Does Borrowing Undo Automatic Enrollment's Effect on Savings?

John Beshears
Harvard University and NBER

James J. Choi
Yale University and NBER

David Laibson
Harvard University and NBER

Brigitte C. Madrian
Harvard University and NBER

William L. Skimmyhorn
United States Military Academy

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Abstract: Automatic enrollment in retirement savings plans has been shown to increase participation and average savings rates in these plans. But how much of these increases are offset by borrowing outside the plan? We study a natural experiment created when the U.S. Army began automatically enrolling its newly hired civilian employees into the Thrift Savings Plan (TSP) at a default contribution rate of 3% of income. We match these employees' payroll records to their credit reports. We find that 4½ years after hire, as a percent of first-year annualized salary, automatic enrollment raises cumulative TSP contributions by 6% at the mean, 17% at the 25th percentile, and 32% at the 10th percentile. However, automatic enrollment's effect on wealth net of debt is only 3% at the mean and 8% at the 10th percentile. There is relatively little crowd-out at the 25th percentile, where the net wealth effect is 15%.

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Automatically enrolling employees in defined contribution retirement savings plans has become increasingly common. In the U.S., adoption of automatic enrollment has been encouraged by the Pension Protection Act of 2006 and by evidence that it increases both the fraction of employees who contribute to the savings plan and the average contribution rate to the plan (Madrian and Shea, 2001; Choi et al., 2002, 2004; Beshears et al., 2008). The United Kingdom and New Zealand have also enacted automatic enrollment in their national pension schemes. However, there has been no evidence to date on how the asset accumulation effects of automatic enrollment inside a savings plan are offset by increased spending or borrowing outside the plan.

In this paper, we link individual employee payroll records to credit reports to identify the amount of crowding out that occurs on the borrowing margin. The setting we study is a natural experiment created by the introduction of automatic enrollment for civilian employees of the U.S. Army. Prior to August 1, 2010, these employees had to opt into contributing to the Thrift Savings Plan (TSP), the defined contribution plan of the U.S. federal government that is similar to a 401(k) plan. Afterwards, newly hired employees were automatically enrolled in the TSP at a default contribution rate of 3% of their income unless they opted out. Importantly, employees hired prior to August 1, 2010 were never subject to automatic enrollment. We can therefore identify the effect of automatic enrollment by comparing the 33,987 employees hired in the year prior to the regime change to the 26,835 employees hired in the year after.

Consistent with prior evidence, we find that automatic enrollment at the low default contribution rate chosen by the TSP (which is the most common non-zero default implemented in 401(k) plans; see Vanguard (2014)) has a modest positive effect on average cumulative contributions to the TSP and a large positive effect at the left tail. Four and a half years after hire, the effect on cumulative contributions as a percent of an employee's first-year salary is 6% at the mean, 17% at the 25th percentile, and 32% at the 10th percentile. To assess the impact on net wealth accumulation, we subtract from these cumulative contributions the change in debt excluding mortgage, student, and auto debt. The reason to exclude these three categories of debt is that they are being used to purchase durable or investment goods, so to a first approximation, increases in these debt balances do not represent declines in net worth. We find evidence of substantial crowding out. Averaged over tenure months 48-52, automatic enrollment increases net wealth by only 3% of first-year income at the mean and 8% of first-year income at the 10th

percentile. However, there is relatively little crowd-out at the 25th percentile, where the net wealth effect at months 48-52 is 15%.

Our paper is related to Chetty et al. (2014), who study how mandatory contributions to Danish retirement accounts affect total savings. They find that a 1% increase in these mandatory contributions results in about a 0.8% increase in the total savings rate. Although mandatory contributions have some similarities with automatic enrollment, these are two different kinds of policies, as shown by the difference in employees' responses to them. Chetty et al. (2014) show that when employees move to an employer whose mandatory contribution rate is 1% higher, the employee's total savings rate response is virtually unchanged over the first ten years after the job change. In contrast, Choi et al. (2004) show that in their sample of automatic enrollment firms, about half of employees have opted out of the default contribution rate within two years of hire. It is therefore not entirely straightforward to extrapolate the effects of mandatory contributions to the automatic enrollment domain.

The remainder of the paper proceeds as follows. Section I summarizes the relevant institutional details of the TSP and the policy change we exploit. Section II describes our data, and Section III describes our empirical methodology. Section IV discusses our empirical findings. Section V concludes.

I. Thrift Savings Plan institutional details and the natural experiment

The institutional details of the Thrift Savings Plan are similar to many private-sector 401(k) plans. Contributions to the TSP are made on each payday. Employee contributions are made via payroll deduction. Civilian employees receive matching contributions from the government: the first 3% of their own income contributed garners a dollar-for-dollar match, and the next 2% of income contributed is matched at a 50% rate. All civilian employee accounts also receive a government contribution called the Agency Automatic (1%) Contribution equal to 1% of their income, regardless of their own contribution rate. Matching contributions are immediately vested, while automatic contributions vest after three years of service. The IRS imposes limits on the total dollars that can be contributed to the TSP within a calendar year. In 2010, the maximum employee contribution was $16,500 for those younger than 50 and $22,000 for those 50 and older. These limits have gradually risen over time.

Participants can invest in five index funds—a U.S. Treasury security fund, a U.S. fixed income fund, a U.S. large cap equity fund, a U.S. small cap equity fund, and an international equity fund—and five lifecycle funds, which are mixes of the five index funds based on various investor time horizons. Participants can take out at most one general purpose loan and one primary residence loan at a time from their TSP balances while employed. Employed participants can also take up to one age-based withdrawal once they reach age 59½ and any number of withdrawals at any age if financial hardship is certified. Hardship withdrawals require the employee to not contribute to the TSP for the following six months, and if the employee is younger than 59½, a tax penalty must be paid equal to 10% of the withdrawal.

When participants leave Army employment, they can keep their balances in the TSP if the balances were greater than $200. Former employees who keep their balances in the TSP can take up to one partial withdrawal if they had not previously taken an in-service age-based withdrawal. Otherwise, they can only keep their entire balances in the TSP or withdraw their balances in full through a mix of a lump sum payment, a series of monthly payments, or an annuity.

Beginning on August 1, 2010, the U.S. Federal Government implemented automatic enrollment for all U.S. federal employees covered by the Federal Employees' Retirement System (FERS), including those in the Army. The Army is the second-largest Cabinet-level agency in the Federal Government, with over 215,000 civilian employees throughout our sample period (United States Office of Personnel Management, 2016). Before this change, all civilian Army employees had to opt into the TSP to make contributions. After the change, civilian employees who were newly hired or re-hired following a break in service of at least 31 calendar days were automatically enrolled into the TSP at a default employee contribution rate of 3% to a pre-tax account. Contributions were invested by default entirely in the U.S. Treasury security fund, although participants could reallocate existing balances and change the destination of future contribution flows into other funds at any point in time.

There were no other changes to the TSP for Army civilian personnel during the year before and the year after the implementation of automatic enrollment. Starting in July 2012, Army civilian employees could make contributions on an after-tax basis to a Roth account in the TSP. From October 1 through 16 of 2013, Army civilian employees did not receive pay due to federal government furloughs. Some employees—referred to as excepted employees—whose

work was deemed essential were required to continue to work without receiving pay during this period. In the last week of October 2013, both excepted and non-excepted employees received retroactive paychecks covering the entire furlough period. Gelman et al. (2015) find that affected employees both reduced spending and delayed debt payments during the period of temporarily low income.

II. Data description

To measure savings in the TSP, we use employee-level administrative payroll data from the Department of Defense. The payroll data consist of monthly cross-sections from January 2007 to December 2015 of all Army employees hired or re-hired during that period of time.[1] We observe demographic information including year of birth, gender, race, education level, and any academic discipline in which that education specialized; employment information including most recent hire date, creditable service, work schedule, and annualized pay rate; and the dollar amounts of employee and employer TSP contributions for the current month. We assume that Army employees did not make TSP contributions when they are missing from the monthly payroll data.

Because we observe only flows into the TSP from employer and employee contributions, we do not observe actual balances or the funds in which balances are invested. Furthermore, we do not observe in-service withdrawals or loans from the TSP, and we cannot distinguish regular TSP contributions from TSP loan repayments. Our measure of TSP savings will be the cumulative employee plus employer contributions to date, which will tend to understate TSP balances to the extent that capital gains are important but overstate them to the extent that in-service withdrawals and loans are important. Because automatically enrolled individuals had their balances invested in the Treasury security fund by default, capital gains are unlikely to be very large in the automatic enrollment cohort.

For the credit analysis, we use matched and deidentified individual-level credit reports from a national credit bureau. The credit data consist of annual year-end cross-sections from 2009 to 2015. In each cross-section we observe debt balances, number of accounts, and various measures of distress (e.g. late payments, delinquent accounts, open liens, and bankruptcy

[1] If an employee converts from being ineligible to TSP to eligible, we count her as being "hired" on the date she becomes eligible because in the automatic enrollment regime, she would by default be enrolled in TSP upon converting.

proceedings, etc.). The debt measures are broken up by source (e.g., mortgage, bankcard, student loans, auto loans, etc.). We also observe Vantage Scores—an estimate of creditworthiness calculated by the credit bureaus that ranges from 300 (least creditworthy) to 850 (most creditworthy)—for all individuals in the credit data. We assume that Army employees who do not match to an Experian credit report have no debt balances.

III. Empirical methodology

We compare the savings and credit outcomes of two hire cohorts to each other at equivalent levels of job tenure. The pre-automatic enrollment (pre-AE) cohort consists of Army civilian employees hired in the year preceding the introduction of automatic enrollment—from August 1, 2009 to July 31, 2010. The post-automatic enrollment (post-AE) cohort consists of Army civilian employees hired in the year following the introduction of automatic enrollment—from August 1, 2010 to July 31, 2011. Table 1 shows that these two cohorts are similar in average annualized starting salary, annualized starting salary deflated by the 2.0% average federal pay increase between 2010 and 2011, and the fraction who are hourly workers, male, and have an matched credit record. Although some of the differences between the cohorts are statistically significant, they are small in economic magnitude.

Because the savings data are monthly, we can compute cumulative contributions for every employee at every tenure month. But our credit data are only yearly, so we can only compute changes in credit variables from year-end to year-end. Therefore, the baseline date from which credit variable changes are computed for an employee is always the first year-end prior to the employee's hire date. Credit variable changes at n months of tenure are computed using only the sample of employees in the cohort hired n months before a year-end. For example, credit variable changes at 5 months of tenure for the post-AE cohort are computed using only August 2010 hires, taking the difference between their December 31, 2010 and December 31, 2009 credit reports. When we compute net savings at n months of tenure, we add together our cumulative contributions variable and borrowing variable values in that tenure month. Individuals who cease to appear in the payroll data and never return are dropped from the sample from their departure date onwards. Individuals who cease to appear in the payroll data and return with a different hire date or the same amount of creditable service are dropped from the sample

from their initial departure date onwards. Attrition across the two cohorts is similar; at 52 months of tenure, 62% of the pre-AE cohort and 60% of the post-AE cohort are still in our sample.

IV. Results

Figures 1 and 2 show that automatic enrollment has effects in the TSP similar to those previously documented in 401(k) plans. In Figure 1, we see that with a modest default contribution rate of 3% of income, automatic enrollment raises average cumulative contributions at the end of 4½ years of tenure (the point at which our credit data end) by about 6% of the employee's first-year annualized income, an effect whose difference from zero is highly statistically significant. The point estimates of this effect drop a bit as we move beyond this horizon, but the confidence intervals widen because we have fewer employees whom we observe for that long, so we cannot reject the hypothesis that the effect on cumulative contributions continues to increase through 64 months of tenure. Figure 2 shows that automatic enrollment's effect is concentrated in the left tail. The 50th and 90th percentiles of cumulative TSP contributions over time are nearly identical under both regimes, but the 10th percentile of cumulative contributions is higher under automatic enrollment by 32% of first-year pay, and the 25th percentile is higher by 17% of first-year pay.

We measure net wealth accumulation by subtracting from cumulative TSP contributions the change (since the year-end prior to hire) in debt balances excluding mortgages, auto loans, and student loans. We exclude these three types of debt because they are being used to purchase durable or investment goods, so to a first approximation, an increase in those types of debt represents a reshuffling of wealth rather than a reduction. For example, when an individual takes out a new mortgage, the increased liability on his balance sheet is offset by the new housing asset he has acquired, so his net worth is unaffected.

Figure 3 shows that the effect of automatic enrollment on net wealth accumulation to pay is considerably attenuated relative to its effect on cumulative TSP contributions to pay. Over most horizons, we cannot reject the hypothesis that automatic enrollment has no effect on average net wealth accumulation. At tenure month 52, the effect's point estimate is 0.8% of first-year pay, and averaging over tenure months 48-52, the effect's point estimate is 2.7% of first-year pay. However, we would expect automatic enrollment's effect on net wealth accumulation to be larger at the left tail.

Figure 4 shows that indeed, automatic enrollment appears to have a positive effect at the 10th and 25th percentiles of the net wealth to pay change distribution. Figure 5 shows that the effect at the 10th percentile is positive and statistically significant for 53% of the tenure months. The point estimate is 5.6% of first-year income at month 52 and 8.3% of first-year income averaging over months 48-52. The size of this effect is considerably smaller than the 32% effect we saw at the 10th percentile of cumulative TSP contributions to pay. There is much less crowd-out at the 25th percentile. At month 52, the net wealth effect is 13.2%, and averaging over months 48-52, it is 14.6%. We see that there are some months where the median or 90th percentile effects are significantly different from zero, but significance is much less common at these points of the distribution.

Although it is tempting to infer that the difference between the two effects at the 10th percentile is due to the debt of the 10th percentile person increasing by over 20% of first-year income, it is important to remember that the person at the 10th percentile of cumulative TSP contributions to pay is not the same as the person at the 10th percentile of net wealth to pay change. Figure 6 plots the average of cumulative TSP contributions to pay, net wealth to pay change, and non-mortgage/auto/student debt to pay change for individuals who are between the 7.5th and 12.5th percentile of cumulative TSP contributions in each tenure month.[2] It turns out that debt does not increase at all over time in these percentiles, and their net wealth to pay is higher under automatic enrollment by 30.5% of first-year income at month 52 and 20.6% of first-year income averaging over months 48-52.[3] This is comparable in magnitude to the 25.5% of first-year income increase of cumulative TSP contributions to pay at month 52 and the 23.5% of first-year income increase averaging over months 48-52 for these percentiles. One way to think about these results is that the left tail of cumulative TSP contributors really does accumulate substantially more net wealth under automatic enrollment.

So then who is at the left tail of net wealth change? In Figure 7, the sample is the 7.5th to 12.5th percentiles of net wealth to pay change since hire. We see that these percentiles' cumulative TSP contributions rise moderately under automatic enrollment—18.2% of first-year income at 52 months and 14.2% of first-year income averaging over months 48-52—and debt

[2] If we instead construct this plot only for individuals who are exactly at the 10th percentile of cumulative TSP contributions, the other two graphs become very noisy because the identity of the 10th percentile individual changes across each tenure month.

[3] These graphs must be interpreted with caution because the people who are in the 7.5th to 12.5th percentile of cumulative TSP contributions changes across tenure months.

rises moderately too, leading to a modest increase in net wealth. This suggests that the crowding out of automatic enrollment's TSP contribution effect is occurring mostly among those for whom automatic enrollment has a moderate positive contribution effect.

The offsetting of TSP contributions by debt is most concerning if the debt bears a high interest rate. Figure 8 shows that automatic enrollment significantly increases the average total credit card balance by 2.5% of first-year income at tenure month 52, or 1.7% averaging over tenure months 48-52. We see in Figure 9 that this appears to happen both because balances at the left tail do not decline as quickly and balances at the right tail increase more quickly. (We do not show the 50th percentile graphs in this figure and others that follow because the median is zero in all tenure months.)

Figures 10 and 11 show that under automatic enrollment, there is an increase in the average auto loan balance of 4.0% of first-year income at tenure month 52 and 2.4% averaged over months 48-52. This increase appears at the right tail rather than the left tail. Figure 12 shows that the average mortgage balance tends to be larger under automatic enrollment as well, although the estimates are quite noisy. At tenure month 52, the mortgage balance is higher by 22.9% of first-year income, and averaged over tenure months 48-52, the increase is 12.6% of first-year income. Figure 13 indicate that this increase is more pronounced at the right tail.

Finally, Figures 14 and 15 show how the Vantage credit score evolves under the two regimes. There is no indication that there is any difference in financial distress or creditworthiness at the mean or at the tails.

V. Conclusion

Automatic enrollment in the TSP at a 3% of income default contribution rate is extremely successful at increasing contributions to the TSP at the left tail of the distribution while leaving the middle and right of the distribution unchanged. This policy raises the average cumulative contributions to the TSP at 4½ years of tenure by 6% of first-year income, while the 10th percentile of cumulative TSP contributions rises by 32% of first-year income and the 25th percentile rises by 17%. However, once crowd-out along debt margins is considered, the effect of automatic enrollment is considerably more modest at the far left tail. The change in net wealth since hire—measured by cumulative TSP contributions minus the change in non-mortgage/student/auto debt—averaged over tenure months 48-52 is only 3% of first-year income

at the mean and 8% of first-year income at the 10th percentile. There is relatively little crowd-out at the 25th percentile, where automatic enrollment's effect on net wealth change is 15% of first-year income. Our results highlight the importance of observing households' entire balance sheet when assessing the effect of savings policies.

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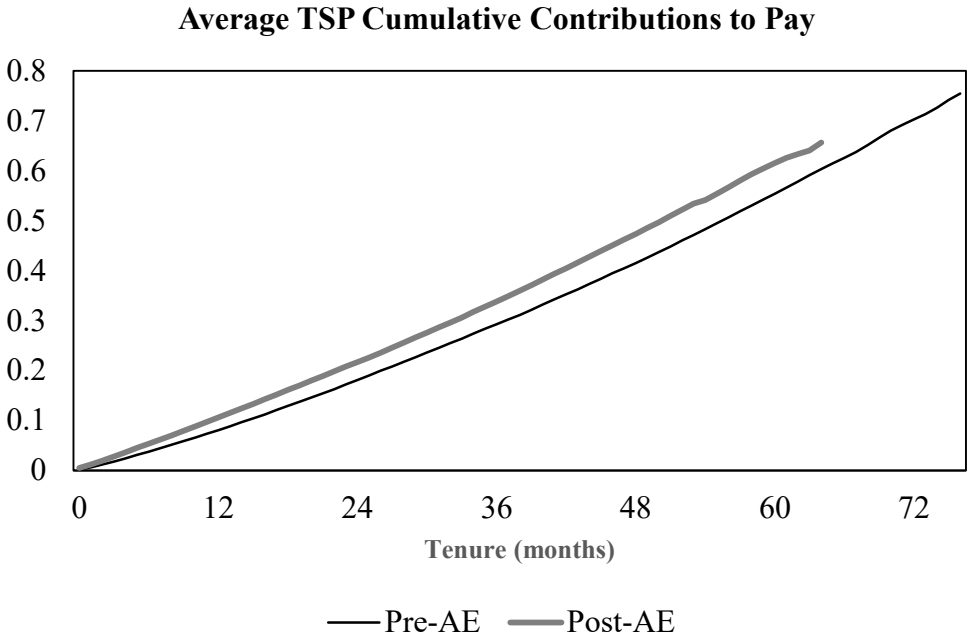
Table 1. Comparison of pre- and post-automatic enrollment hire cohorts

	Pre-AE	Post-AE	Difference	*p*-value of difference
Avg. annualized starting salary	$53,002	$52,660	-$342	0.138
Avg. annualized deflated starting salary	$53,510	$52,660	-$850	0.000
Avg. age at hire	39.5	39.8	0.3	0.001
% hourly worker	10.2%	9.5%	-0.7%	0.003
% male	60.9%	61.3%	0.4%	0.294
% of months missing from payroll data when employed by Army	3.3%	4.0%	-0.7%	0.000
% with credit report at year-end prior to hire	82.6%	82.8%	0.2%	0.564
% of years when employed by Army with credit report	83.5%	83.5%	0.0%	0.780
N	33,987	26,835		



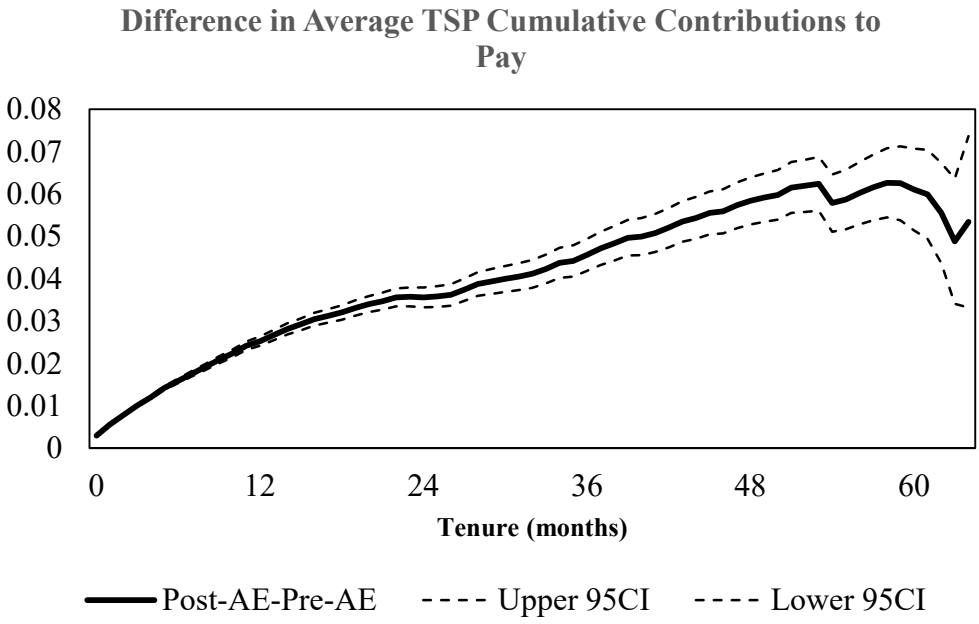


Figure 1. TSP cumulative contributions to annualized first-year pay ratio, averages

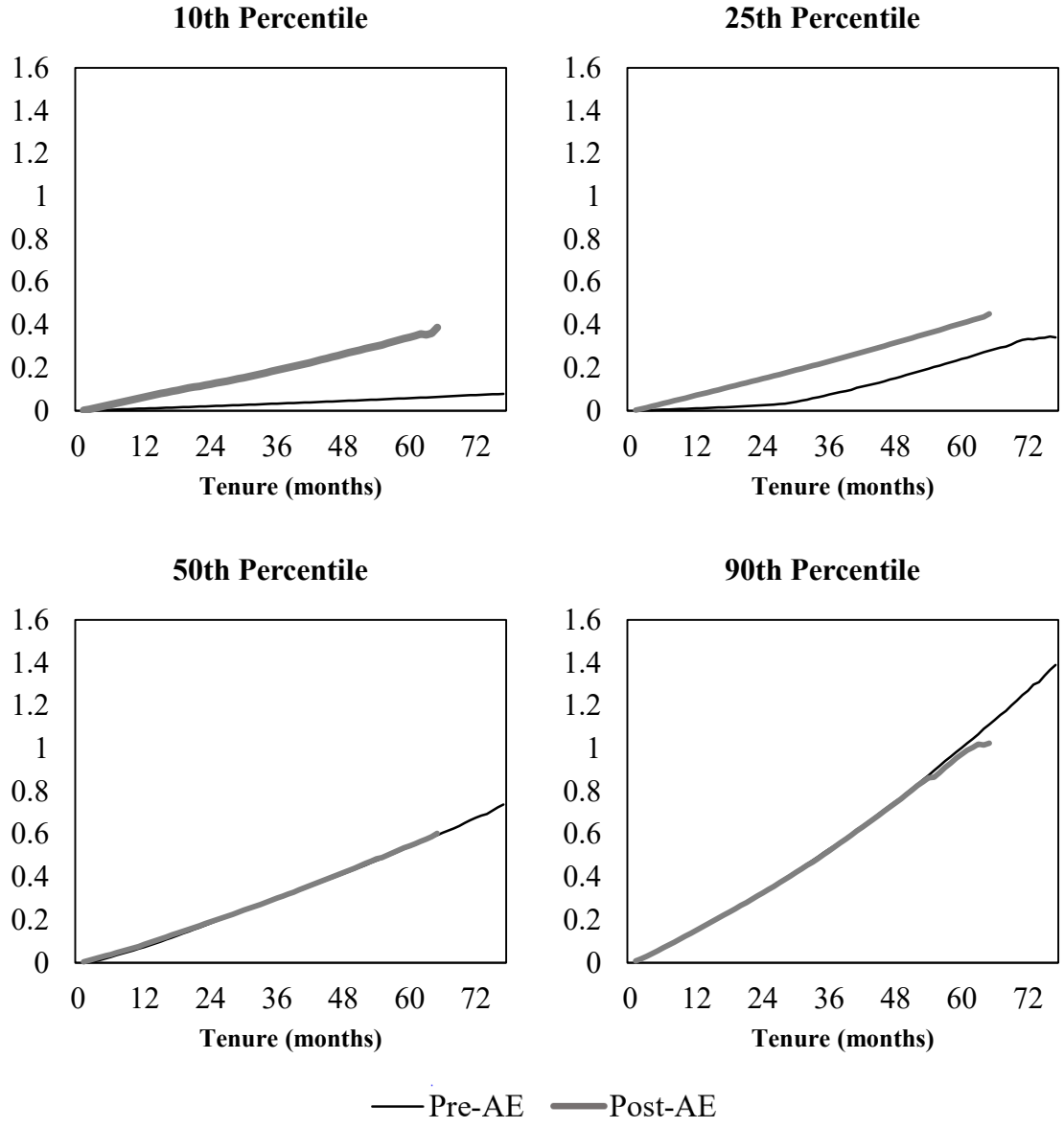
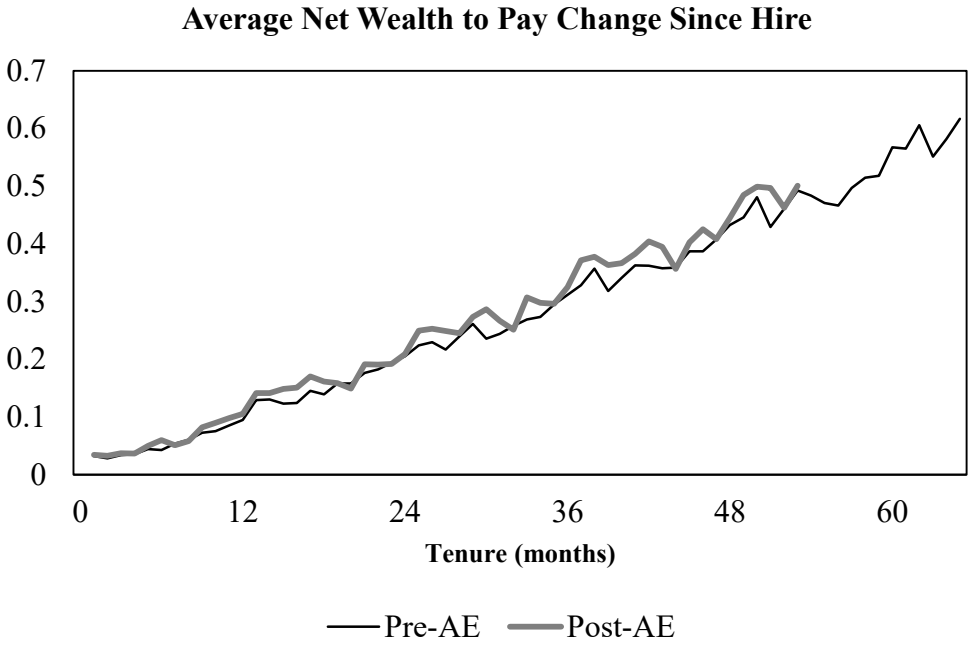


Figure 2. TSP cumulative contributions to annualized first-year pay ratios at 10th, 25th, 50th, and 90th percentiles



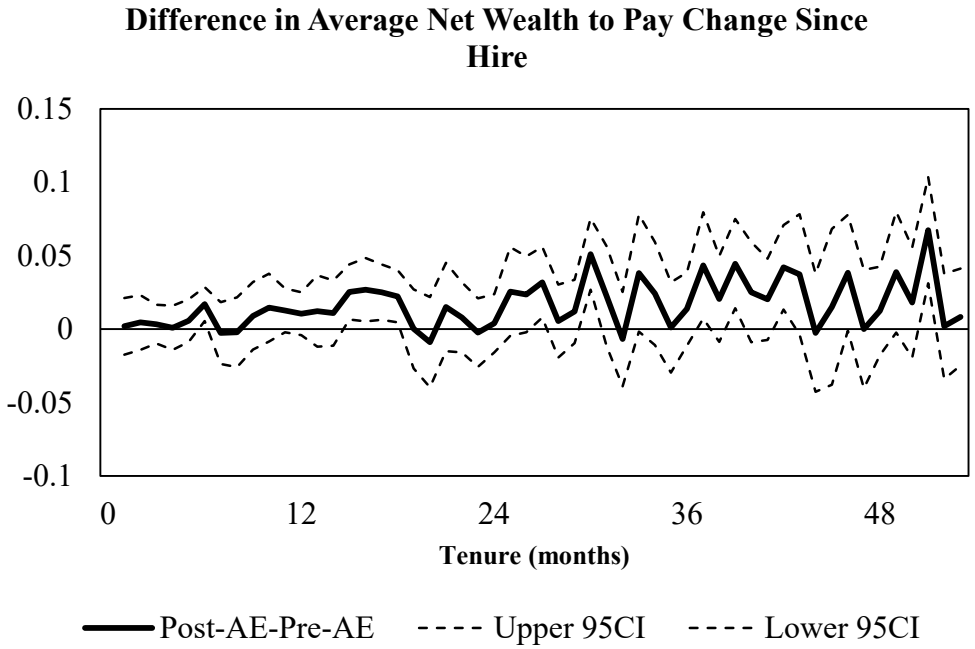


Figure 3. Net wealth change since hire, averages. Net wealth change is calculated as cumulative TSP contributions minus change in debt excluding mortgages, student loans, and auto loans.

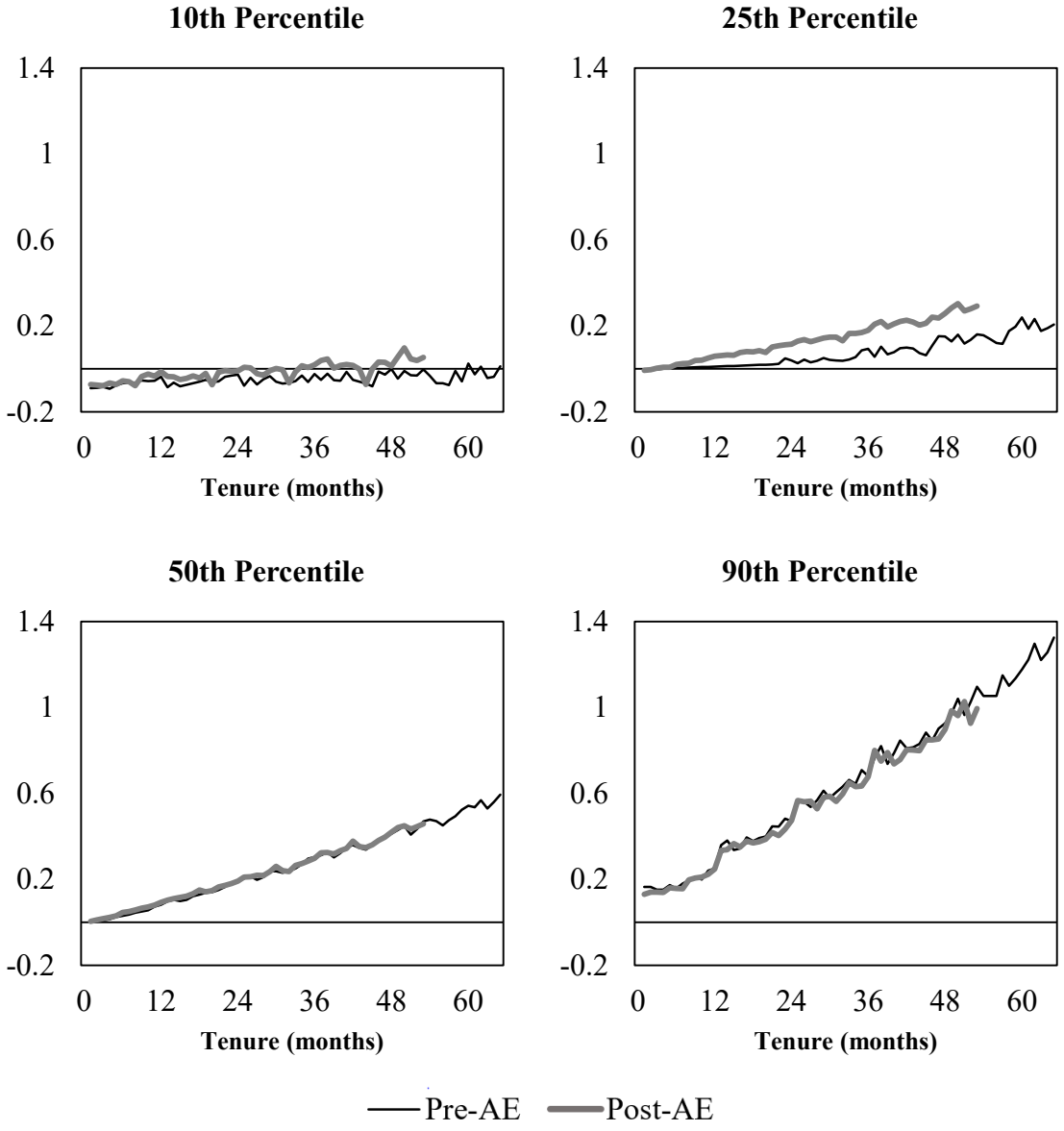


Figure 4. Net wealth change to annualized first-year pay ratio changes at 10th, 25th, 50th, and 90th percentiles. Net wealth change is calculated as cumulative TSP contributions minus change in debt excluding mortgages, student loans, and auto loans.

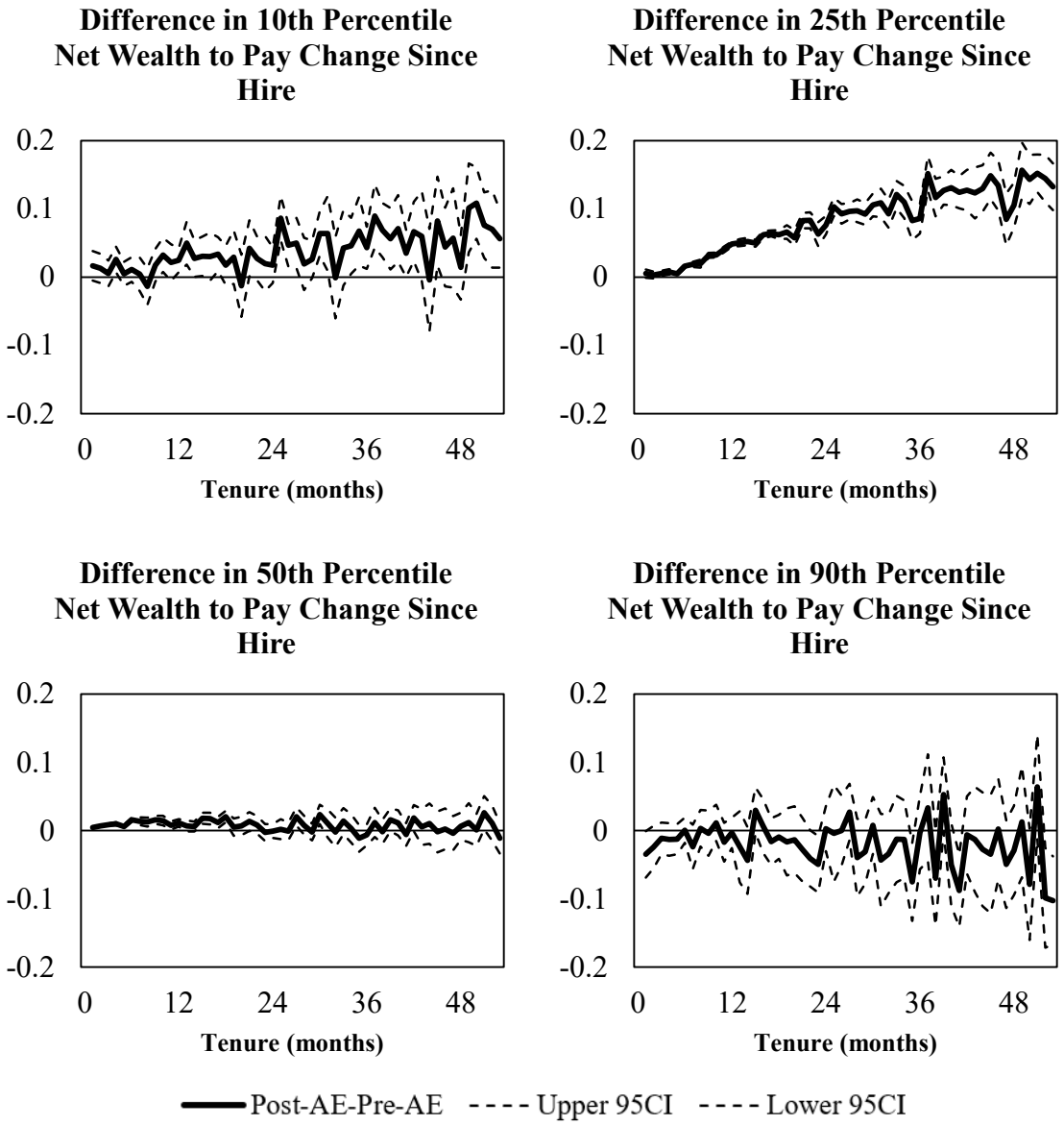


Figure 5. Treatment effect of automatic enrollment on 10th, 25th, 50th, and 90th percentile net wealth change. Net wealth change is calculated as cumulative TSP contributions minus change in debt excluding mortgages, student loans, and auto loans.

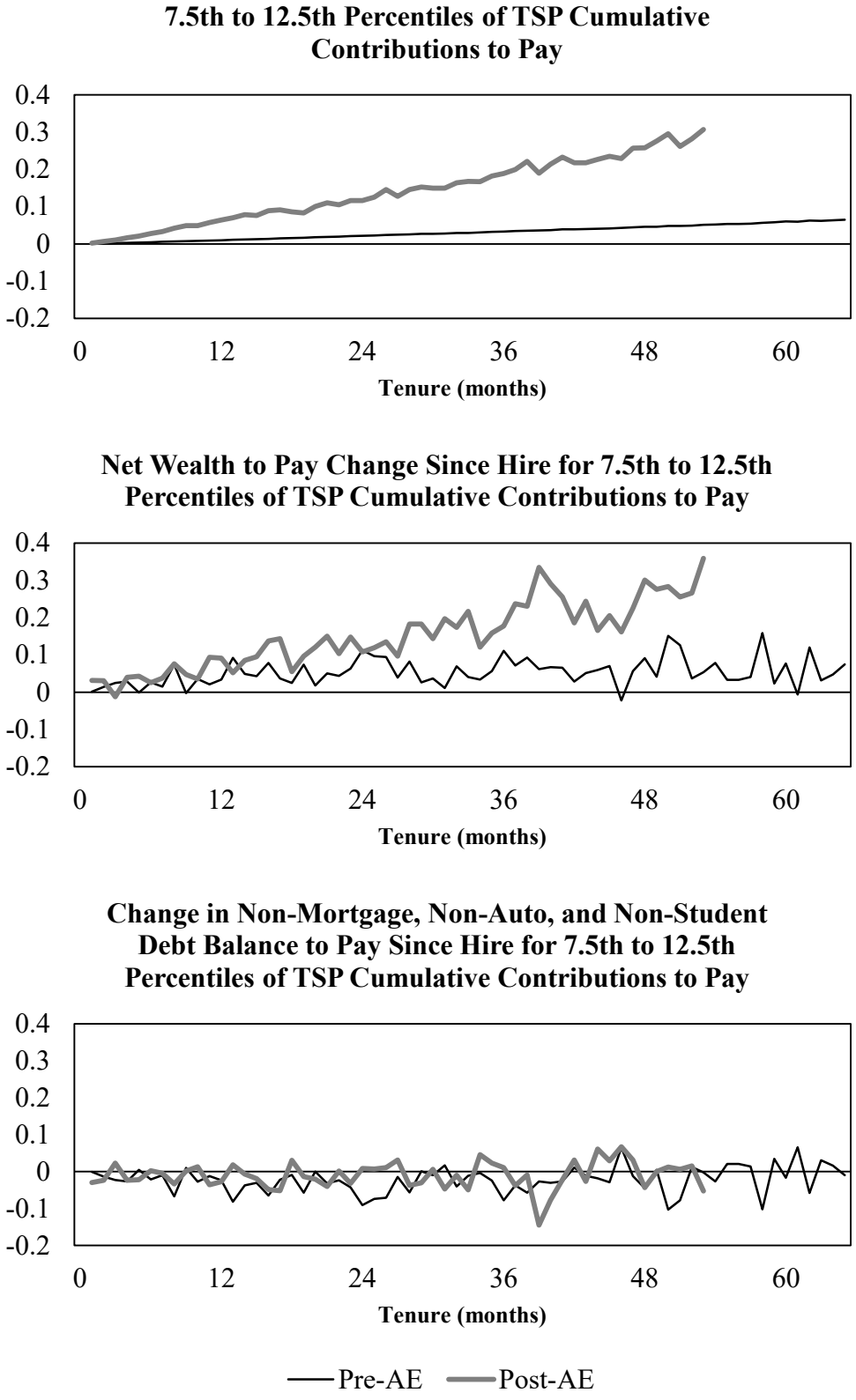


Figure 6. Treatment effect of automatic enrollment for 7.5th to 12.5th percentiles of TSP cumulative contributions to first year annualized pay

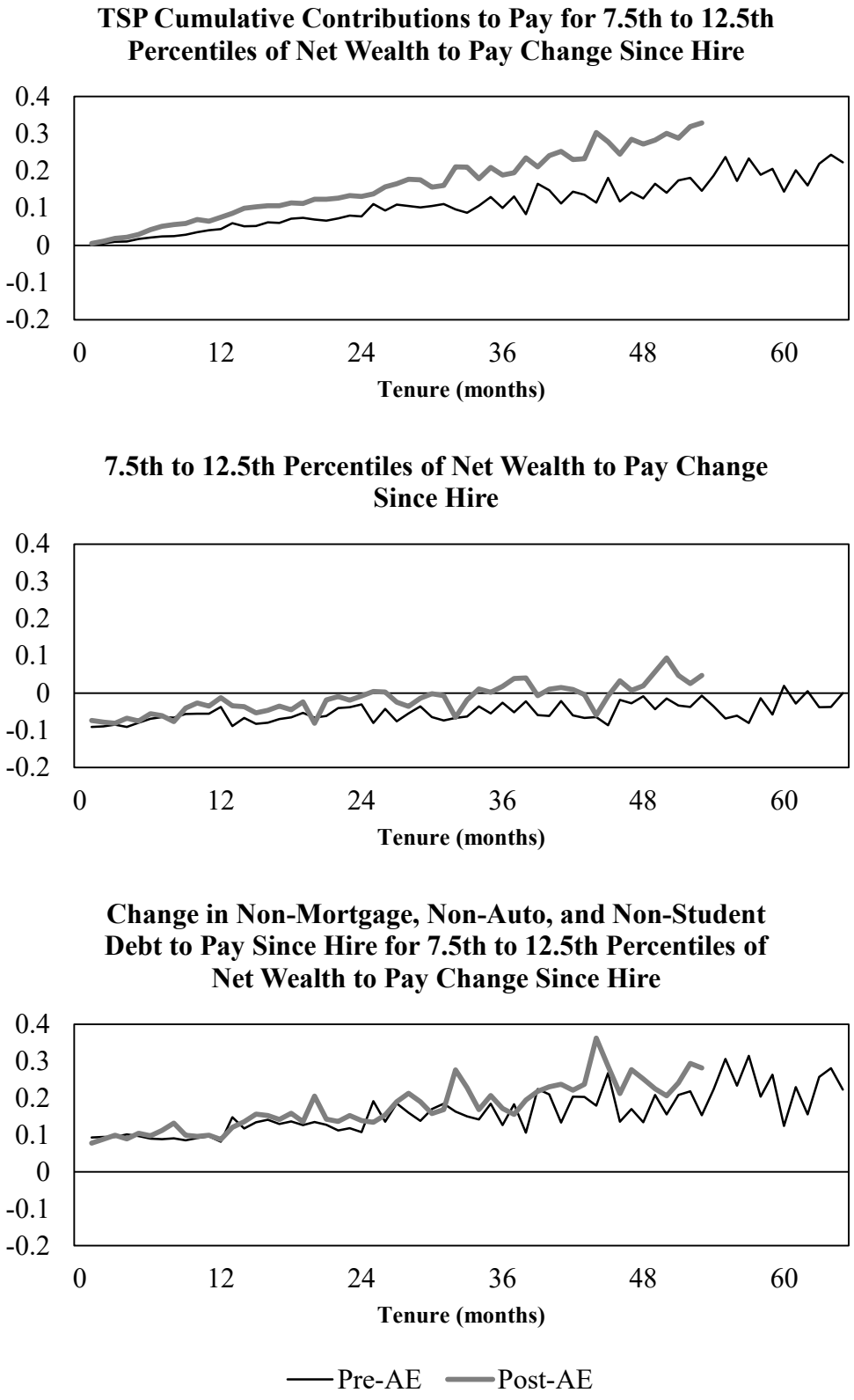
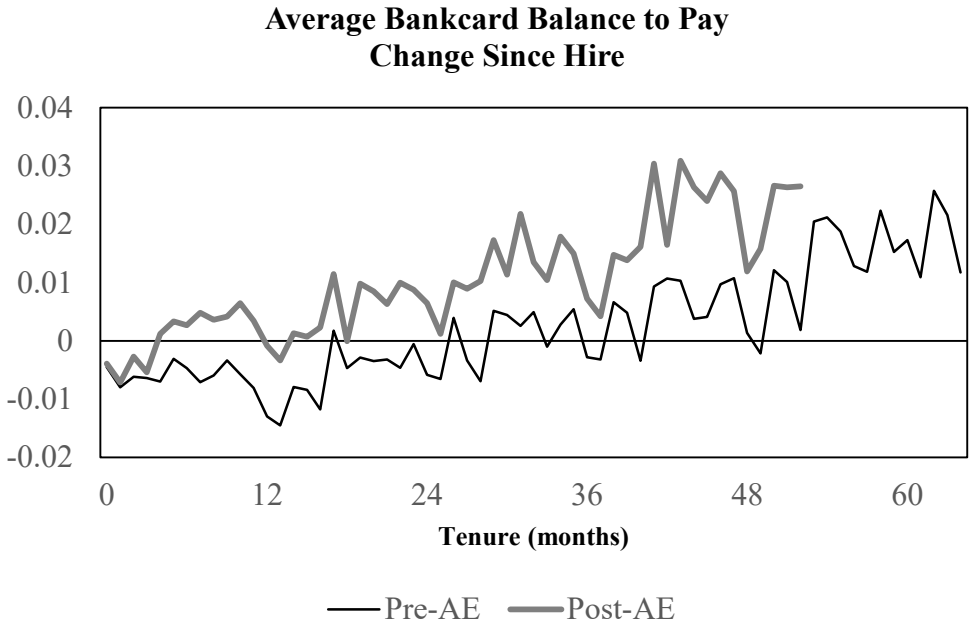


Figure 7. Treatment effect of automatic enrollment for 7.5th to 12.5th percentiles of net wealth to pay change since hire



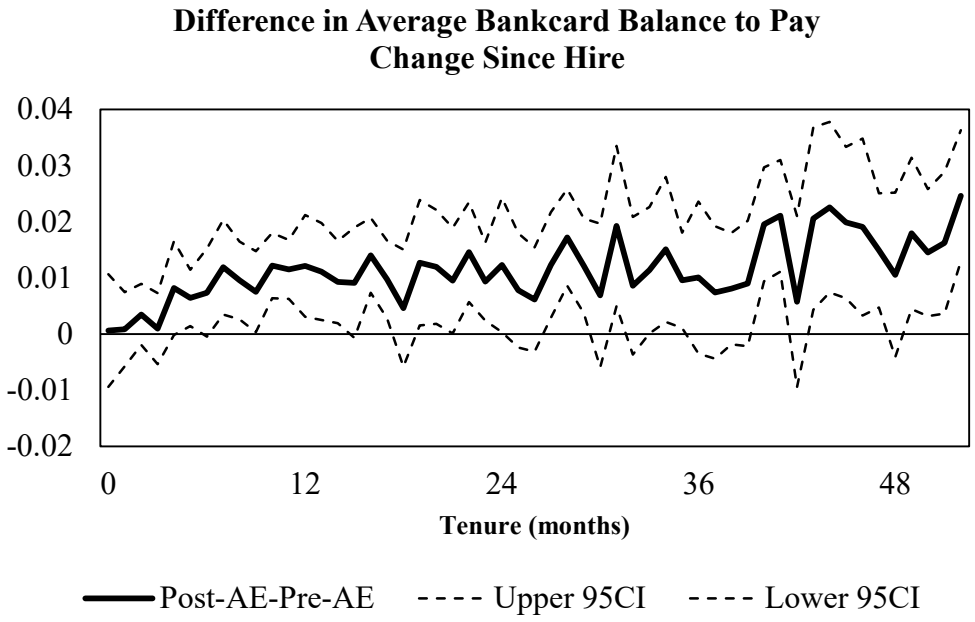


Figure 8. Changes in bankcard balances to annualized first-year pay ratio since hire, averages

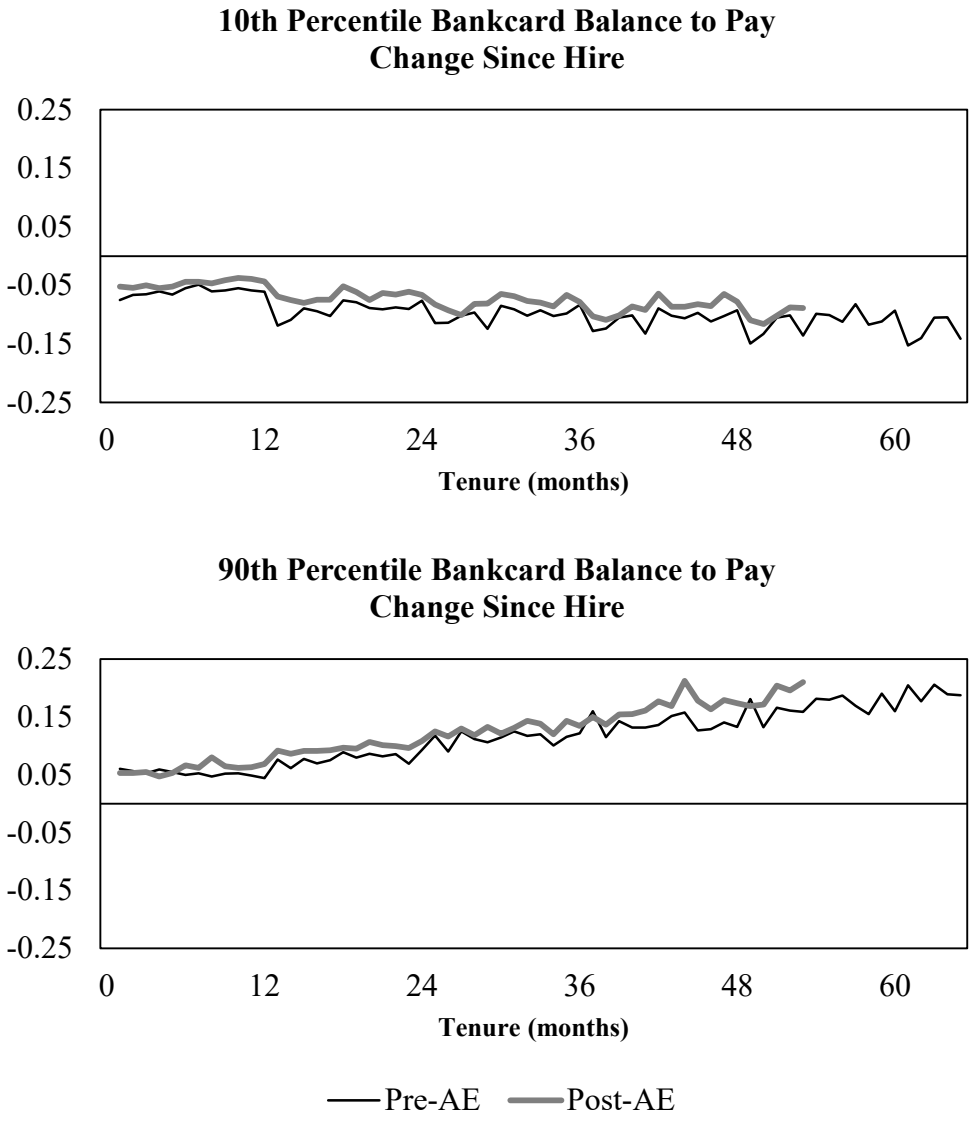


Figure 9. Changes in bankcard balances to annualized first-year pay ratio since hire at 10th, 50th, and 90th percentiles

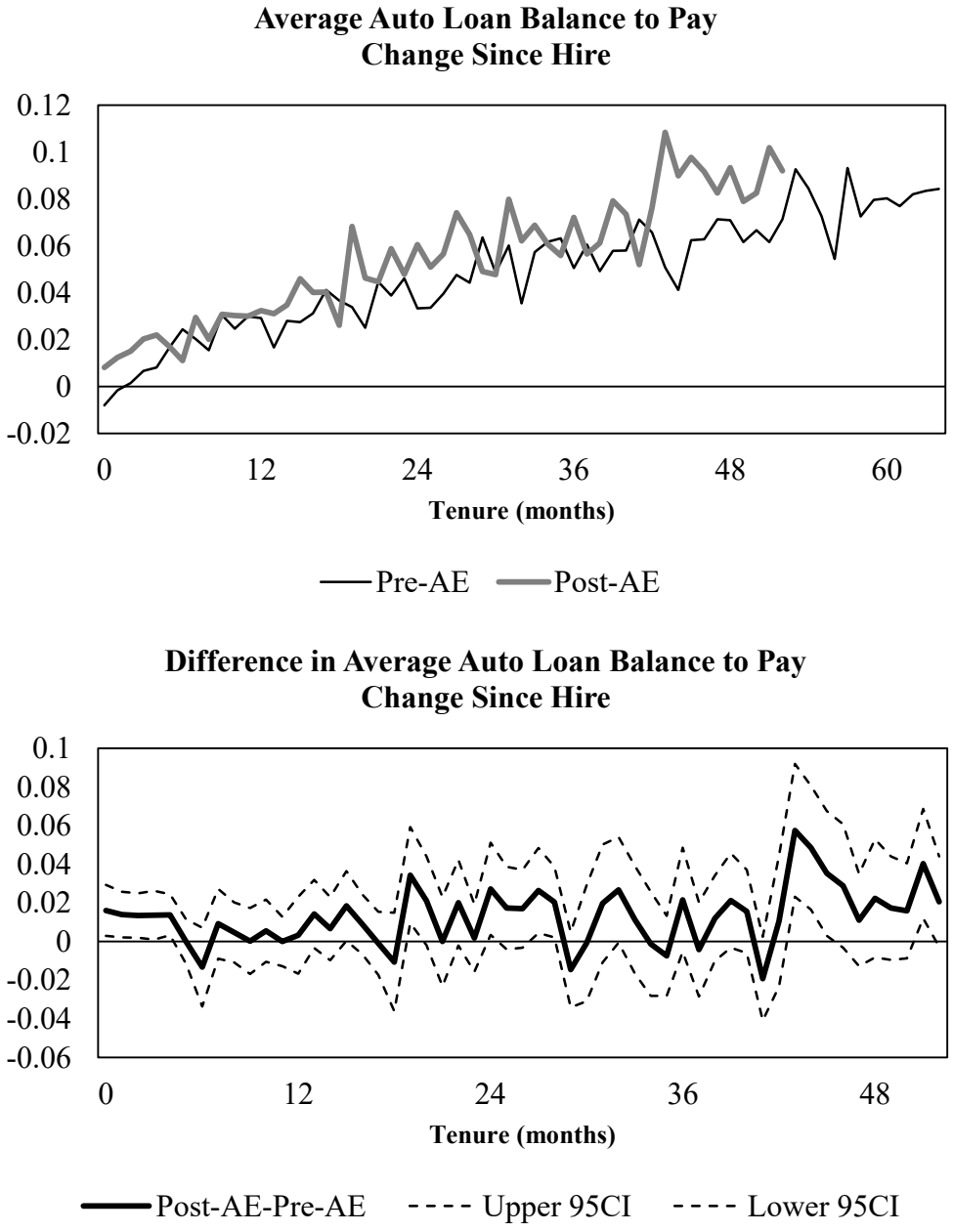


Figure 10. Changes in auto loan balances to annualized first-year pay ratio since hire, averages

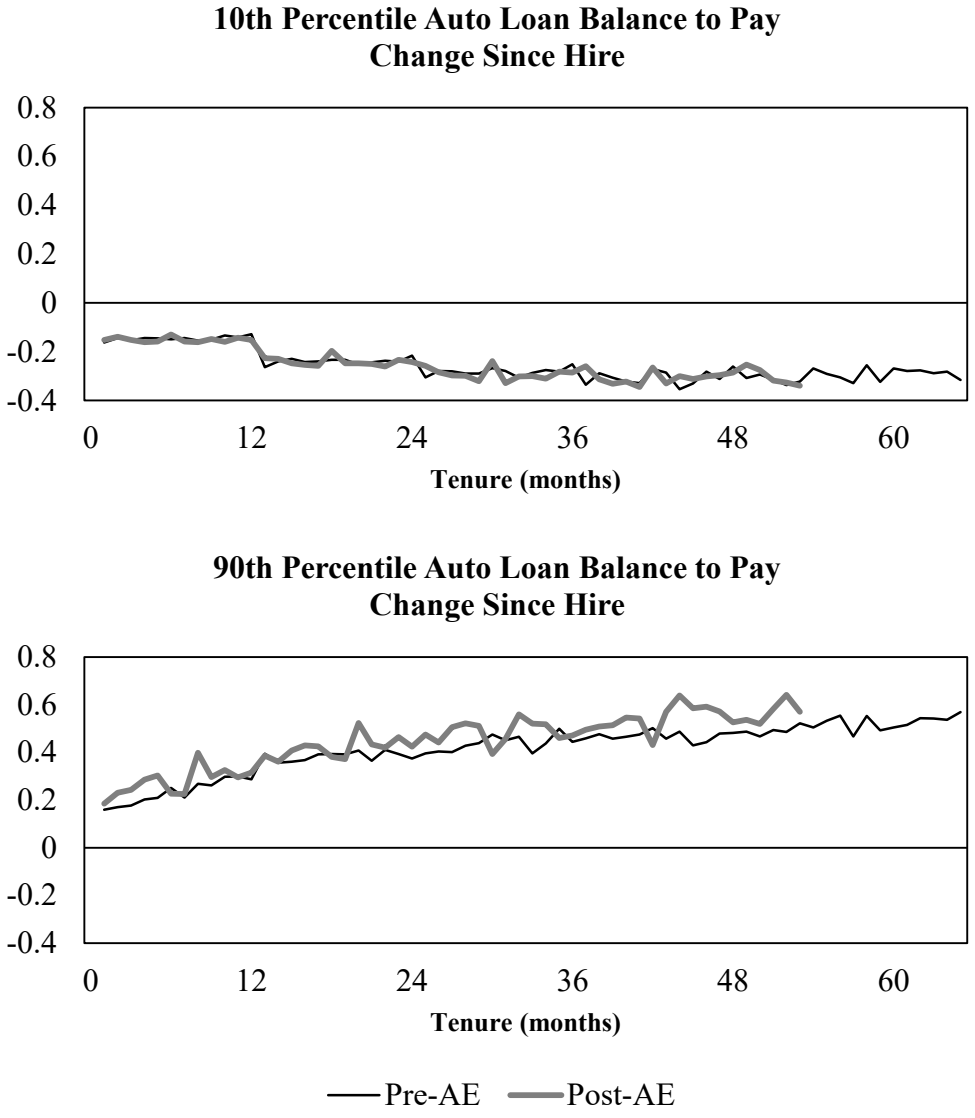


Figure 11. Changes in auto loan balances to annualized first-year pay ratio since hire at 10th and 90th percentiles

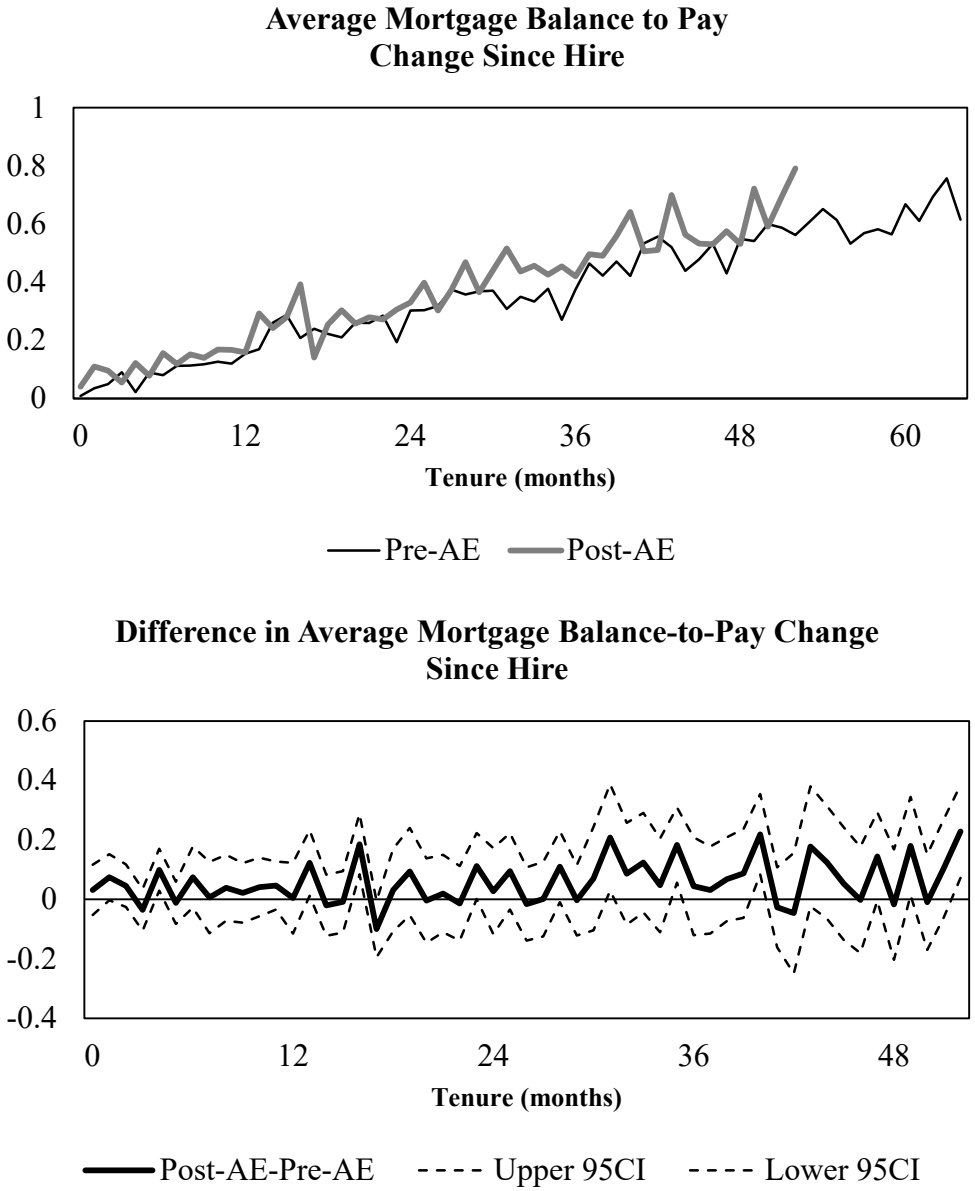


Figure 12. Changes in mortgage balances to annualized first-year pay ratio since hire, averages

Figure 13. Changes in mortgage balances to annualized first-year pay ratio since hire at 10th and 90th percentiles

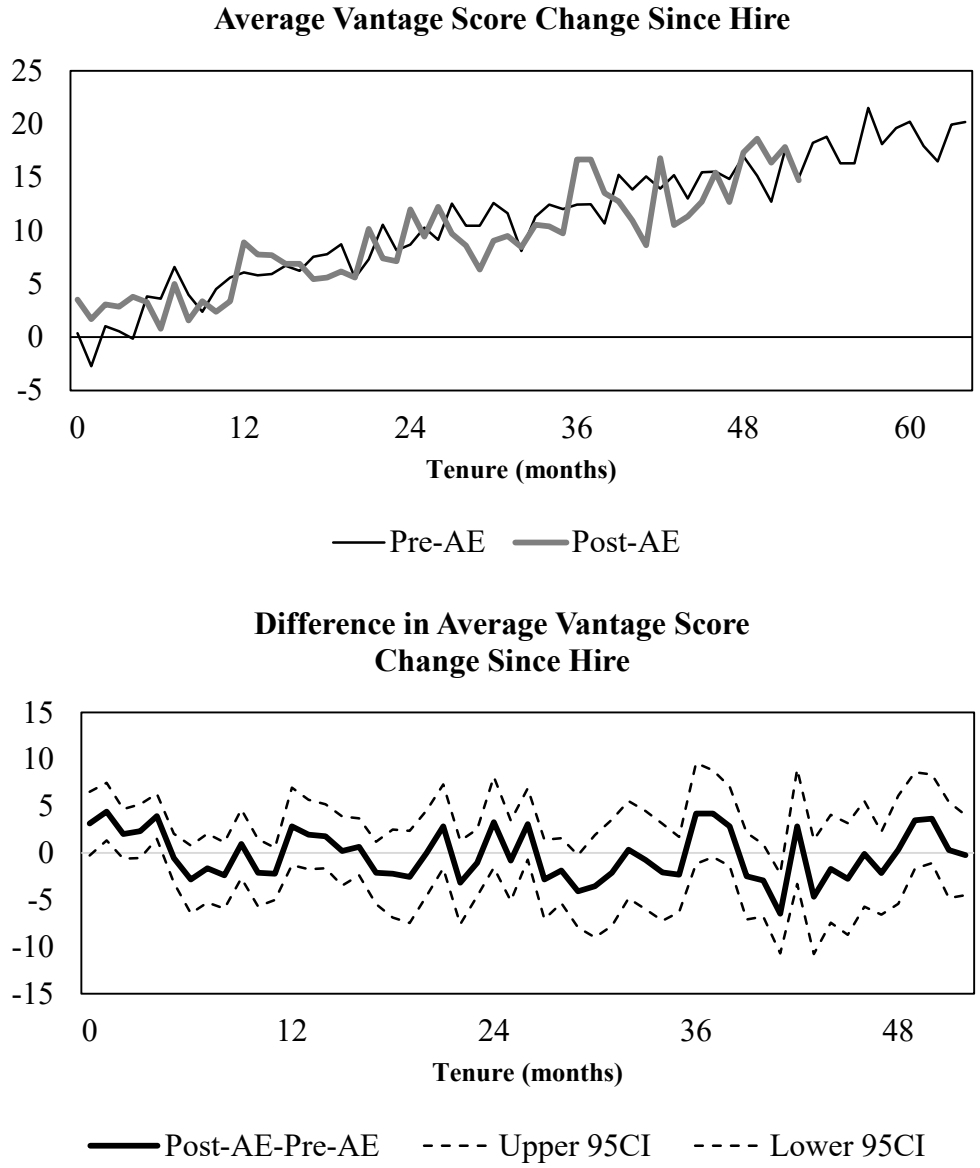


Figure 14. Changes in Vantage scores since hire, averages

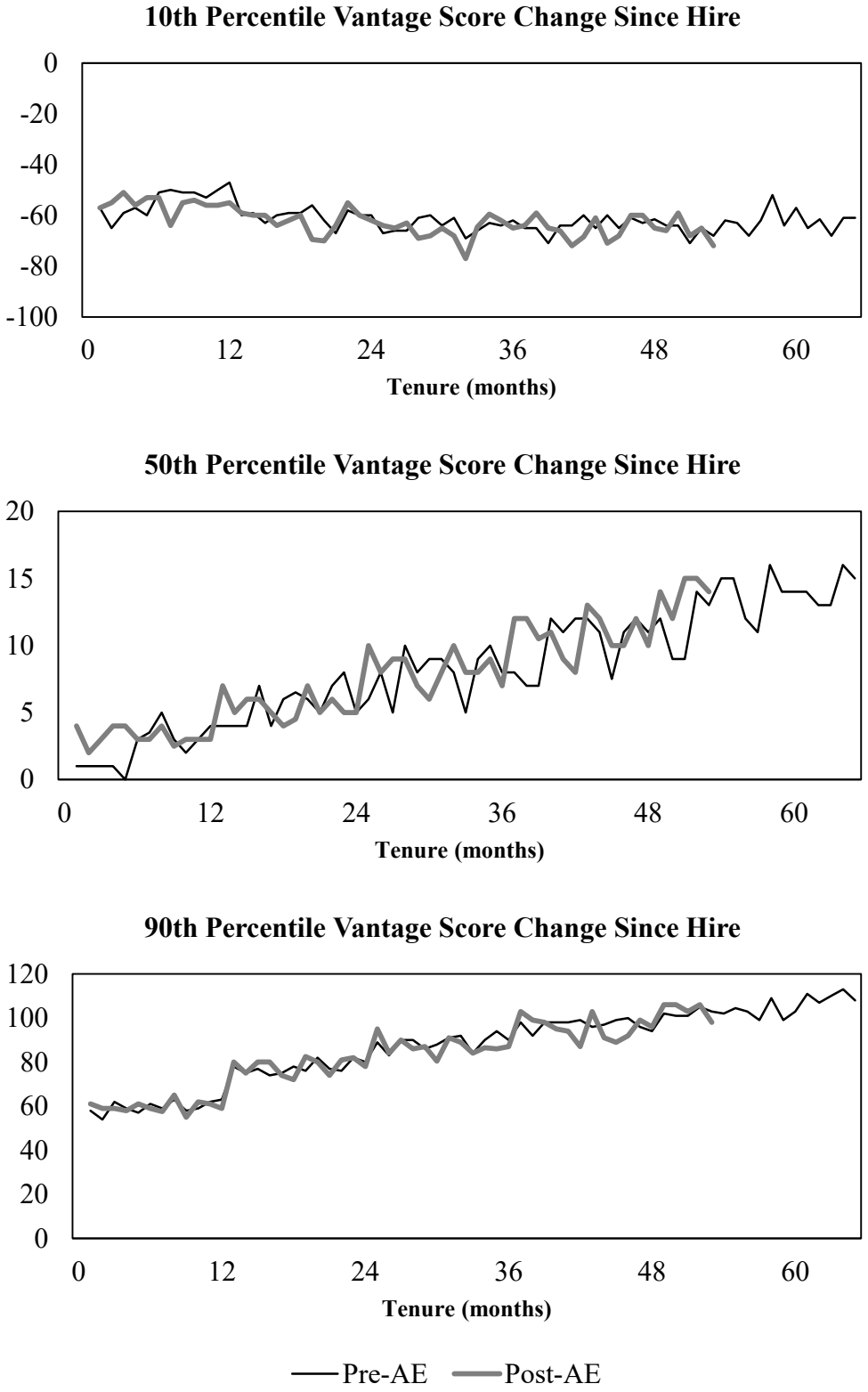


Figure 15. Changes in Vantage scores since hire at 10th, 50th, and 90th percentiles