and (8) require that *spons\_dfe\_mail\_us\_state* equals "OR". In Panel B, we convert the count data into industry shares.

Industry	OregonSaves				Department of Labor Form 5500			
	Employer		All Employees * (1 - opt out)	Employees	All Plans	Oregon Plans	All Active Participants	Oregon Active Participants
	All Employers	Processed Contributions						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Panel A. Total numbers of employers and participants								
Food Services	2,523	1,453	91,342	61,888	3,989	65	2,367,328	12,704
Business Support	571	302	32,930	20,986	4,334	48	2,760,500	9,002
Health Care	837	453	26,893	16,422	18,441	237	12,116,678	122,130
Retail Trade	1,322	615	25,509	13,451	8,443	125	8,440,690	44,929
Agriculture	687	299	21,593	11,283	1,195	47	506,907	3,880
Manufacturing	708	376	16,510	8,065	17,207	244	10,748,252	109,073
Construction	1,066	463	13,344	6,479	7,621	120	2,708,666	33,133
Other Services	909	375	12,375	5,860	7,182	76	1,268,682	12,638
Arts/Entertainment	324	186	8,770	5,321	2,541	33	866,583	4,635
Transportation/Storage	250	113	6,472	4,056	3,159	39	3,310,005	51,750
Professional/Scientific	459	205	5,376	2,452	20,381	238	7,446,504	25,845
Education	236	152	4,704	2,468	2,982	32	1,761,565	36,800
Wholesale Trade	265	105	4,403	1,786	6,103	88	2,296,014	21,929
Real Estate	330	138	4,255	1,813	4,237	69	1,252,484	10,700
Information	94	57	1,249	593	2,539	32	2,383,531	6,147
Management	18	8	576	310	993	5	1,515,983	1,024
Finance and Insurance	75	13	417	107	8,219	94	4,839,304	28,583
Mining/Oil/Gas	12	3	144	27	841	0	394,993	0
Utilities	0	0	0	0	521	5	668,718	9,393
All	10,686	5,316	276,862	163,368	120,928	1,597	67,653,387	544,295





### Online Appendix Table 4: OregonSaves Opt-Out Rates and Initial Account Balances by Industry

In this table, the unit of observation is employee  $i$  three months after the date on which the employee would be eligible to contribute to OregonSaves (where the eligibility date is set under the assumptions that her identify is verified and she remains employed). Unlike in Table 2, we do not limit the sample to the subset of employee-employer observations for which the employer has processed at least one OregonSaves contribution. Industries appear in the same order as in Table 1. We report the number of employees in column (1). The focus on each employee during this particular month explains the reduced sample size relative to Tables 1 and 2. Column (2) reports the fraction of these employees who have formally opted out of OregonSaves within three months of eligibility. Columns (3) and (4) condition the sample on having opted out and report the fraction that list the reason for opting out as “I can't afford to save at this time” or “I have my own retirement plan,” respectively. Columns (5), (6), and (7) report the fractions of all employees without an account (which is where the vast majority of employees who opt out fall), with an account balance of \$0, or with a positive account balance. The remaining columns focus on the subset of employees with positive account balances after three months of eligibility and report the mean, median, and interquartile range of their account balance three months after being eligible.

Industry	Employees (1)	Formal opt out (2)	Conditional on Opt Out		Account status			Conditional on Account > \$0		
			Cannot afford (3)	Existing plan (4)	None (5)	\$0 (6)	> \$0 (7)	Mean (8)	Median (9)	IQR (10)
Food Services	70,419	32.2%	35.0%	21.6%	66.3%	1.7%	32.0%	\$ 229	\$ 172	\$ 216
Business Support	22,319	36.3%	34.4%	19.4%	75.0%	1.2%	23.8%	\$ 231	\$ 167	\$ 277
Health Care	19,682	38.9%	35.0%	26.8%	64.2%	1.9%	33.9%	\$ 240	\$ 183	\$ 237
Retail Trade	20,252	47.3%	30.4%	27.7%	73.7%	1.5%	24.9%	\$ 254	\$ 199	\$ 243
Agriculture	16,880	47.7%	23.5%	14.7%	89.7%	0.5%	9.8%	\$ 357	\$ 306	\$ 365
Manufacturing	12,772	51.2%	28.1%	28.3%	74.2%	1.2%	24.7%	\$ 334	\$ 275	\$ 331
Construction	11,388	51.4%	27.7%	28.3%	79.6%	1.1%	19.2%	\$ 450	\$ 391	\$ 430
Other Services	10,637	52.6%	26.7%	35.4%	72.4%	1.2%	26.4%	\$ 286	\$ 222	\$ 267
Arts/Entertainment	7,186	39.3%	23.6%	40.1%	69.2%	0.9%	29.9%	\$ 192	\$ 111	\$ 197
Transportation/Storage	5,395	37.3%	29.4%	31.4%	79.8%	1.4%	18.8%	\$ 354	\$ 313	\$ 349
Professional/Scientific	4,791	54.4%	22.1%	36.3%	76.5%	1.0%	22.5%	\$ 462	\$ 305	\$ 434
Education	4,348	47.5%	22.5%	41.1%	68.3%	1.0%	30.7%	\$ 230	\$ 135	\$ 269
Wholesale Trade	3,342	59.4%	27.3%	29.2%	79.9%	1.1%	19.1%	\$ 416	\$ 320	\$ 345
Real Estate	3,473	57.4%	26.6%	32.5%	75.6%	1.4%	23.0%	\$ 383	\$ 295	\$ 372
Information	1,100	52.5%	29.8%	32.4%	68.5%	0.9%	30.5%	\$ 292	\$ 207	\$ 370
Management	325	46.2%	24.7%	28.7%	70.2%	0.6%	29.2%	\$ 270	\$ 186	\$ 275
Finance and Insurance	335	74.3%	14.5%	44.2%	90.1%	0.0%	9.9%	\$ 437	\$ 304	\$ 327
Mining/Oil/Gas	118	81.4%	14.6%	43.8%	90.7%	0.0%	9.3%	\$ 378	\$ 392	\$ 647
<i>Missing</i>	7,145	29.4%	34.7%	25.3%	62.4%	2.4%	35.2%	\$ 365	\$ 194	\$ 268
All	221,907	40.9%	30.3%	26.0%	71.8%	1.4%	26.7%	\$ 268	\$ 192	\$ 265

### Online Appendix Table 5: OregonSaves Opt-Out Rates by Month

In this table, the unit of observation is employee  $i$  three months after the data on which the employee would be eligible to contribute into OregonSaves (under the assumptions that she has her identify verified, does not opt out, and remains employed). We exclude employees who become eligible before 201805 (because we lack data on the timing of opt out before 201808) or after 202001 (because the administrative data end in 202004). We exclude the small number of employees for whom an eligibility date is missing (typically because the employer is classified as "Exempt"). We do not condition on the employee being classified as active or having an open account. The pooled 40.9% opt-out rate in the left panel matches the rate reported in the bottom row of Table 2; it does not condition on whether the employer has begun to process contributions. The pooled 37.1% opt out rate in the right panel is based on a sample that only includes employees working at employers that have begun to process contributions. In both panels, we report the equal-weighted average cohort-specific opt-out rate and the standard deviation of cohort-specific opt out rates.

Date	All Employers			Employers Processing Contributions		
	Formally opt out?		% Yes	Formally opt out?		% Yes
	No	Yes		No	Yes	
Aug 2018	4,409	3,167	41.8%	4,296	2,971	40.9%
Sep 2018	4,615	3,195	40.9%	3,732	2,665	41.7%
Oct 2018	4,381	2,770	38.7%	3,681	2,381	39.3%
Nov 2018	4,126	2,118	33.9%	3,371	1,840	35.3%
Dec 2018	3,542	1,528	30.1%	3,329	1,328	28.5%
Jan 2019	3,351	1,140	25.4%	2,692	915	25.4%
Feb 2019	3,512	1,852	34.5%	3,291	1,533	31.8%
Mar 2019	4,926	2,698	35.4%	4,180	2,158	34.0%
Apr 2019	9,610	7,587	44.1%	7,492	5,997	44.5%
May 2019	8,394	6,149	42.3%	6,633	4,490	40.4%
Jun 2019	4,528	2,946	39.4%	3,802	2,086	35.4%
Jul 2019	5,624	2,408	30.0%	3,378	1,701	33.5%
Aug 2019	6,147	4,789	43.8%	5,138	3,234	38.6%
Sep 2019	11,799	9,992	45.9%	8,094	6,048	42.8%
Oct 2019	9,870	6,046	38.0%	7,297	3,697	33.6%
Nov 2019	6,606	3,732	36.1%	5,172	2,504	32.6%
Dec 2019	6,216	3,544	36.3%	4,744	2,104	30.7%
Jan 2020	5,697	3,361	37.1%	4,662	2,144	31.5%
Feb 2020	6,166	4,996	44.8%	5,161	2,659	34.0%
Mar 2020	9,061	9,116	50.2%	6,203	3,997	39.2%
Apr 2020	8,722	7,679	46.8%	6,008	3,890	39.3%
<b>Pooled</b>	<b>131,302</b>	<b>90,813</b>	<b>40.9%</b>	<b>102,356</b>	<b>60,342</b>	<b>37.1%</b>
<b>Average</b>			<b>38.8%</b>			<b>35.9%</b>
<b>Std Dev</b>			<b>6.2%</b>			<b>5.0%</b>

### Online Appendix Table 6: Employers That Have Processed OregonSaves Contributions

In this table, we report the fraction of employers that have processed OregonSaves contributions in event time. Time -1 is the month before we predict that the employer's initial batch of employees will be eligible to contribute, time 0 is the initial month, ..., and time 12 is twelve months after the initial batch of employees should have become eligible. The fraction of employers that processed at least one contribution rises monotonically in event time, from 18.6% in time 0 to 74.6% in time 12. We also report the average opt-out rate in event time for employers that have and have not already begun processing contributions (these are equal-weighted averages of employer-level averages). Throughout our sample, employers that have begun processing contributions have significantly lower opt-out rates.

Time since initial eligibility	Total Number of Employers	% Employers Processing Contributions	% Employees Formally Opted Out		
			Employer Processing Contrib.?		Delta
			No	Yes	
-1	10,218	0.6%	20.5%	16.1%	4.4%
0	10,272	18.6%	46.1%	41.6%	4.5%
1	10,188	39.1%	54.6%	44.2%	10.3%
2	10,062	44.8%	56.8%	45.0%	11.8%
3	9,776	47.7%	57.6%	45.5%	12.1%
4	8,818	51.2%	58.4%	45.8%	12.6%
5	6,860	56.5%	56.5%	45.5%	11.0%
6	6,091	59.3%	54.2%	45.2%	9.0%
7	5,764	60.8%	53.6%	45.0%	8.6%
8	5,343	62.9%	52.8%	45.0%	7.8%
9	4,956	64.4%	52.7%	45.2%	7.5%
10	4,239	67.0%	53.5%	45.2%	8.4%
11	3,031	72.5%	54.1%	43.7%	10.4%
12	2,584	74.6%	52.3%	42.5%	9.9%

### Online Appendix Table 7: Growth of OregonSaves, August 2018 to April 2020

In this table, we summarize the growth of OregonSaves during our sample period. The unit of observation in columns (1) and (2) is the employer. We report the total number of employers that have uploaded employee information to the OregonSaves administrator during or before month  $t$ , and the subset of employers that have processed payroll for at least one employee. The unit of observation in the remaining columns is the employer-employee pair. Column (3) reports the total number of employees uploaded to the administrator and column (4) reports the subset working at employers that have processed payroll. Column (5) reports the number of employees who are classified by the administrator as both eligible to participate and actively working, and column (6) reports the subset working at employers that have processed payroll. Column (7) reports the number of employees in column (3) with positive account balances in month  $t$  and column (8) reports the number that ever have a positive account balance. Because employee identifiers are unique to employee-employer pairs, and because some individual work for multiple employers over our sample period, the number of employees with accounts overstates the number of accounts (which we report in Table 1). Finally, we report two participation rates. The global participation rate is defined as the number of employees with current positive account balances (column (7)) divided by the total number of employees (column (4)). The feasible participation rate is defined as the number of employees who ever have a positive account balance (column (8)) divided by the number of active, eligible employees working at employers that have already processed payroll (column (6)).

Date	Employers		Employee-Employer Pairs				Positive Balance?		Participation Rate	
	Total (1)	Employer Processed Contributions (2)	Total (3)	Employer Processed Contributions (4)	Eligible & Active (5)	Eligible & Active Contributions (6)	Currently (7)	Ever (8)	Global (9) = (7) / (4)	Feasible (10) = (8) / (6)
Aug 2018	846	524	72,092	60,102	48,305	40,638	18,703	24,145	31.1%	59.4%
Sep 2018	902	569	76,460	64,720	51,776	44,324	20,177	25,569	31.2%	57.7%
Oct 2018	1,001	620	82,081	69,344	54,345	46,604	21,415	27,589	30.9%	59.2%
Nov 2018	1,184	666	89,834	73,602	58,232	49,464	22,727	30,171	30.9%	61.0%
Dec 2018	1,740	745	107,127	78,651	63,860	52,804	24,430	36,166	31.1%	68.5%
Jan 2019	2,162	1,039	122,319	90,620	77,631	60,227	27,943	41,126	30.8%	68.3%
Feb 2019	2,368	1,324	128,931	102,025	89,851	70,027	31,980	43,347	31.3%	61.9%
Mar 2019	2,600	1,540	137,145	110,369	94,704	76,036	35,505	45,809	32.2%	60.2%
Apr 2019	3,029	1,677	147,725	117,698	100,109	79,964	38,062	49,255	32.3%	61.6%
May 2019	4,288	1,862	170,180	125,689	108,515	84,830	40,622	55,530	32.3%	65.5%
Jun 2019	4,990	2,299	186,888	139,582	127,981	94,068	45,062	60,256	32.3%	64.1%
Jul 2019	5,403	2,807	197,200	152,396	139,720	103,895	49,661	63,540	32.6%	61.2%
Aug 2019	5,897	3,130	207,220	163,124	145,804	110,573	53,556	66,367	32.8%	60.0%
Sep 2019	6,261	3,370	216,282	171,154	149,848	113,018	56,705	69,203	33.1%	61.2%
Oct 2019	7,102	3,568	227,563	178,174	154,160	115,798	59,677	72,735	33.5%	62.8%
Nov 2019	9,097	3,842	245,976	185,165	161,525	119,638	62,616	77,341	33.8%	64.6%
Dec 2019	10,118	4,380	262,518	194,649	174,406	124,138	66,594	81,392	34.2%	65.6%
Jan 2020	10,541	4,988	272,990	208,826	183,977	130,239	71,021	83,979	34.0%	64.5%
Feb 2020	10,799	5,285	280,075	217,289	190,313	136,149	74,218	85,505	34.2%	62.8%
Mar 2020	10,978	5,444	286,121	222,527	192,841	138,126	76,344	86,179	34.3%	62.4%
Apr 2020	11,088	5,537	289,657	226,178	193,993	138,465	77,652	86,380	34.3%	62.4%

### Online Appendix Table 8: Summary Statistics for Employee-Level Regressions

In this table, we present the imputed monthly income as averaged across all non-missing values in our sample. All other variables are limited to one observation per employee-employer pair, for the subset of employees that we observe three months after they would become eligible to contribute into OregonSaves in their identity is verified and they do not opt out.

Variable	N	Mean	Std Dev
Formally opt out within 3 months of eligibility? (t)	205,654	42.3%	49.4%
Positive account balance within 3 months of eligibility? (t)	205,654	26.8%	44.3%
Fraction of coworkers who formally opted out (t-1)	198,349	44.2%	27.1%
Fraction of coworkers with positive account balance (t-1)	198,349	24.6%	21.7%
Age < 26? (t)	205,654	26.1%	43.9%
Age 26-35? (t)	205,654	28.2%	45.0%
Age 36-45? (t)	205,654	19.1%	39.3%
Age 46-55? (t)	205,654	13.6%	34.3%
Age 56-65? (t)	205,654	9.3%	29.1%
Age 66-75? (t)	205,654	3.2%	17.7%
Age > 75? (t)	205,654	0.5%	7.2%
Account holder in rural Oregon? (t)	205,654	34.5%	47.5%
Account holder lives outside Oregon? (t)	205,654	5.1%	22.0%
Average county unemployment rate (t-3 to t-1)	202,911	3.9%	0.9%
Hired 3+ months after employer joins OregonSaves? (t)	205,654	28.3%	45.0%
OregonSaves job number 2+? (t)	205,654	11.3%	31.7%
Employee terminated? (t)	205,654	14.0%	34.7%
Ln (number of employees at enrollment)	205,026	3.5	1.3
Pilot employer? (t)	205,654	1.4%	11.7%
Employer registered late? (t)	204,632	19.1%	39.3%
Employer processed payroll? (t)	205,654	73.2%	44.3%
Imputed monthly income (t)	452,997	2,364.9	2,494.4
Median imputed industry income (t-1)	194,515	2,089.6	997.8
Median imputed industry-county income (t-1)	165,867	2,106.9	1,287.6
Average OED industry-county income (q-1)	152,361	2,586.3	1,289.5
Median within-EE SD of income within industry (t-1)	196,394	702.2	487.0
Median within-EE SD of income within industry-county (t-1)	172,710	733.3	651.2

**Online Appendix Table 9: Predicting Opt Out from OregonSaves**

This table is an expanded version of Table 4. Again, we estimate linear probability models to predict opt out from OregonSaves. The unit of observation is employee  $i$ . The dependent variable equals 100 if employee  $i$  has formally opted out of OregonSaves three months after her initial eligibility date, and zero otherwise. Employee-level independent variables include age category dummy variables (omitted category is ages 18-25); account holder location dummy variables (omitted category is account holder lives in an urban Oregon zip code); a dummy variable indicating whether the employee was hired 3 or more months after the employer registered with OregonSaves; a dummy variable indicating whether the account is linked to a prior OregonSaves employment spell; and a dummy variable indicating if the employee was terminated during this three month period. Employer-level independent variables include the fraction of coworkers who formally opted out of OregonSaves through month  $t-1$  and firm size (natural logarithm of one plus the number of employees when the employer registered), as well as dummy variables indicating whether the employer joined OregonSaves during the pilot phase, whether the employer registered after the OregonSaves deadline based on firm size, and whether the employer has processed payroll for at least one employee through month  $t$ . Industry-level independent variables include median employee income within the industry (or industry-county) in month  $t-1$  and the median within-employee standard deviation of imputed income within the industry (or industry-county) in month  $t-1$ . We also include the average county-level unemployment rate in months  $t-3$  to  $t-1$ , and the average income within each industry-county in the prior calendar quarter (provided to us by the Oregon Employment Department). All columns include year-month fixed effects. Columns (1) through (3) focus on three sets of employees: all, those with account addresses in Oregon or Washington, and those with account addresses in Oregon; they include industry-level income measures. Columns (4) through (9) use industry-county-level income measures. Column (7) adds NAICS6-level fixed effects to the baseline specification in column (6), while column (8) adds the employer-level opt out measure, and column (9) adds employer fixed effects. Standard errors cluster on NAICS6 industry. Statistical significance at the 1-percent, 5-percent, and 10-percent levels is indicated by \*\*\*, \*\*, and \*, respectively.

	Predicting opt out 3 months after eligibility								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Age 26-35? (t)	4.44 *** (0.86)	4.27 *** (0.93)	4.32 *** (0.93)	4.56 *** (0.97)	4.14 *** (0.98)	4.51 *** (0.98)	3.81 *** (0.67)	3.57 *** (0.43)	3.65 *** (0.58)
Age 36-45? (t)	7.08 *** (0.94)	6.90 *** (0.94)	7.00 *** (0.92)	7.43 *** (0.92)	7.20 *** (0.89)	7.28 *** (0.96)	5.86 *** (0.58)	4.85 *** (0.44)	5.29 *** (0.63)
Age 46-55? (t)	10.03 *** (1.10)	9.97 *** (1.09)	10.04 *** (1.08)	10.47 *** (1.06)	10.33 *** (1.00)	10.34 *** (1.10)	8.29 *** (0.86)	5.96 *** (0.56)	6.61 *** (0.76)
Age 56-65? (t)	19.63 *** (1.38)	19.64 *** (1.33)	19.88 *** (1.29)	19.95 *** (1.32)	20.25 *** (1.22)	19.66 *** (1.40)	16.96 *** (1.13)	13.04 *** (0.72)	13.80 *** (0.95)
Age 66-75? (t)	30.72 *** (1.74)	30.64 *** (1.57)	30.96 *** (1.57)	31.56 *** (1.55)	31.37 *** (1.59)	31.24 *** (1.59)	27.76 *** (1.17)	22.75 *** (0.95)	24.05 *** (1.17)
Age > 75? (t)	35.54 *** (2.32)	35.47 *** (2.27)	35.80 *** (2.26)	36.65 *** (2.48)	37.54 *** (2.21)	36.21 *** (2.51)	32.15 *** (2.10)	25.67 *** (2.04)	27.04 *** (2.21)
Account holder in rural Oregon? (t)	1.28 (0.87)	1.00 (0.90)	0.86 (0.86)	-1.55 * (0.82)	-1.37 * (0.80)	-1.52 * (0.80)	-1.56 ** (0.63)	-1.33 *** (0.48)	-0.23 (0.50)
Account holder lives outside Oregon? (t)	-1.64 (1.43)	-1.24 (1.63)	-3.26 *** (1.15)	-5.58 *** (2.10)	-5.58 *** (2.07)	-2.79 (2.41)	-1.67 (2.01)	-0.08 (1.04)	0.96 (0.95)
Hired after employer joins OregonSaves (t)	-12.96 *** (2.00)	-13.16 *** (1.92)	-13.33 *** (1.97)	-14.59 *** (1.86)	-11.13 *** (1.54)	-14.24 *** (1.91)	-10.49 *** (1.11)	-9.84 *** (0.84)	-7.75 *** (0.91)
OregonSaves job number 2+ (t)	-6.70 *** (1.42)	-6.54 *** (1.60)	-7.01 *** (1.66)	-5.94 *** (1.14)	-4.82 *** (0.78)	-5.48 *** (1.06)	-3.84 *** (0.78)	-3.31 *** (0.80)	-2.52 *** (0.48)
Employee terminated? (t)	-14.77 *** (1.90)	-15.24 *** (2.08)	-15.31 *** (2.04)	-14.40 *** (1.95)	-13.22 *** (2.05)	-14.39 *** (1.97)	-14.40 *** (2.07)	-14.37 *** (1.19)	-17.75 *** (1.09)
Average county unemployment rate (t-3 to t-1)				1.40 ** (0.56)	1.77 *** (0.68)	1.57 ** (0.64)	1.22 ** (0.58)	0.18 (0.26)	-0.16 (0.41)
Fraction of coworkers who formally opted out (t-1)								79.09 *** (1.65)	
Ln (number of employees at enrollment)	-1.73 ** (0.80)	-1.14 (0.70)	-0.77 (0.73)	-1.62 (0.99)	-2.83 *** (0.98)	-2.00 ** (0.96)	-2.65 *** (0.76)	-0.32 (0.40)	
Pilot employer? (t)	-8.68 *** (2.26)	-9.36 *** (2.24)	-9.61 *** (2.37)	-8.51 *** (2.30)	-9.24 *** (3.21)	-8.31 *** (2.23)	-11.81 *** (2.32)	-1.40 (1.45)	
Employer registered late? (t)	-3.82 ** (1.33)	-3.12 ** (1.25)	-3.16 ** (1.28)	-2.01 ** (1.00)	-0.74 (0.98)	-1.86 * (0.97)	-0.37 (0.77)	-0.24 (0.56)	
Employer processed payroll? (t)	-3.41 *** (1.19)	-4.21 *** (1.33)	-4.08 *** (1.18)	0.31 (1.80)	-0.27 (1.71)	-0.24 (1.92)	-1.61 (1.78)	1.39 ** (0.58)	4.92 (3.43)
Median imputed industry income (t)	3.28 *** (0.60)	3.37 *** (0.65)	3.56 *** (0.67)						
Median within-EE SD of income within industry (t-1)	2.15 * (1.29)	1.63 (1.29)	1.15 (1.27)						
Average OED industry-county income (q-1)					2.33 *** (0.44)				
Median imputed industry-county income (t-1)				1.48 *** (0.39)		1.50 *** (0.38)	0.31 (0.30)	-0.09 (0.13)	0.50 (0.47)
Median within-EE SD of income within industry-county (t-1)				2.48 *** (0.86)	1.33 ** (0.58)	2.37 *** (0.84)	1.65 ** (0.70)	0.23 (0.21)	7.97 *** (2.58)
Limited to accounts in OR?	--	--	Yes	Yes	Yes	--	--	--	--
Limited to accounts in OR or WA?	--	Yes	--	--	--	Yes	Yes	Yes	Yes
Year-month FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NAICS6 Industry FE?	--	--	--	--	--	--	Yes	--	--
Employer FE?	--	--	--	--	--	--	--	--	Yes
N	200,135	186,973	178,200	154,354	134,754	161,937	161,937	161,804	163,088
Adj. R2	0.1084	0.1046	0.1047	0.0959	0.0935	0.0964	0.1201	0.2427	0.2772
Mean Dependent:	41.13	42.33	42.79	40.43	39.98	40.01	40.01	40.01	39.96

**Online Appendix Table 10: Predicting Positive Account Balance Conditional on Participation**

In this table, we estimate linear probability models to predict positive OregonSaves account balances. The unit of observation is employee  $i$ . The dependent variable equals 100 if employee  $i$  has a positive account balance three months after her initial eligibility date, and zero otherwise. We limit the sample to employees working at employers that have processed payroll for at least one employee through month  $t$ . The independent variables and fixed effects match Table 3 except that, in column (3), we replace the fraction of coworkers who formally opted out through month  $t-1$  with the fraction of coworkers with a positive account balance through month  $t-1$ . Standard errors cluster on NAICS6 industry. Statistical significance at the 1-percent, 5-percent, and 10-percent levels is indicated by \*\*\*, \*\*, and \*, respectively.



	Predicting positive account balance 3 months after eligibility			
	(1)	(2)	(3)	(4)
Age 26-35 (t)	12.94 *** (2.43)	13.11 *** (1.89)	12.35 *** (2.07)	11.48 *** (1.62)
Age 36-45 (t)	11.91 *** (2.14)	12.90 *** (1.45)	12.17 *** (1.75)	11.83 *** (1.27)
Age 46-55 (t)	13.14 *** (2.38)	14.64 *** (1.58)	14.17 *** (2.01)	13.99 *** (1.50)
Age 56-65 (t)	15.16 *** (2.56)	16.65 *** (1.61)	16.62 *** (2.15)	15.08 *** (1.47)
Age 66-75 (t)	12.64 *** (3.07)	13.21 *** (2.20)	13.67 *** (2.59)	11.76 *** (2.04)
Age > 75 (t)	0.25 (6.98)	7.45 * (4.36)	4.87 (5.75)	10.63 *** (3.69)
Account holder in rural Oregon? (t)	-3.15 (2.10)	-0.36 (0.59)	-2.50 (1.52)	0.90 * (0.49)
Account holder live outside Oregon? (t)	-14.56 *** (2.84)	-8.62 *** (1.62)	-12.28 *** (2.09)	-2.42 (1.75)
Hired after employer joins OregonSaves (t)	-14.17 *** (3.13)	-8.41 *** (0.97)	-12.50 *** (2.44)	-6.64 *** (1.20)
OregonSaves job number 2+ (t)	4.25 (3.33)	8.30 *** (1.26)	5.11 ** (2.46)	10.25 *** (0.80)
Employee terminated? (t)	-32.89 *** (1.95)	-34.20 *** (1.82)	-31.34 *** (1.97)	-38.90 *** (1.42)
Average county unemployment rate (t-3 to t-1)	3.41 *** (1.28)	1.17 (0.76)	2.89 *** (0.96)	0.22 (0.67)
Fraction of coworkers with positive account balance (t-1)			57.35 *** (4.45)	
Ln (number of employees at enrollment)	-5.12 *** (1.36)	-3.94 *** (0.61)	-3.46 *** (1.21)	
Pilot employer? (t)	-19.16 ** (8.60)	-19.17 *** (3.90)	-17.26 *** (5.33)	
Employer registered late? (t)	-0.41 (2.26)	0.45 (1.61)	-0.31 (1.77)	
Median industry-county income (t-1)	0.15 (0.57)	-0.52 (0.33)	0.40 (0.44)	-0.77 (0.93)
Median within-EE SD of income within industry-county (t-1)	-2.14 * (1.17)	-2.50 *** (0.95)	-1.29 (0.87)	0.11 (3.40)
Limited to ERs that processed contrib.?	Yes	Yes	Yes	Yes
Limited to accounts in OR or WA?	Yes	Yes	Yes	Yes
Year-month FE?	Yes	Yes	Yes	Yes
Industry FE?	--	Yes	--	--
Employer FE?	--	--	--	Yes
N	81,531	81,531	81,508	81,874
Adj. R2	0.1817	0.2328	0.2226	0.3183
Mean Dependent:	54.46	54.46	54.45	54.42

**Online Appendix Table 11: Comparing Imputed Monthly Incomes for Employees Who Made One or Two Contributions to Those Who Made Three or More**

This table is an expanded version of Table 5. Again, the dependent variable is imputed after-tax monthly income, and we compare the monthly income of employees who make exactly one contribution and exactly two contributions to OregonSaves to the monthly incomes of employees who make more than two contributions. All columns include year-month fixed effects. Column (1) includes all employees regardless of their location and does not require that contributions be made in consecutive months; column (2) limits the sample to employees with account addresses in Oregon or Washington; column (3) requires that when employees made two or more contributions, those contributions be made in consecutive months; column (4) adds employee and employer controls; column (5) adds 527 fixed effects based on NAICS6; column (6) replaces industry fixed effects with 4,709 employer fixed effects and drops (time-invariant) employer-level controls; and column (7) replaces the employer fixed effects with 19,780 employer-month fixed effects. Standard errors cluster on NAICS6 industry. Statistical significance at the 1-percent, 5-percent, and 10-percent levels is indicated by \*\*\*, \*\*, and \*, respectively.

	Imputed After-Tax Monthly Income						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Only one contribution	-703.78 *** (60.90)	-699.52 *** (58.34)	-666.00 *** (57.60)	-539.51 *** (49.88)	-485.61 *** (42.81)	-538.05 *** (48.20)	-611.07 *** (37.30)
Only two contributions	-580.78 *** (40.29)	-581.01 *** (40.72)	-589.95 *** (35.97)	-455.61 *** (31.96)	-380.72 *** (29.07)	-380.08 *** (26.49)	-381.90 *** (30.70)
Age 26-35 (t)				433.07 *** (32.18)	370.13 *** (24.36)	331.34 *** (29.89)	323.70 *** (29.89)
Age 36-45 (t)				691.26 *** (55.49)	559.86 *** (33.66)	547.16 *** (37.06)	545.53 *** (40.38)
Age 46-55 (t)				797.22 *** (69.63)	631.40 *** (43.88)	632.25 *** (46.03)	632.49 *** (51.04)
Age 56-65 (t)				657.72 *** (80.72)	504.11 *** (58.95)	549.42 *** (57.03)	535.07 *** (62.17)
Age 66-75 (t)				163.93 * (95.33)	119.28 * (64.89)	186.22 *** (56.16)	200.01 *** (65.02)
Age > 75 (t)				-373.80 *** (113.54)	-256.55 ** (104.86)	4.81 (96.62)	41.02 (98.59)
Account holder in rural Oregon? (t)				-113.02 *** (39.24)	-109.14 *** (27.32)	-59.23 ** (27.33)	-54.59 * (30.76)
Account holder live outside Oregon? (t)				568.33 *** (118.70)	374.19 *** (76.49)	164.09 ** (74.12)	110.12 (71.96)
Hired after employer joins OregonSaves (t)				-402.76 *** (50.58)	-386.10 *** (41.52)	-390.41 *** (46.78)	-407.57 *** (63.43)
OregonSaves job number 2+ (t)				-127.29 *** (42.80)	-8.85 (30.34)	-21.71 (28.83)	-54.09 * (28.72)
Average county unemployment rate (t-3 to t-1)				-199.34 *** (28.15)	-192.30 *** (21.51)	-69.66 *** (21.54)	-60.12 ** (27.68)
Ln (number of employees at enrollment)				-77.93 ** (36.08)	85.02 *** (28.90)		
Pilot employer? (t)				240.63 ** (104.51)	54.30 (197.36)		
Employer registered late? (t)				19.57 (64.88)	0.66 (38.29)		
Constant	2130.92 *** (84.13)	2160.42 *** (82.85)	2128.04 *** (80.11)	2875.89 *** (183.44)	2447.57 *** (117.36)	2309.53 *** (94.27)	2131.30 *** (113.25)
Limited to ERs that processed contrib.?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Limited to accounts in OR or WA?	--	Yes	Yes	Yes	Yes	Yes	Yes
Limited to consecutive months?	--	--	Yes	Yes	Yes	Yes	Yes
Year-month FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE?	--	--	--	--	Yes	--	--
Employer FE?	--	--	--	--	--	Yes	--
Employer-by-year-month FE?	--	--	--	--	--	--	Yes
Employee controls?	--	--	--	Yes	Yes	Yes	Yes
Employer controls?	--	--	--	Yes	Yes	--	--
N	113,839	106,344	100,332	99,364	99,364	99,732	99,732
Adj. R2	0.0152	0.0149	0.0153	0.0507	0.1453	0.2632	0.3951

**Online Appendix Table 12: Frequency of monthly changes in contribution rates among active, eligible employees with open accounts**

In this table, we provide evidence on persistence in contribution rates across months. Similar to column (4) of Table 7, the unit of observation is employee-month and the sample is limited to employees who are active, eligible, have an open account, and have not formally opted out in month t-1. For each lagged contribution rate, we report the number of employee-months with the current contribution rate, as well as the percent decreasing or increasing their contribution rate. Because we combine all contribution rates greater than 7% into a single category, we do not report percentage increase within this row.

Lagged Rate	Current Rate									All	% Decrease	% Increase
	0%	1%	2%	3%	4%	5%	6%	7%	> 7%			
0%	51,239	9	8	7	3	21	1	2	9	51,299	--	0.1%
1%	131	11,779	363	33	7	32	1	2	9	12,357	1.1%	3.6%
2%	151	62	12,161	444	17	14	3	2	10	12,864	1.7%	3.8%
3%	163	63	34	11,497	420	40	5	4	3	12,229	2.1%	3.9%
4%	40	14	24	14	3,218	129	7	2	9	3,457	2.7%	4.3%
5%	19,385	483	449	323	50	838,895	23,394	107	539	883,625	2.3%	2.7%
6%	908	30	27	48	29	72	116,850	5,204	116	123,284	0.9%	4.3%
7%	127	6	8	13	6	23	5	15,477	139	15,804	1.2%	0.1%
> 7%	236	29	11	17	9	127	12	10	13,470	13,921	3.2%	--
All	72,380	12,475	13,085	12,396	3,759	839,353	140,278	20,810	14,304	1,128,840	2.0%	2.8%

### Online Appendix Table 13: Likelihood of Increasing or Decreasing Contribution Rate by Month

In this table, we report the fractions of employees who have not formally opted out of OregonSaves in month t-1 that (1) increase their contribution rate in month t, (2) decrease their contribution rate between month t-1 and t, but still have a positive contribution rate, (3) decrease their contribution rate in month t to 0% without formally opting out, and (4) decrease their contribution rate in month t to 0% by formally opting out. We require that the employee have a positive contribution rate in month t-1, and in columns (1) through (3), we also require that the employee not be formally opted out in month t. We do not impose any other filters on the sample. Because our contribution rate date begin in August 2018, the first month for which we can measure changes is September 2018. The vast majority of the increases occur in January 2019 and January 2020, which are the months when automatic escalation occurs. Although not reported in the table, we find that 95.5% of all rate increases are equal to 1%.

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Date	Increase rate (1)	Decrease rate but not all the way to 0% (2)	Decrease rate to 0% without opting out (3)	Decrease rate to 0% by formally opting out (4)
Sep 2018	0.2%	1.0%	0.8%	2.6%
Oct 2018	0.2%	1.7%	1.4%	2.2%
Nov 2018	0.1%	1.1%	0.9%	2.6%
Dec 2018	0.1%	0.3%	0.1%	3.9%
Jan 2019	15.3%	0.4%	0.1%	7.8%
Feb 2019	0.1%	0.4%	0.1%	5.7%
Mar 2019	0.1%	0.2%	0.1%	3.3%
Apr 2019	0.1%	0.2%	0.1%	2.6%
May 2019	0.1%	0.2%	0.1%	3.6%
Jun 2019	0.1%	0.3%	0.1%	5.4%
Jul 2019	0.1%	0.2%	0.1%	4.2%
Aug 2019	0.1%	0.3%	0.2%	2.6%
Sep 2019	0.1%	0.2%	0.1%	2.6%
Oct 2019	0.1%	0.2%	0.1%	2.1%
Nov 2019	0.1%	0.3%	0.2%	2.5%
Dec 2019	0.1%	0.5%	0.3%	4.1%
Jan 2020	15.4%	1.1%	0.9%	4.2%
Feb 2020	0.1%	0.3%	0.1%	2.1%
Mar 2020	0.0%	0.4%	0.3%	1.7%
Apr 2020	0.0%	0.5%	0.5%	0.7%
All	1.7%	0.4%	0.3%	3.1%
Excl. January	0.1%	0.4%	0.2%	2.9%

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### Online Appendix Table 14: Growth of OregonSaves

The sample is limited to open accounts in month t. We report the total number of dollars invested in OregonSaves at the end of each month, as well as the total net flows (inflows minus outflows), inflows, and outflows during the month. Percent net flow is the net flow during month t scaled by total assets in month t-1. Percent inflow and outflow are defined similarly. Statistics for August 2018 through April 2020 are calculated from our administrative data; statistics for August 2020 through May 2022 are from public reports available at <https://www.oregon.gov/treasury/financial-empowerment/Pages/Oregon-Retirement-Savings-Board.aspx#meetings>; there are no public reports for May 2020 through July 2020. "% Liquid Reserve" is the fraction of all OregonSaves assets invested in the State Street Institutional Liquid Reserve Fund, the initial default investment option for each account. "% S&P Index" is the fraction of all OregonSaves assets invested in the State Street Equity 500 Index, which is not a default investment option for any account. We are not able to calculate "% Liquid Reserve" or "% S&P Index" from public data.

Date	Total assets	Total net flow	Total inflow	Total outflow	Percent net flow	Percent inflow	Percent outflow	% Liquid Reserve	% S&P Index
Jul 2018	5,576,907	999,495	1,147,746	-148,251					88.6%
Aug 2018	6,679,928	1,074,570	1,287,967	-213,397	19.3%	23.1%	-3.8%	86.4%	1.3%
Sep 2018	7,730,532	1,034,423	1,231,143	-196,720	15.5%	18.4%	-2.9%	84.7%	1.1%
Oct 2018	8,814,097	1,151,576	1,447,061	-295,485	14.9%	18.7%	-3.8%	83.2%	1.1%
Nov 2018	9,910,995	1,052,093	1,348,217	-296,124	11.9%	15.3%	-3.4%	80.8%	1.1%
Dec 2018	10,948,439	1,131,755	1,427,083	-295,328	11.4%	14.4%	-3.0%	79.1%	1.1%
Jan 2019	12,531,133	1,372,018	1,753,164	-381,146	12.5%	16.0%	-3.5%	75.9%	1.3%
Feb 2019	14,164,566	1,538,361	1,872,047	-333,686	12.3%	14.9%	-2.7%	74.2%	1.4%
Mar 2019	16,211,620	1,949,131	2,294,651	-345,520	13.8%	16.2%	-2.4%	72.9%	1.4%
Apr 2019	18,420,364	2,055,547	2,520,999	-465,452	12.7%	15.6%	-2.9%	71.5%	1.4%
May 2019	20,380,644	2,168,732	2,677,598	-508,866	11.8%	14.5%	-2.8%	71.5%	1.4%
Jun 2019	22,780,423	2,039,662	2,601,049	-561,387	10.0%	12.8%	-2.8%	69.8%	1.5%
Jul 2019	25,487,492	2,638,161	3,328,270	-690,109	11.6%	14.6%	-3.0%	69.3%	1.5%
Aug 2019	28,541,770	3,067,188	3,918,247	-851,059	12.0%	15.4%	-3.3%	68.8%	1.5%
Sep 2019	31,326,977	2,634,966	3,297,416	-662,450	9.2%	11.6%	-2.3%	68.2%	1.5%
Oct 2019	34,559,000	2,973,977	3,808,450	-834,473	9.5%	12.2%	-2.7%	67.3%	1.5%
Nov 2019	37,572,465	2,713,452	3,463,042	-749,590	7.9%	10.0%	-2.2%	66.2%	1.6%
Dec 2019	40,955,951	3,014,223	3,930,297	-916,074	8.0%	10.5%	-2.4%	65.1%	1.7%

Jan 2020	43,800,314	2,852,497	4,065,011	-1,212,514	7.0%	9.9%	-3.0%	64.8%	1.8%
Feb 2020	45,924,890	3,201,617	4,862,348	-1,660,731	7.3%	11.1%	-3.8%	60.7%	1.7%
Mar 2020	46,711,651	3,188,054	4,567,289	-1,379,235	6.9%	9.9%	-3.0%	61.5%	1.6%
Apr 2020	51,054,705	2,485,249	3,202,234	-716,985	5.3%	6.9%	-1.5%	58.1%	1.8%
May 2020									
Jun 2020									
Jul 2020									
Aug 2020	66,846,469	2,972,867	3,864,015	-891,148					
Sep 2020	69,167,837	3,147,522	4,054,036	-906,514	4.7%	6.1%	-1.4%		
Oct 2020	71,325,749	2,630,940	3,735,119	-1,104,179	3.8%	5.4%	-1.6%		
Nov 2020	79,106,584	3,947,290	5,032,998	-1,085,708	5.5%	7.1%	-1.5%		
Dec 2020	84,741,739	3,793,004	5,052,385	-1,259,381	4.8%	6.4%	-1.6%		
Jan 2021	87,886,663	3,418,852	4,856,028	-1,437,176	4.0%	5.7%	-1.7%		
Feb 2021	92,275,410	3,632,750	4,858,733	-1,225,983	4.1%	5.5%	-1.4%		
Mar 2021	99,147,494	5,933,215	7,127,454	-1,194,239	6.4%	7.7%	-1.3%		
Apr 2021	107,217,323	6,087,937	7,318,970	-1,231,033	6.1%	7.4%	-1.2%		
May 2021	113,149,423	5,250,447	6,613,461	-1,363,014	4.9%	6.2%	-1.3%		
Jun 2021	118,898,674	4,939,225	6,594,160	-1,654,935	4.4%	5.8%	-1.5%		
Jul 2021	125,013,352	5,568,824	6,955,408	-1,386,584	4.7%	5.8%	-1.2%		
Aug 2021	131,548,621	5,207,896	6,747,971	-1,540,075	4.2%	5.4%	-1.2%		
Sep 2021	133,535,002	4,830,690	6,790,233	-1,959,543	3.7%	5.2%	-1.5%		
Oct 2021	140,695,842	3,796,568	5,832,967	-2,036,399	2.8%	4.4%	-1.5%		
Nov 2021	140,697,792	1,266,459	2,770,796	-1,504,337	0.9%	2.0%	-1.1%		
Dec 2021	150,010,539	5,071,394	6,765,391	-1,693,997	3.6%	4.8%	-1.2%		
Jan 2022	147,278,855	4,113,674	6,119,649	-2,005,975	2.7%	4.1%	-1.3%		
Feb 2022	148,076,981	3,913,840	6,735,388	-2,821,548	2.7%	4.6%	-1.9%		
Mar 2022	153,896,905	4,741,584	7,333,035	-2,591,451	3.2%	5.0%	-1.8%		
Apr 2022	147,788,686	4,803,287	6,902,522	-2,099,235	3.1%	4.5%	-1.4%		

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### Online Appendix Table 15: Evolution of Account Balances Based on Employee Status

In this table, the unit of observation is account  $i$  in month  $t$ . We limit the sample to the 23,617 accounts for which the first contribution is made between August 2018 and May 2019. This filter allows us to track each account over its first twelve months. The fraction of participants classified by (one or more of their employers) as active at the end of month  $t$  falls from 96.8% to 69.9%. We report account statistics separately for active and inactive employees. We report the fraction of open accounts with positive balances, with any inflows during the month, with any outflows during the month, and the average account balance at the end of the month (including zeros).

Months	% still active	Active in month $t$				Inactive in month $t$			
		% with positive balance	% with inflow	% with outflow	Average balance (incl. 0)	% with positive balance	% with inflow	% with outflow	Average balance (incl. 0)
1	97.0%	99.7%	99.9%	0.5%	83	99.3%	99.7%	0.8%	115
2	94.1%	98.3%	85.3%	2.5%	165	97.4%	52.8%	3.1%	126
3	90.9%	97.2%	80.0%	2.2%	248	96.4%	31.7%	2.2%	145
4	87.8%	96.3%	74.4%	2.5%	328	94.6%	21.4%	2.4%	166
5	84.8%	95.5%	70.6%	2.3%	405	93.7%	14.8%	1.8%	184
6	82.2%	94.7%	68.0%	2.6%	479	92.6%	12.0%	1.7%	205
7	80.1%	94.0%	64.9%	2.5%	548	91.4%	10.3%	1.8%	225
8	78.0%	93.5%	62.8%	2.7%	616	90.7%	9.3%	1.4%	241
9	76.2%	92.8%	60.7%	2.7%	680	90.0%	9.0%	1.4%	263
10	74.4%	92.2%	58.3%	3.1%	743	89.4%	8.5%	1.3%	284
11	72.3%	91.5%	56.3%	3.4%	800	88.6%	7.5%	1.4%	298
12	69.9%	90.9%	56.0%	3.5%	865	87.7%	7.2%	1.5%	311



**Online Appendix Table 16: Dispersion in OregonSaves Account Balances and Employment Status**

In this table, the unit of observation is account  $i$  in month  $t$ . We limit the sample to the 23,617 accounts for which the first contribution is made between August 2018 and May 2019. This filter allows us to track each account over its first twelve months. The fraction of participants classified by (one or more of their employers) as active at the end of month  $t$  falls from 96.8% to 69.9%. We report the 10th, 30th, 50th, 70th, and 90th percentiles of the OregonSaves account balance separately for active and inactive employees.

Months	% still active	Employee classified as active in month $t$					Employee classified as inactive in month $t$				
		Account balance percentile					Account balance percentile				
		10th	30th	50th	70th	90th	10th	30th	50th	70th	90th
1	97.0%	15	36	58	92	170	7	21	49	100	175
2	94.1%	26	79	132	194	331	9	29	65	128	225
3	90.9%	30	114	201	300	501	9	33	78	170	300
4	87.8%	29	136	264	403	679	8	35	94	207	352
5	84.8%	28	156	322	504	856	7	38	104	236	407
6	82.2%	25	167	376	603	1,035	6	39	115	264	463
7	80.1%	22	174	423	699	1,205	4	39	124	287	524
8	78.0%	20	177	463	788	1,378	3	39	128	304	583
9	76.2%	16	174	495	873	1,548	1	40	135	325	636
10	74.4%	13	171	524	955	1,721	0	40	141	350	692
11	72.3%	9	165	546	1,031	1,884	0	38	144	371	734
12	69.9%	6	166	580	1,118	2,063	0	37	144	388	775

### Online Appendix Table 17: Employee Status and Average OregonSaves Account Balance

In this table, the unit of observation is account  $i$  in month  $t$ . We limit the sample to the 23,617 accounts for which the first contribution is made between August 2018 and May 2019. This filter allows us to track each account over its first twelve months. Each month, we report the fraction of participants classified by (one or more of their employers) as active at the end of month  $t$  and the average account balance, separately by age range.

Months	Fraction of accounts where employee is classified as active in month $t$							Average balance (incl. 0)						
	< 26	26-35	36-45	46-55	56-65	66-75	> 75	< 26	26-35	36-45	46-55	56-65	66-75	> 75
1	96.0%	97.6%	96.8%	97.7%	97.0%	98.0%	100.0%	65	82	95	104	101	78	72
2	92.2%	94.2%	94.5%	95.5%	95.3%	96.5%	97.7%	123	158	185	204	200	149	131
3	88.4%	90.4%	91.9%	93.5%	93.7%	95.8%	97.7%	176	232	272	300	292	219	179
4	84.4%	87.0%	89.3%	91.4%	91.8%	92.6%	97.7%	224	298	351	393	386	288	241
5	80.3%	83.5%	86.8%	89.5%	90.0%	90.6%	97.7%	266	357	425	476	467	354	292
6	77.0%	80.7%	84.5%	88.0%	87.6%	88.2%	97.8%	301	409	497	559	553	418	304
7	74.2%	78.3%	82.9%	86.8%	86.6%	88.0%	95.7%	334	460	560	638	629	466	369
8	71.6%	76.1%	81.0%	85.0%	85.4%	86.3%	95.7%	365	505	618	710	699	518	421
9	69.7%	73.8%	79.2%	83.5%	84.0%	85.7%	93.6%	392	543	676	778	772	579	460
10	67.2%	71.8%	78.0%	82.3%	82.5%	84.7%	93.9%	415	579	724	850	843	634	501
11	64.0%	69.9%	76.4%	80.4%	81.1%	81.6%	90.4%	433	605	768	899	909	684	507
12	61.3%	66.9%	74.5%	78.4%	78.8%	78.2%	87.7%	453	635	810	946	969	758	554