Stock Market Wealth and Worker Output*

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Abstract

This paper uses individual-level data linking stock investments to work performance to examine how changes in stock market wealth affect worker output. Exploiting large return variations over time and across investors, we document a 10% increase in monthly stock investment returns is associated with a decrease of 3.9% in the same investor's next-month work output. The negative output response is not driven by concurrent economic conditions, pronounced when focusing on more idiosyncratic stock investment returns, and moreover is unexplained by investor-specific liquidity needs. Consistent with the wealth-effect interpretation, the effect is stronger for higher-income workers. In the negative-return domain, interestingly, a decline in stock investment returns is followed by lower output, especially for male, younger, less educated, and lower-income workers. Overall, our results highlight a novel channel of transmitting stock market fluctuation to the real economy through labor supply.

Keywords: Stock Investment Return, Stock Market Wealth, Consumption, Worker Output, Work Performance, Labor Supply, Wealth Effect, Household Finance

JEL Classification: D14, G12, G51, J22, J31

1. Introduction

Stock holdings constitute a considerable portion of a household's financial assets. For example, in the last quarter of 2019, direct and indirect stock holdings of US households account for 36% of their household financial assets. Moreover, households are the largest holders of US equities, with their total holdings of $34.2 trillion comprising over 90% of the market capitalization of the US stock market (*The Federal Reserve*, 2020). These facts have two implications. First, fluctuations in the stock market have a significant impact on household wealth accumulation (Poterba, 2000). Second, the household sector serves an important transmission channel from the stock market to the real economy, whereby changes in stock market wealth either directly affect aggregate tax revenues or indirectly reshape households' real decision-making. Di Maggio, Kermani, and Majles (2019) document a significant marginal propensity to consume out of changes in household stock market wealth. Given the importance, asset prices have been frequently discussed as a consideration factor in setting monetary policies (Greenspan, 1999).

In this paper, we focus on the individual labor supply response to changes in stock market wealth. Household consumption consists of both market goods and leisure. A natural prediction of traditional theories suggests an increase in demand for leisure after stock market wealth appreciation. Incorporating the leisure response not only offers a more comprehensive understanding of the consumption impact of changes in stock market wealth, but also carries first-order implications for the labor market. After positive stock investment returns, households enjoy more leisure by choosing to supply less labor. Through this household response, variation in the stock market prices shares a tight link with labor market conditions, including labor supply and output.

Furthermore, the labor market effects of stock market movements are more nuanced than what could be extrapolated from the findings on the spending response. The effect of high-frequency changes in the stock market wealth on households' labor decisions, which tend to adjust at a lower frequency, remains unclear. In addition, numerous studies document particularly strong spending response after wealth shocks for lower-income or more financially constrained consumers, whereas the impact is more muted for wealthier and more resourceful consumers (see review by Jappelli and Pistaferri, 2010). On the other hand, to the extent that leisure is a normal good, we expect the effect on leisure consumption—hence, labor supply—to be concentrated

among higher-income workers, leading to a different distributional impact of changes in stock market wealth on the labor market. Last but not the least, prior literature in finance finds a significant psychological effect of stock market fluctuations, especially associated with negative stock market returns. Rather than supplying more labor to earn more income after stock market investment losses, as predicted by traditional theory, frustration and stress can weigh in adversely on work behavior and output, which reinforces the negative real impact associated with declining asset prices (e.g., lower consumption and firm investment).

Empirical studies of the labor response to stock market fluctuations face severe challenges. Stock market wealth and labor market choices are both affected by a variety of macroeconomic conditions and (unobserved) heterogeneity in individual characteristics. A strong economy bodes well for the stock market performance as well as household wealth (e.g., housing), the latter of which independently affects labor market choices. Alternatively, individuals with greater wealth endowments likely have higher exposure to stock market movements and simultaneously make different labor supply decisions. These confounding factors make it difficult to infer a causal effect from the association between the aggregate stock market and labor market outcomes. Valid identification requires granular data that allow us to track within-individual variation in the stock market wealth together with labor supply behavior so that we can reasonably attribute the labor supply response to the same individual's recent stock market wealth fluctuation. Given the volatile stock market with constant price movements, analysis at high frequency strengthens causal identification but at the same time raises the hurdle for an accurate measurement of labor supply. At the extensive margin, lumpy labor market decisions (e.g., participation) may not be the primary margin of adjustment in response to high-frequency stock market fluctuations. At the intensive margin, measurement of the effective amount of labor supply is difficult; earnings as a proxy do not change frequently enough for many occupations given the typical compensation contract in practice.

We provide a direct empirical examination of the impact of changes in stock market wealth on labor market choices by exploiting a novel micro-level dataset that links information on individuals' work performance and their direct stock market investments and wealth at the monthly frequency. We obtain the monthly income of the universe of all insurance sales agents (over 17,000) in a major city branch of a leading Chinese life insurance company during 2013–2016. Specifically, we focus on the sales-commission income in the analysis because insurance

sales use a piece-rate compensation contract, and agents are paid a fixed rate for each insurance contract they sell. As a result, sales commission, which varies month by month, directly tracks concurrent work output and labor supply. This unique advantage of our data is crucial for empirical identification of the labor-supply response to the high-frequency changes in stock market wealth. Besides the income variables, we also observe a wide range of demographics and work-related characteristics, including age, gender, education, tenure, and job title.

We then link each sales agent in our sample to their entire stock investment activities for stocks listed on the Shenzhen Stock Exchange during the four-year period. Shenzhen stock exchange (SZSE, hereafter) is one of the two major stock exchanges in China (and the 8th largest in the world), with a total market capitalization of 17 trillion RMB by the end of 2018. Retail (or individual) investors play a significant role in SZSE—individual investors own 276 million accounts in SZSE, and they hold 6% of the total tradable amount and account for 25% of the total dollar volume traded on the exchange (*SZSE Fact Book*, 2018). We identify 18% of the insurance sales agents in the raw data who have brokerage accounts *and* made direct investments in SZSE stocks during 2013–2016 (in comparison, 18% of China's urban population held stock accounts in 2018). For each investor, we obtain information at the security-month level, whereby we observe the month-end value of each stock held, as well as the dollar value and shares bought and sold for each stock in each month. Collectively, the final linked dataset allows us to track the individual-specific stock market wealth and the same individual's labor output at the monthly frequency. Importantly, stock investment returns demonstrate large variations in our sample not only over time but also across individuals within the same month, which increases the power of the empirical analysis and helps address concerns regarding concurrent macroeconomic factors.

Using the investor sample, we start the analysis by showing that a 1% increase in the monthly stock investment returns is associated with a 0.39% decrease in the insurance sales commission in the subsequent month, after controlling for individual and year-month fixed effects. On the other hand, we do not detect any significant change in the worker's propensity to get promoted (demoted) or exit. We also find no change in the quality of the products sold—stock investment returns in the last month do not predict the withdrawal of insurance policy contracts by customers. The effect is not persistent—the sales-commission income is primarily responsive to the last-month stock investment returns—likely due to the high-frequency, repeated nature of the wealth shocks. We infer the total insurance premium sold by the sales agents to derive a more

direct measure of work output and find a similar result both qualitatively and quantitatively.

To verify that our result reflects the work-performance response, we take advantage of the data richness and conduct a falsification test by using the income component unindicative of the current performance as the dependent variable. Specifically, we study sales agents' installment-commission income, which derives from insurance policies sold in previous years, and find it is unresponsive to the last-month stock investment returns. In sum, these results suggest changes in stock market wealth have a significant negative impact on the sales agents' subsequent work output.

A natural alternative interpretation of the main results stems from the concurrent macro and local economic conditions that affect both investment returns and labor output. In addition to the previously described omitted-variable issues, a booming local economy may also influence the number of insurance policy sales due to better labor market opportunities elsewhere (i.e., agents rely less on insurance sales as their source of income). Positive stock investment returns may also shift demand to direct stock market investments and away from insurance products (that also offer savings). In these cases, fewer insurance policy sales need not suggest a decrease in labor supply.

The identification concern rests on the premise that the confounding factors share a common trend with the stock market movement. However, stock investment returns exhibit large variations across investors within the same month in our sample. All sales agents in our sample work in the same city and, at a given point in time, face very similar housing market and labor market conditions as well as insurance demand, yet we observe large differences in their stock investment returns in the same month. The cross-sectional standard deviation of monthly stock investment returns is, on average, RMB 21,600 in dollar terms (or 26% when scaled by the stock market wealth); the magnitude is close to 50% of the average stock market holdings among investors in our sample. Put differently, holding macro and local economic conditions constant, investors who happen to have higher stock investment returns earn a lower next-month sales commission than those investors with lower stock investment returns in the same month.

We further address the identification concerns in several ways. For each investor in our sample, we randomly assign their stock investment returns in each month to either a non-investor worker or another worker within the investor group. If stock investment returns, on average, correlate with concurrent local economic conditions, we expect to find a similar negative

association between sales commission and the randomly assigned stock investment returns. On the contrary, the empirical relationship is close to zero. In addition, we extract variation in the individual stock investment returns that is plausibly idiosyncratic. First, we restrict our analysis to the stock investment returns driven by non-local stocks, which are unlikely to be highly correlated with local economic conditions and find an equally strong response. Second, among investors with low investment skills, whose stock investment returns are more likely to be idiosyncratic, we continue to find a strong negative response of sales commission to stock investment returns. These results provide strong evidence that our results are unlikely to be driven by common factors, and that the documented work-output change captures a labor-supply response.

Another potential endogeneity concern relates to individual-specific circumstances that influence their decisions to access stock market wealth and supply labor. For example, liquidity needs derived from life shocks may prompt individuals to withdraw their stock market wealth and reduce labor supply at the same time. In addition, investors are potentially more likely to use stock market wealth to meet their liquidity needs when they are making money from the stock market. However, we find the magnitude and statistical significance of the output response to total stock investment returns remain unchanged after controlling for realized gains. Moreover, after excluding months with higher liquidity needs, the output response remains significant. The collective evidence thus lends credence to a causal interpretation of the impact of stock investment returns on labor supply.

While our analyses study workers in a single industry, we note that the insurance industry in China generated 3.8 trillion RMB in insurance premiums and hires 8 million insurance sales agents in 2018 (*China Insurance Regulatory Commission*, 2019; *Chyxx.com*, 2019). The insurance company in our sample is one of the largest players, accounting for 20% of the industry's collected premium and 25% of employed sales agents. Furthermore, to investigate external validity of our findings, we verify that the effect of stock investment returns is not driven by part-time workers who are less likely to rely on insurance sales as their major source of income, nor is it specific to workers with high income volatility, who might be particularly sensitive to stock market wealth fluctuations.

A leading economic channel for our findings is the wealth effect, whereby workers increase their leisure consumption and reduce labor supply after positive shocks to their stock market

wealth (Imbens, Rubin, and Sacerdote, 2001; Cesarini, Lindqvist, Notowidigdo, and Östling, 2017). In particular, the wealth effect predicts a stronger labor-supply response among higher-income workers whose leisure consumption is more sensitive to wealth shocks. Indeed, the sales-commission response to stock investment returns is significantly larger for the higher-income sales agents in our sample. On the other hand, the alternative distraction channel, whereby workers choose to spend more time on the stock market and less time working after positive stock investment returns, implies an opposite effect given the lower opportunity cost of time among lower-income workers. Additional analyses further mitigate the distraction interpretation. First, we find no evidence that the pure act of investing in the stock market distracts investors away from work. More importantly, the sales-commission response to stock investment returns does not differ across investors with varied inclinations to become distracted, or by the volatility level of the stock market that attract different levels of attention.

We also uncover new patterns of asymmetric labor-supply responses to stock investment gains and losses. Motivated by the existing literature that documents a significant psychological impact of stock market decline, we divide the stock investment returns into positive- and negative-return domains and study the sales-commission response in the two return domains separately. Interestingly, the negative relationship between sales commission and stock investment returns, as predicted by the wealth effect, concentrates in the positive return domain. In the negative return domain, the association becomes positive—a decline in stock investment returns is followed by a lower subsequent output, suggesting an additional noteworthy factor underpinning labor supply responses to stock market wealth. The asymmetric effect is particularly prominent and statistically significant for male, younger, less educated, and lower-income workers.

This paper directly contributes to the literature on the real economic impact of the stock market through the household response. Poterba (2000) and Di Maggio, Kermani, and Majlesi (2019) show the gains from stock market wealth can translate into higher household consumption, thereby providing an important input for monetary policymaking. Meyer, Pagel, and Previtero (2019) find individuals increase consumption in response to the realized capital gains from mutual fund closures. Choi, Lou, and Mukherjee (2019) document an interesting finding that superstar firms in the stock market influence college-major choices. We offer the first empirical analysis of the labor supply response to changes in stock market wealth that exploits high-frequency and rich variation in individual stock investment returns and a direct

measure of their work output. The effect is economically significant: a 10% increase in stock investment returns is associated with a 3.9% decrease in workers' output in the following month. The finding complements the existing literature by showing a novel and first-order channel of transmitting stock market fluctuations to the real economy through labor supply.

Many studies also find a strong effect of stock market performance on individual preferences or psychological well-being. Stock market losses appear to significantly negatively affect individuals' mental health (Engelberg and Parsons, 2014; Schwandt, 2018). Lin and Pursiainen (2019) show state-level domestic-violence consequences of declining local stock prices. Chang, Huang, and Wang (2019) find an increase in stock market volatility increases loan officers' risk aversion. Our results suggest the psychological impact of stock market losses extends to major economic outcomes through a reduction in labor supply especially during pessimistic market conditions, which potentially amplifies the negative aggregate consequences in those times.

We also relate to the vast literature on the effect of income and wealth shocks on household decisions, especially consumption decisions. Various studies have documented individuals' consumption responses to income shocks.[1] To the extent that household consumption consists of both market goods and leisure, our findings complement the consumption-response findings by studying the leisure-consumption (and labor-supply) response to stock investment returns. In addition, our paper adds to the large literature on the wealth effect on labor supply (e.g., Imbens, Rubin, and Sacerdote, 2001; Autor, Duggan, Greenberg, and Lyle, 2016; Cesarini, et al., 2017; Gelber, Moore, and Strand, 2017; Li, Li, Lu, and Xie, 2020, Gu, He, and Qian, 2020). Compared to the studies, our findings demonstrate how labor supply responds to high-frequency and repeated wealth shocks by exploiting monthly variation in the individual's stock investment returns. Furthermore, the stock market setting allows us to examine the labor-supply response to both positive and negative wealth shocks and our analysis reveals new patterns of asymmetric labor-supply responses to wealth gains and losses.

The rest of the paper proceeds as follows: Section 2 introduces the institutional background of the insurance sales agents and stock market in China. Section 3 describes the data and methodology. The main results are presented in Sections 4. Section 5 discusses the possible

[1] See, for example, Shapiro and Slemrod (1995, 2003), Souleles (1999), Hsieh (2003), Stephens (2003, 2006. 2008), Johnson, Parker and Souleles (2006), Agarwal, Liu and Souleles (2007), Parker et al. (2013), Gelman et al. (2014), Agarwal and Qian (2014, 2017), Di Maggio et al., (2017), Olafsson and Pagel (2018), and Agarwal, Qian, and Zou (2020). For a complete review of the literature, please refer to Browning and Collado (2001) and Jappelli and Pistaferri (2010).

economic mechanisms, and Section 6 explores the heterogeneity and additional robustness. Section 7 concludes.

2. Institutional Background

2.1.Insurance sales agents in China

The insurance industry is large and growing fast in China. In 2018, the industry had collected around 3.8 trillion RMB (US$567 billion) in insurance premiums; the magnitude is equivalent to 4% of the national GDP. Around 58% of the premiums are generated by the five leading insurance companies (*China Insurance Regulatory Commission*, 2019). Revenues from selling insurance products depend highly on the effort of sales agents. By 2018, the Chinese insurance industry had employed over 8 million sales agents (*Chyxx.com*, 2019).

The Chinese insurance companies sign agency contracts with the sales agents; hence, they are not guaranteed a minimum wage (as stipulated by the government). In other words, the insurance sales agents have zero base salary and earn income based on their work performance. A sales agent has three major income sources. The largest is the sales commission. Because insurance sales use a piece-rate compensation contract, the sales commission is a fixed fraction of each insurance contract sold. Therefore, the sales-commission income varies month by month and directly tracks the sales agent's work output and labor supply. The second source of income is the installment commission of long-term insurance policies sold in previous years. Because the policies were sold years ago, this source of income is *not* relevant to the current-month worker performance. Various bonuses constitute the third source. Bonuses are granted, based on a non-linear formula, to reward lagged performance of either the individual or the entire team, making them a much less informative measure of a worker's current performance.

The sales agents in Chinese insurance firms operate in teams, with team managers and those with higher ranks performing management and administrative duties for the firm. The insurance firm in our sample has 12 job levels in total for sales agents, five job levels below team managers, and another seven job levels for managers and above. At the beginning of each quarter, the firm reassesses agents' last-quarter performance including insurance sales and new agent referrals, based on a pre-determined job-rating algorithm, and makes promotion and demotion decisions. Excellent performance in the last quarter will promote a worker to a higher job level, whereas failing to meet the requirements for the current job level leads to a demotion; workers in between remain at their existing job level. The average workweek for insurance industry

employees in China is 42 hours (*National Population Survey*, 2005).

2.2.Stock market in China

China has two stock exchanges: the Shanghai Stock Exchange and Shenzhen Stock Exchange (SZSE), both founded in December 1990. Stocks that are listed on the two exchanges and are tradable for Chinese investors are called A-share stocks. By the end of 2016, 1,222 A-share stocks were listed on the Shanghai Stock Exchange, and 1,902 A-share stocks were listed on SZSE. Moreover, households play a significant role in the Chinese stock market. In 2018, 18% of China's urban population have stock accounts (*China Securities Depository and Clearing; National Bureau of Statistics of China, 2019*) and the direct and indirect stock holdings of Chinese urban households represent around 10 percent of their financial assets in 2019, equivalent to an average of 64,000 RMB per household (*People's Bank of China, 2020*). Moreover, individual investors in 2018 directly hold nearly 20% of the market capitalization in the Shanghai Stock Exchange and 6% of the market capitalization in Shenzhen Stock Exchange, amounting to $5.5 trillion RMB in total (*SZSE Fact Book*, 2018; *Shanghai Stock Exchange Statistics Annual*, 2019).

The stock investment information for our study is provided by SZSE, which is the eighth largest stock exchange in the world, with a total market capitalization of around 17 trillion RMB by 2018. Although SZSE has a smaller total market capitalization than the Shanghai Stock Exchange, it enjoys a higher participation of individual investors (by contract, the Shanghai Stock Exchange attracts more institutional investors). Individual investors own 276 million stock accounts at SZSE by the end of 2018 (*SZSE Fact Book*, 2018). In addition, they held 6% of the total tradable amount, and traded around 25% of total dollar turnover in the stock exchange.

3. Data and Methodology

We employ two datasets to construct our main sample: a large panel dataset of monthly performance for sales agents from a leading Chinese insurance company and the stock investment information from SZSE. We obtain supplemental stock characteristics and aggregate market return information from China Stock Market & Accounting Research Database (CSMAR). Detailed descriptions of the key variables' definitions are included in the Appendix.

3.1.Raw data

3.1.1. Worker-performance data

We use a unique dataset of worker performance from a large branch of a leading life insurance firm in China. As one of the largest insurance companies in China, this firm employs 25% of the industry's sales agents and earns 20% of the total industry's collected premiums as of 2012. The company operates branches across China, and our sample covers all sales agents during 2013–2016 from the firm's branch in a large eastern city that has a 7-million resident population and produces about 1% of the country's GDP. During the four-year sample period, sales agents at the branch generated around 153 million RMB in insurance premiums.

This dataset provides the monthly income components for every sales agent from the city branch from January 2013 to December 2016. Specifically, we focus on sales commission, which is the largest source of insurance sales income and direct tracks the current-month sales output. Another income component, the commission from installment payments of long-term insurance policies sold in previous years, does not measure current-month performance and will be used for falsification analysis.[2] In our sample, we observe 17,486 workers at the branch who have earned at least one month of positive sales commission during the four-year sample period.

In addition to the quantitative income measures, we also observe the individual's job level, the insurance contract withdrawal status, and the time the worker exits the firm. This information enables us to assess the effect on the worker's promotion or demotion likelihood as well as the quality of service. The data also contain detailed demographic information, including the gender, age, and years of education received. Team-structure information and contract starting time are also provided.

3.1.2. Stock investment data

We then merge the work performance of the sales agents with the de-identified data of their entire stock investments of stocks listed on SZSE during the four-year period. Among the 17,486 workers, 3,120 have stock investments during the four-year sample period. For each stock ever held by the sales agent, the data provide the buy value, sell value, and total number of shares bought and sold every month, together with the holding value and shares held at the month-end. The insurance firm in our sample is not listed on SZSE, hence the stock investments of sales

[2] The bonus component of income is a non-linear function of current and lagged (agent and team) performance, which introduces measurement error and therefore is not included in our measure of individual worker output. In addition, we have also conducted a robustness test by including the bonus in our measure of worker output and continue to find a significant negative relationship.

agents are unrelated to their employer's stock performance.

The combined dataset offers several key advantages for our study. First, the sales commission, earned from piecemeal contracts based on the amount of insurance sales, allows us to closely track workers' output at a high frequency. Second, we can directly link the workers' output to their monthly stock investment returns, which facilitates the identification of the stock investment return–worker output relationship. In particular, the large variation in stock investment returns, both over time and across investors in the same month, increases the test power to isolate the effect of changes in stock market wealth from unobserved heterogeneity. Third, we can utilize the rich investment information and worker characteristics to further disentangle the economic mechanisms. Last but not least, the high-frequency gains and losses in the stock market provide a great opportunity to investigate the possible asymmetric response to positive and negative wealth shocks from the stock market.

One potential caveat of the data is that we do not directly observe the stock dividend income at the individual level. However, dividend income is unlikely to have a material impact on our estimation for two reasons. First, the dividend yield from SZSE-listed stocks stays low during our sample period, with an average of 0.9% (*Wind*, 2020). Second, dividend distribution is an infrequent event (annually or at an even lower frequency), whereas our identification mainly relies on the monthly variation of capital gains and cross-sectional variation within the same month.

3.2.Sample construction and summary statistics

To construct the analysis sample, we exclude investors with extremely large stock market wealth from the study, who are more likely to have insider information or able to influence the stock price. Specifically, we exclude the 48 investors who have sell value, buy value, or holding value of stocks in any month equal to or over 5 million RMB during our sample period. Our final sample consists of data on worker performance and stock investment returns from the remaining 3,072 investors during 2013–2016. To mitigate the outlier effect, we winsorize the monthly worker performance and stock investment return measures at the 0.5 and 99.5 percentiles.

Panel A of Table 1 presents the demographic characteristics of the 3,072 investors in the final sample. 65% of the investors are female, have an average age of 38 years, and receive an average of 14 years of education. The average sales agent works at the firm for 37 months, and 3% of them carry a job level of team managers and above. Most demographic characteristics for the

other 14,345 sales agents who have not invested in any stocks during the sample period are similar to those of the investors, except that the non-investors have a shorter work tenure (reported in Panel A of Table IA1).

[insert Table 1 about here]

We report the investors' work-performance information in Panel B of Table 1. Investors in our sample earn a total sales commission of 712 RMB per month on average. During the sample period, investors have an average promotion rate of 4.6%, demotion rate of 4.3%, and exit rate of 3.6%. They experience 2.1% likelihood of insurance-policy withdrawal requests from clients. Meanwhile, Panel B of Table IA1 shows that non-investors earn around 100 RMB less in sales commission on average. Additionally, while the promotion and insurance-policy withdrawal rates are similar for the two groups of workers, non-investors have relatively lower demotion rates and higher exit rates.

The stocks held by investors in our final sample are overall representative of the A-share stock population in the Chinese stock market (from both stock exchanges). Investors in the sample have invested in 1,862 out of 1,902 A-share stocks listed in SZSE by the end of 2016, almost covering the entire Shenzhen A-share market. Moreover, as displayed in Figure IA1 in the Internet Appendix, the industry distribution of stocks held by investors in our final sample is very similar to that from all A-share stocks in the Chinese stock market. According to the comparison of stock characteristics in Panel C of Table IA1 in December 2012, the A-share stocks that have ever been held by investors in our sample have similar PE ratios, M/B ratios, and turnover rate to the never-held stocks. The only visible difference is that stocks held by investors in our sample tend to have smaller market capitalization, likely because stocks listed on SZSE generally have smaller market capitalization than stocks listed on the Shanghai Stock Exchange.

We construct the monthly stock investment returns for each investor as the total dollar returns received from trading or holding stocks over the month. Specifically,

$$Stock\ inv.return_t = holding\ value_t - holding\ value_{t-1} + sell\ value_t - buy\ value_t.$$

Returns are denoted as missing for months when investors do not have stock investments. We further decompose the total stock investment returns into realized returns through stock sales, and unrealized returns. As displayed in Panel C of Table 1, investors in the sample hold 2.6 stocks per month on average, with their month-end stock holdings averaging 45,000 RMB. They

lose around 1,700 RMB per month in the stock market, which can be decomposed into a 711 RMB realized gain and a 2,417 RMB unrealized loss. They show a moderate tendency to invest in stocks of firms headquartered in the local city. On average, they are 4.5% likely to hold local stocks during our four-year sample period, and the number of local stocks they hold constitute 2.1% of the total number of all stocks held.

In our empirical analyses, to account for the scale difference across individuals, we divide the individual's stock investment return in each month by their stock market wealth (proxied by the stock holdings at the end of the last month), which can be interpreted as the percentage change in the stock market wealth. Over time, the mean of the scaled stock investment returns of all investors varies considerably, with a peak in early 2015 and two low points in the middle of 2015 and the beginning of 2016. More importantly, we observe a large dispersion in investors' stock investment returns in the cross-section. The standard deviation of the scaled stock investment returns across investors for a given month has a mean (median) of 26% (22%), or equivalently 21,600 RMB (16,700 RMB) in dollar terms, which is 12.5 (9.6) times the magnitude of the mean individual stock investment returns during the sample period. To interpret, investors in our sample have significant differences in their stock investment returns despite sharing the same aggregate stock market performance and common economic conditions, which empowers our empirical analysis to isolate the stock market's wealth effect. We also visualize the time-series and cross-sectional distribution of investors' scaled stock investment returns in Figure IA2 of the Internet Appendix.

3.3.Empirical strategy

Our objective is to investigate the effect of stock investment returns on workers' earned sales commission. To adjust for the scale difference across investors, we divide the sales commission in each month by the agent's baseline commission and use the scaled sales commission as the main dependent variable. The baseline commission is defined as the average monthly sales commission for the individual before the first stock investment return in our sample. To avoid look-ahead bias, we drop the months used to construct the baseline commission for each investor.

Using the investor sample, we examine the effect of the last-month stock investment returns on the current-month sales commission based on the following regression model:

$$\frac{Sales\ commission_{i,t}}{Baseline\ commission_i} = \alpha_i + \gamma_t + \beta \frac{Stock\ inv.\ return_{i,t-1}}{Stock\ mkt\ \ wealth_{i,t-2}} + \mu \frac{Sales\ commission_{i,t-1}}{Baseline\ commission_i} + \epsilon_{i,t} \quad (1)$$

Where $\frac{Sales\ commission_{i,t}}{Baseline\ commission_i}$ measures the scaled sales-commission income for individual *i* in month *t*, and $\frac{Stock\ inv.\ return_{i,t-1}}{Stock\ mkt\ wealth_{i,t-2}}$ measures the scaled stock investment return for the same individual in month *t-1*. To account for the persistence in sales commission, we also include the lagged scaled sales commission in the regression as an additional control variable. α_i represents a vector of individual fixed effects, and γ_t denotes the calendar year-month fixed effect. The two sets of fixed effects will absorb any time-invariant confounding factors at the individual level, or the common time trends. In the subsequent heterogeneity analyses by worker characteristics, we allow for worker group-specific time fixed effects. Because all workers in our sample are from the same firm and same city, their income could be clustered in time; thus, we allow for two-way clustering of standard errors by individual and year-month (Thompson, 2011; Cameron, Gelbach, and Miller, 2011).

Under the assumption that the within-individual returns from stock market investments are idiosyncratic to factors influencing work performance, the results can be interpreted as follows. A 1% change in stock investment returns (scaled by lagged stock market wealth) leads to a β% change in the sales commission (scaled by the baseline commission) in the subsequent month.

4. Main Results

4.1.Baseline results

We begin the analysis by estimating the average effect of the last-month stock investment returns (scaled by lagged stock market wealth) on the current month sales commission (scaled by the baseline commission). As shown in column (1) of Panel A, Table 2, a 1% increase in the last-month stock investment returns is associated with a 0.38% decrease in the sales commission for the current month. When the last-month sales commission is included as an additional control (column (2)), the effect of the last-month stock investment returns barely changes: the sales commission will decrease by 0.39% in response to a 1% increase in the last-month stock investment returns.[3]

[3] We also study the extent to which larger stock investment returns (scaled by lagged stock market wealth) have a greater impact on work output than stock investment returns of smaller magnitude. The large-magnitude stock investment returns generally have an effect of greater magnitude on the worker's subsequent sales commission, which is also statistically significant. On the other hand, we cannot reject the null that the effect is statistically

[insert Table 2 about here]

In Panel B of Table 2, we investigate the effect of the last-month stock investment returns on the current-month worker performance along other margins. Specifically, in columns (1)–(3), we find workers' propensity to get promoted, demoted, or exit does not significantly respond to their last-month stock investment returns. We also do not detect a significant change in the quality of service, in that the response of customers' insurance contract-withdrawal is close to 0.

In Panel C of Table 2, we investigate the persistence of the sales-commission response. We add the stock investment returns from the past three months into the regression, and only the last-month stock investment returns exhibit a significant impact on the current-month sales commission. This finding suggests the influence of stock market fluctuations on workers' sales commission is immediate but not persistent, likely due to the high-frequency, repeated nature of the shocks.

To further validate that the response of sales commission to the last-month stock investment returns captures the change in work performance, we derive a more direct measure of worker output: the sales value of insurance policies. Because the sales commission is essentially a fixed proportion of the corresponding insurance policy sales, with varying rates for different insurance products, we infer the dollar value of insurance policy sales by an agent from the sales commission earned in that month. Similar to the effect on sales commission, a 1% increase in stock investment returns (scaled by lagged stock market wealth) decreases the total premium sold (scaled by the baseline premium) in the subsequent month by 0.34% (Table IA3).

4.2.Falsification test

Under our hypothesis, the portion of income that does not capture the current-month output should not be responsive to stock investment returns. When insurance agents sell a long-term insurance product, part of their commission income is collected in subsequent years in installments. Hence, this part of the sales income is not reflective of their current work behavior. We use the commission from installment payments of long-term insurances sold in previous years for a falsification test. Consistent with the prediction, Table 3 shows that the last-month stock investment returns do not significantly affect the current-month commission received from installment payment of previously sold policies.

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indistinguishable from that of the small-magnitude stock investment returns (Table IA2).

[insert Table 3 about here]

4.3.Disentangling confounding economic factors

One natural endogeneity concern for our identification is omitted variables arising from common economic conditions that coincide with stock-price movements and simultaneously affect labor supply. For example, housing wealth, which may positively comove with stock market performance, directly influences households' labor market decisions. Moreover, a booming local economy (and a well-performing stock market) could induce sales agents to seek better labor market opportunities and reduce insurance sales. Local residents may also shift their demand from insurance products (with savings features) to direct investment in the stock market. As such, lower insurance policy sales after positive stock investment returns do not necessarily suggest a labor-supply response.

First, any concerns about common factors are greatly mitigated by the large cross-sectional variation in stock investment returns within a given month. The cross-sectional standard deviation of monthly stock investment returns is, on average, RMB 21,600, which is close to 50% of the average stock holdings among investors in our sample. Our identification does not entirely hinge on the time-series variation, which could be contaminated by concurrent macro and local economic conditions. In other words, the results indicate that holding local market conditions constant, investors who happen to have higher stock investment returns earn a lower next-month sales commission than those investors with lower stock investment returns in the same month.

We further address the endogeneity concerns using several empirical tests. Specifically, we randomly assign the stock investment returns in each month to non-investor workers or within the investor workers. If stock investment returns, on average, correlate with local economic conditions, we expect to find a similar negative association between sales commission and the randomly assigned stock investment returns.

Contrary to this prediction, we find the relationship is close to zero under the random assignment of stock investment returns. First, for each month, we randomly assign the returns from an investor to another non-investor (i.e., same-branch insurance sales agent without stock investments during the sample period) as their pseudo stock investment returns and regress the non-investor's sales commission this month on the lagged pseudo stock investment returns. We repeat this procedure for 100 times. Column (1) of Panel A, Table 4 shows the average estimated

coefficient is indistinguishable from 0 (mean of coefficients = -0.004, *p* value = 0.896). We also conduct the same random assignment within the investor group and find a similar result. Column (2) shows the mean coefficient of 0.000 from the 100 iterations is still statistically insignificant (*p* value = 0.990). Finally, we randomly reshuffle the stock investment returns within each investor. Column (3) reveals the mean coefficient from the 100 iterations is 0.003, which is still economically small and not statistically different from 0 (*p* value = 0.896). This suggests that our finding is not explained by the individual-specific persistent trend in both the stock investment returns and labor supply and further corroborates the output response to the last-month stock investment returns. In addition to reporting the mean coefficients, Figure IA3 of the Internet Appendix plots the distributions of coefficients for the three sets of random assignments.

[insert Table 4 about here]

The next set of tests aims to extract plausibly idiosyncratic variation from stock investment returns. One might be concerned that the stock price of local firms is highly correlated with the local economic conditions that affect labor supply choices. We exclude local stocks from the portfolio in computing stock investment returns and study whether work output responds to the local-stock-excluded portfolio performance. As shown in the first column of Panel B, Table 4, a 1% increase in the stock investment returns after excluding local stocks still leads to a 0.34% decrease in sales commission (scaled by the baseline commission) in the following month (*p* value=0.010).

We also identify investors for whom stock investment returns are more idiosyncratic. In this aspect, we classify investors based on their investment record—those who have generated at least three months of positive stock investment returns during their first six investment months are classified as high-skill investors. Stock investment returns for the other investors with a poorer investment record are likely to be more idiosyncratic. As such, we exclude the high-skill investors from the analysis and focus on the sales commission–stock investment return relationship for the investors with a poorer track record. In column (2) of Panel B, we find the sales-commission response of the low-skill investors remains strong and significant (coefficient=-0.421, *p* value=0.004).[4]

[4] We also tried an alternative (more stringent) definition of high-skill investors as the individuals who have earned at

4.4.Another endogeneity concern: liquidity needs

Another possible omitted variable that affects both individual-level stock investment returns and worker performance is the individual-specific liquidity needs. For example, liquidity shocks out of life events may prompt individuals to withdraw from their stock market wealth and at the same time reduce labor supply. In addition, investors are potentially more likely to tap into their stock market wealth to meet the liquidity needs when they are making money in the stock market.

We investigate this hypothesis in the following two ways. First, we follow Di Maggio, Kermani, and Majlesi (2019) by adding the last month realized stock investment returns (scaled by lagged stock market wealth) as an additional control into the regression. If the effect of stock investment returns on sales commission is driven by realized stock investment returns, which strongly indicate investors' liquidity needs, the estimated effect of total stock investment returns will be muted considerably after controlling for realized stock investment returns. However, as shown in column (1) of Table 5, although the realized stock investment returns have a comparable impact on the next-month sales commission (coefficient = -0.371, *p* value = 0.568), the effect for total stock investment returns remains large both statistically and economically (coefficient = -0.353, *p* value = 0.001). Note that the correlation between total stock investment returns and realized stock investment returns is 0.37, alleviating the concern about multicollinearity.

[insert Table 5 about here]

Second, when investors command immediate liquidity, they should withdraw money from their stock-sale proceeds. The signal for liquidity needs is even greater when investors only sell without reinvesting in the stock market. In column (2) of Table 5, we exclude from the regression the individual months with only stock sales in the previous month. Again, a 1% increase in total stock investment returns significantly decreases the following-month sales commission by 0.35% (*p* value=0.004). In an unreported result, we also find a significant negative response when we exclude individual months when investors sell stocks with and without reinvesting in the stock

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least three consecutive positive stock investment returns during the first six investment months. The effect remains similar. The results are also robust when we define the high-skill investors on a 6-month rolling-window basis. Moreover, we also capture investors with close to random return variation as those with close to zero mean investment returns and find significant response among them.

market.

4.5.External validity

4.5.1. Is the effect driven by part-time workers?

Some of the agents in our sample may not rely on selling insurance products as their major source of income. Thus, a natural question arises on the extent to which the documented effect can generalize to a wider population of workers in the economy.

In this subsection, we start by investigating whether our results pertain only to the less devoted sales agents. To proceed, we classify sales agents into part-time and full-time workers based on their work intensity. First, we proxy full-time workers as those with both the number of working months and the fraction of positive-sales-commission months higher than the sample median. Within the full-time workers, a 1% increase in stock investment returns leads to a 0.52% decrease in the subsequent month's sales commission (column (1), Panel A, Table 6). This pattern is also robust if we use a more stringent definition of full-time workers as those with both the number of working months and fraction of positive-sales-commission months in the top tercile of the cross-sectional distribution.

We also employ an alternative approach to capture full-time workers: managers for the firm are more likely to devote full-time to the insurance firm. Therefore, we define the full-time workers base on their job levels and continue to find a strong and significant response from the insurance agents with a rank of manager or above (column (2) of Panel A, Table 6).

[insert Table 6 about here]

In an unreported result, we also perform an additional external validity check by investigating the heterogeneous responses of the investors with an average monthly total income above and below RMB1,000. The 1,000 cut-off is chosen in that the distribution of the stock holdings-to-annual income ratio for sales agents with above 1,000 RMB monthly income closely mimics the ratio distribution of nationwide investors (*China Household Finance Survey*, 2014), making this group of workers more representative of the general investor population. We continue to find a strong and significant response from insurance agents with a total monthly income greater than RMB 1,000.

4.5.2. Is the effect specific to workers with a volatile income stream?

Another external validity concern is that the effect of stock investment returns on subsequent sales commission earned may be specific to workers with a volatile income stream. Compared with many other occupations, insurance sales agents on average have more volatile income. If investors with a more volatile income stream are more sensitive to wealth shocks, our findings could be less applicable to the broader worker population. Thus, we test the prediction of a stronger output response among insurance sales agents with a higher income volatility in our sample.

For each investor in the sample, we compute the time-series standard deviation of the monthly total income from the insurance company during the sample period, and scale the income standard deviation by the time-series average monthly income for the same individual to account for the income level differences across individuals. We classify workers with higher-than-median (lower-than-median) scaled income standard deviation as higher (lower) income volatility investors and test the response difference between the two groups of investors (Panel B, Table 6). The response of sales commission to last-month stock investment returns is statistically indistinguishable between the two subgroups of investors (coefficient for lower income volatility workers = -0.471, p value = 0.037; coefficient for higher income volatility workers = -0.310, p value = 0.028; p value for the difference = 0.596). The finding is also robust when we classify workers in the bottom tercile of the scaled income standard deviation distribution as lower income volatility workers, and the rest as higher income volatility workers.

5. The Economic Mechanism

The negative impact of stock investment returns on subsequent sales commission can work through two mechanisms. If leisure is a normal good, a positive wealth shock from the stock market will lead to more leisure consumption, hence lower labor supply and sales commission. Alternatively, the result could be attributable to the distraction effect. Due to limited attention, exerting more energy in stock investments will distract workers from their job of selling insurance products, leading to a negative relation between the stock investment returns and the subsequent sales commission. In this section, we discuss and disentangle the two economic mechanisms.

5.1. Wealth effect

The leading explanation for the observed negative relation is the wealth effect. Workers

increase leisure consumption and reduce labor supply (i.e., the effort in selling insurance policies) in response to positive shocks from their stock market wealth (Imbens, Rubin, and Sacerdote, 2001; Cesarini, et al., 2017).

The wealth effect predicts a stronger labor-supply response among higher-income workers, who will increase leisure consumption more than lower-income workers after positive wealth shocks. On the other hand, if the result is driven by workers choosing to spend more time on stock investments and less on work after positive stock investment returns, we do not expect a stronger effect for higher-income workers. By contrast, the effect should be more pronounced among lower-income workers since they have a lower opportunity cost of time.

In Panel A of Table 7, we define higher-income workers as the sales agents with an average monthly total income higher than the city's average monthly urban disposable income during our sample period (i.e., RMB 3,278 per month). The results are consistent with the wealth-effect prediction: the sales commission response is -0.84 for the higher-income workers, which is more negative than the effect for the lower-income workers (-0.33). The difference between the two coefficients is statistically significant (p value= 0.096).[5]

[insert Table 7 about here]

5.2.Distracted by the stock market？

Another possible mechanism is the distraction of attention. Motivated by the findings that investors suffer from inattention, higher investment returns may distract the workers from selling insurance contracts, leading to lower sales commission afterwards (DellaVigna and Pollet, 2009; Hirshleifer, Lim, and Teoh, 2009).

We investigate the distraction channel using three heterogeneity tests in Panel B of Table 7. First, if workers focus on investing in the stock market, which significantly affects their work performance, we expect to observe significantly lower sales commissions during periods with stock investments, compared to the time when workers do not invest in any stocks. This prediction is inconsistent with our finding: the estimated coefficient for the last-month investment-period dummy is close to 0 (column (1) of Panel B, Table 7).

[5] This effect is robust if we define higher-income workers using the sample median income as the cut-off. We verify that the higher-income workers are not equivalent to the full-time workers discussed above. We investigate the income-group heterogeneity by restricting to the subsample of full-time workers, and still find a stronger effect among the higher-income workers within the full-time subsample.

A direct test of the distraction hypothesis is to study the trading response after changes in investment returns. However, we only observe the month-end total buy and sell volume of each stock instead of the within-month disaggregated trades. To circumvent the measurement issue, we design our test to study the differential output response by investor activeness, which is proxied by the total number of stocks being bought or sold. The distraction channel predicts a stronger effect among the more active investors. In column (2) of Panel B, we classify workers as active investors if they, on average, buy or sell no less than two stocks per month in the first six investment months (median number of stocks bought or sold = 1). We find an equally strong sales-commission response among active and less active investors. The results are robust when we use three or four stocks as the cut-off to identify active investors or use the rolling window approach to identify active investors.

Under the distraction hypothesis, we also expect a stronger output response during volatile market conditions that attract more investor attention. In column (3) of Panel B, we identify months with a higher market volatility when the standard deviation of the daily aggregate market returns (for all A-share stocks in the Chinese stock market) ranks in the top quartile among all months since 2000. Similarly, the effect of the last-month stock investment returns on sales commission is equally strong during volatile and non-volatile times.

The collective evidence in this section suggests the negative impact of stock investment returns on agents' sales commission is consistent with the wealth-effect channel whereby workers enjoy more leisure and cut back their labor supply in response to positive wealth shocks from the stock market.

6. Heterogeneity and Additional Robustness

6.1.Cross-sectional heterogeneity by worker demographics

Female workers, as shown in column (1) of Table 8, have a larger sales-commission response of -0.46% (p value=0.013), compared with a -0.23% effect for male workers (p value=0.390). On the other hand, workers above 40 exhibit a much larger sales-commission response than the below-40 workers (coefficient for below-40 workers = 0.041, p value = 0.759; coefficient for above-40 workers = -0.837, p value = 0.008; p value for the difference = 0.038). This finding is consistent with prior literature on the income effect of labor supply (Cesarini et al., 2017).

[insert Table 8 about here]

We also examine the heterogeneity along the education dimension.[6] As reported in column (3) of Table 8, the more educated workers have a stronger sales-commission response than the less educated ones (coefficient for less-educated workers = 0.113, *p* value = 0.580; coefficient for more-educated workers = -0.885, *p* value = 0.001; *p* value for the difference = 0.013).

6.2.Asymmetric response to negative and positive returns

Prior literature in finance finds a significant psychological effect of stock market fluctuations, especially associated with negative stock market returns. As such, rather than supplying more labor to earn more income after stock market investment losses, as predicted by traditional theory, frustration and stress can weigh in adversely on work behavior and output. Next, we decompose the returns into positive and negative domains and investigate whether the output response differs in the two regions.

Panel A of Table 9 reports that a 1% increase in stock investment returns (scaled by lagged stock market wealth) leads to a 0.57% decrease in sales commission (scaled by the baseline commission) when the stock investment returns are positive (*p* value=0.004). However, the relation is (insignificantly) positive in the negative-return domain: a 1% decline in the stock investment returns leads to a 0.23% decrease (rather than increase) in sales commission (*p* value = 0.287). The difference between the two coefficients is statistically significant (*p* value = 0.027).

[insert Table 9 about here]

We further explore the asymmetric response by worker characteristics. In Panel B of Table 9, we study the heterogeneous effect by gender and document a strong asymmetric response among the male workers only. In the positive-return domain, the male workers' sales commission decreases by 0.86 percent in response to a 1% gain in last-month stock market wealth (*p* value = 0.027); whereas in the negative-return domain, male workers' sales commission also decreases by 2.17% in response to a 1% loss in stock market wealth in the previous month (*p* value =

[6] The education level for investors in our sample, however, is correlated with the gender and age: the higher-educated investors in our sample are generally younger and more likely to be male. To purge the age and gender effects, we classify workers into less-educated and more-educated groups based on the sample median of residualized years of education received. Specifically, we conduct a cross-sectional regression of years of education on the average age and the female dummy for all investors in sample and use the regression residuals to split the sample. Please refer to the appendix for detailed variable construction.

0.004); and the difference of responses in the two return domains is highly significant (*p* value = 0.001). In contrast, female workers' sales commission decreases by 0.38% following a 1% gain in the positive-return domain (*p* value = 0.074), and increases by 0.73% following a 1% loss in the negative-return domain (*p* value = 0.059) in the previous month; and the difference of effects in the two return domains is statistically insignificant (*p* value = 0.428).

Panel C of Table 9 investigates the asymmetric effect along the age dimension. The significant positive relationship between stock investment returns and sales commission in the negative-return domain only pertains to younger workers: a 1% gain in the last-month stock market wealth in the positive domain leads to a 0.22% decrease in current-month sales commission (*p* value = 0.103), while a 1% loss in the last-month stock market wealth in the negative domain leads to a 1.01% decrease in current-month sales commission (*p* value = 0.037), with the difference in the two coefficients being statistically significant (*p* value = 0.022). The above-40 workers, on the other hand, exhibit a negative relationship between stock investment returns and sales commission in both return domains, and the difference in the effects in the two return domains is insignificant (*p* value = 0.577).

Moreover, using the orthogonalized measure of education, we document a strong asymmetric effect among the less educated workers (Panel D of Table 9). Their sales commission negatively responds to an increase in stock investment returns in the positive-return domain (coefficient = -0.181, *p* value = 0.539), whereas a 1% loss in their stock market wealth is associated with a 1.34% lower sales commission in the negative-return domain (*p* value = 0.029), and the difference in the effects from two return domains is statistically significant (*p* value = 0.061). More-educated workers demonstrate a negative association between stock investment returns and sales commission in both positive- and negative-return domains (coefficient = -0.967, *p* value = 0.001 for the positive-return domain; coefficient = -0.540, *p* value = 0.243 for the negative-return domain; *p* value for difference = 0.437).

Lastly in Panel E, we find the asymmetric response is concentrated among the lower-income workers. In the positive-return domain, a 1% gain in stock market wealth leads to a 0.51% decrease in the subsequent-month sales commission for lower-income workers (*p* value = 0.012); however in the negative-return domain, a 1% percent further loss in stock market wealth is followed by 0.33% lower sales commission (*p* value = 0.157); the difference in the two domain effects is statistically significant (*p* value = 0.022). On the other hand, higher-income workers

exhibit a negative stock investment return–sales commission relationship in both return domains (coefficient = -0.984, *p* value = 0.019 for the positive-return domain; coefficient = -0.418, *p* value = 0.646 for the negative-return domain; *p* value for difference = 0.616).[7]

6.3. Robustness tests

6.3.1. The influence of outliers?

We conduct additional tests to corroborate the robustness of our findings. First, our result is not driven by new investors. In Table IA5 of the Internet Appendix, we find that instead of the inexperienced new investors, investors who opened the stock accounts earlier exhibit a larger sales-commission response. Second, we estimate the sales-commission response for each individual by interacting the individual dummies with the last-month stock investment returns. A median effect of -0.14%, with 55% of the individuals having a negative sales-commission response, further suggests the main finding does not derive from a few outlier investors.

Additionally, while we show a similar effect by the level of market volatility, we further verify that the finding is not specific to 2015 that witnessed a large boom-and-bust cycle. We continue to find a very significant result when we exclude 2015 from our sample.

6.3.2. Alternative specifications

In an alternative econometric specification, we include the non-investors in the regression to strengthen our estimation of counterfactuals—their work output helps capture the trend absent the influence of stock market wealth fluctuations. We include all non-investors or the PS-matched non-investors in the regression and find the effect of the stock investment returns on the subsequent worker sales commission remains quantitatively and qualitatively similar. Results are reported in Table IA6 of the Internet Appendix.

Lastly, we examine the robustness of our results under alternative specifications. First, instead of controlling for the lagged sales commission (scaled by the baseline commission) in the regression, we directly employ the first-difference regression. Column (1) of Panel A, Table IA7, shows the first difference of the last-month stock investment returns (scaled by lagged stock market wealth) still significantly decreases the first difference of the current-month sales commissions (scaled by the baseline commission). In the second column of this panel, we show

[7] We also investigate the specification that includes the effect of positive and negative stock investment returns for different worker groups in one regression. The results are similar as the subsample specification and are reported in Table IA4.

that including the current-month scaled stock investment returns as an additional control does not weaken the effect of the last-month stock investment returns. Moreover, the sales-commission response stays robust under alternative standard-error clustering units: by worker, by team, or two-way clustering by team and time (Panel B, Table IA7). The last panel shows that the results are robust when we restrict our analysis to workers with a longer work history (Panel C, Table IA7).

7. Conclusion

This paper provides micro-level evidence of worker-output response to changes in stock market wealth. Linking individual-level worker performance data with stock investments information, we find a significant negative effect of the stock investment returns on workers' subsequent sales commission. Specifically, a 1% increase in the last-month stock investment returns leads to a 0.39% decrease in the current-month insurance sales commission. We provide a collection of evidence to support the causal interpretation; the relation between stock investment returns and subsequent sales commission is unlikely driven by omitted variables, including common macro or local economic factors or individual-specific liquidity needs.

The negative relation between stock investment returns and subsequent sales commission mainly works through the wealth effect channel: workers choose to enjoy more leisure and reduce labor supply after an increase in stock market wealth. We also uncover asymmetric responses to stock market gains and losses. In the negative-return domain, a decline in stock investment returns is followed by lower subsequent output, especially for lower-income, male, younger, and less-educated workers. Overall, our results highlight a novel channel of transmitting stock market fluctuations to the real economy through labor supply.

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Appendix. Variable Definitions and Constructions

1. Stock Information:

Holding value is the monthly dollar value of stock holdings (in RMB).

Stock inv. return is the monthly dollar value of stock investment returns (in RMB). $Stock\ inv.\ return_t = holding\ value_t - holding\ value_{t-1} + sell\ value_t - buy\ value_t$, where the $sell\ value_t$ is the total dollar value of stocks sold in month *t*, and $buy\ value_t$ is the total dollar value of stocks bought in month *t*.

Stock mkt wealth is the stock market wealth for an individual-month, proxied by the stock holdings at the end of the last month. If the last-month stock holdings are zero, then we use the stock holdings in the most recent non-zero-holding month.

Realized return is the monthly dollar value of realized stock investment returns from stock sale (in RMB). We construct this variable by summing up the realized stock investment returns from all stocks held by an individual-month. Specifically, for each stock *s* with stock sales in month *t,* the realized return in month *t* is defined as the difference in sell price and cost price, multiplied by the volume of stocks sold: $realized\ return_{st} = (sell\ price_{st} - cost\ price_{st}) \times sell\ volume_{st}$. The cost price is a weighted average of the buy price in the current month and the holding price in last month: $cost\ price_{st} = buy\ price_{st} \times \frac{buy\ volume_{st}}{buy\ volume_{st} + holding\ volume_{s,t-1}} + holding\ price_{st-1} \times \frac{holding\ volume_{s,t-1}}{buy\ volume_{st} + holding\ volume_{s,t-1}}$, and $holding\ price_{st-1} = \frac{holding\ value_{s,t-1}}{holding\ volume_{s,t-1}}$. The realized return is 0 for stock-months without stock sales.

Unrealized return is the monthly dollar value of unrealized stock investment returns from stock-price changes (in RMB). $Unrealized\ return_t = stock\ return_t - realized\ return_t$.

No. of stocks held is the total number of stocks held for a month by an individual.

Hold local-city stocks is a dummy variable equal to 1 if the individual held any local-city stocks in a month.

Proportion of local-city stocks is the fraction of the number of local-city stocks out of the number of all stocks held in a month.

Stock inv. return ex. local is the monthly dollar value of stock investment returns after excluding local-city stocks (in RMB).

Stock mkt wealth ex. local is the stock market wealth after excluding local-city stock holdings (in RMB).

Investment period is a dummy variable equal to 1 if the individual has stock investments in a month.

Volatile mkt is a dummy variable equal to 1 for the months with volatile market returns. We define a month as under volatile market condition if it has the top-quartile standard deviation of daily aggregate market returns (for all A-share stocks in the Chinese stock market) since 2000. The rest time during the sample period is classified as under ***nonvolatile mkt*** condition.

2. Work Performance:

Sales commission is the monthly commission income from current-month insurance product sales (in RMB). Sales commission is a linear function of the corresponding insurance policy sold in the current month.

Baseline commission is the average monthly sales commission before the individual's first stock investment return in the sample, or the first positive sales commission if all sales commissions before the first stock investment return

are 0.

Total premium sold is the monthly total dollar amount of insurance policy sales inferred from sales commission (in RMB). ***Baseline premium*** is the average monthly total premium sold before the individual's first stock investment return in the sample, or the first positive total premium sold if all total premiums sold before the first stock investment return are 0.

Installment commission is the monthly commission income from installment payments of insurance policies sold in previous years (in RMB).

Baseline installment commission is the average monthly installment commission before the individual's first stock investment return in the sample, or the first positive installment commission if all installment commissions before the first stock investment return are 0.

Total income is the monthly total income (in RMB). $Total\ income_t = sales\ commission_t + commission\ of\ installment\ payment\ of\ policies\ sold\ in\ previous\ years_t + bonus_t$

Baseline total income is the average monthly total income before the individual's first stock investment return in the sample, or the first positive total income if all total income before the first stock investment return is 0.

Promotion is a dummy variable equal to 1 if the individual has been promoted to a higher job level in a month.

Demotion is a dummy variable equal to 1 if the individual has been demoted to a lower job level in a month.

Exit is a dummy variable equal to 1 for the last month that the individual works for the firm, except the sample end month (i.e., 2016:12).

Withdraw is a dummy variable equal to 1 for the month with any insurance contract withdrawal.

3. Worker Characteristics:

Age is the age in years.

Female is a dummy variable equal to 1 for female workers.

Years of education is the years of education received.

Tenure is the number of months that the worker has worked for the firm.

Team manager and above is a dummy variable equal to 1 for individuals whose average job level during the sample period was team manager or above.

High-skill investor is an individual who has generated at least three months of positive stock investment returns during the first six investment months.

Full time is a dummy variable equal to 1 for the full-time workers. We employ two classification criteria for the full-time worker: (1) an individual whose number of working months and fraction of positive sales-commission time during the sample period are both above the sample median; and (2) an individual who has ever been a manager or above during our sample period. The rest workers are classified as ***part time*** workers under corresponding full-time worker definition.

Higher income vol. is a dummy variable equal to 1 for workers with higher income volatility, defined as the ones with scaled total income standard deviation (=time series standard deviation of total income/time series mean of total income) higher than the cross-sectional sample median. The rest workers are classified as with ***lower income***

vol..

Higher income is a dummy variable equal to 1 for workers with monthly average total income higher than the city's average urban disposable income during the sample period (i.e., 2013–2016). The rest workers are classified as with ***lower income***.

Active investor is a dummy variable equal to 1 for the individual buys or sells no less than two stocks per month on average in the first six investment months. The rest workers are classified as ***inactive investors***.

>40 years old is a dummy variable equal to 1 for workers whose average age during the sample period is over 40 years. The rest workers are classified as ***≤40 years old***.

More educated is a dummy variable equal to 1 for workers with residualized years of education received higher than the cross-sectional sample median. We residualize education to isolate the role of education from confounding factors. Specifically, for all investors in the sample, we regress the years of education on the female dummy and average age during the sample period, and the regression residual is the residualized years of education received. The rest workers are classified as ***less educated***.

Earlier entry investors is a dummy variable equal to 1 for investors who opened their stock account earlier than the median year among all workers who have ever opened a stock account with the exchange (i.e., the year 2010). The rest workers are classified as ***later entry investors***.

4. Stock Characteristics:

Market capitalization is the total market value of stocks outstanding for the firm (in billions of RMB).

Price-to-earnings ratio is the price per share divided by earnings per share for the firm.

Market-to-book ratio is the total market value divided by total book value for common stocks.

Share turnover rate is the number of stocks traded, divided by the total number of shares outstanding (in December of 2012).

Table 1: Summary Statistics for Investors in the Sample

Panel A: Demographics

	Mean	Median	Std. Dev.
	(1)	(2)	(3)
Age	38.3	38.4	9.1
Female (%)	64.6	100.0	47.8
Years of education	14.0	15.0	1.5
Tenure (months)	36.6	11.0	52.4
Team manager and above (%)	2.7	0.0	16.2
No. of workers	3,072		

Panel B: Worker performance

	Mean	Median	Std. Dev.
	(1)	(2)	(3)
Sales commission (RMB)	719	258	1,385
Promotion (%)	4.6	4.2	4.4
Demotion (%)	4.3	4.2	4.2
Exit (%)	3.6	0.0	6.5
Withdraw (%)	2.1	0.0	4.8
No. of workers	3,072		

Panel C: Stock information

	Mean	Median	Std. Dev.
	(1)	(2)	(3)
Holding value (RMB)	44,666	12,926	98,477
Stock inv. return (RMB)	-1,731	-64	12,088
Realized return (RMB)	711	133	2,898
Unrealized return (RMB)	-2,417	-258	12,122
No. of stocks held	2.6	2.0	2.1
Hold local-city stocks (%)	4.5	0.0	16.5
Proportion of local-city stocks (%)	2.1	0.0	10.3
No. of workers	3,072		

Notes: This table reports the summary statistics for investors in our sample. Panels A-C provide the summary statistics of demographic characteristics, work performance, and stock investment information for investors in our sample during the sample period (i.e., January 2013–December 2016), respectively. All variables are reported as the individual average. Please refer to the appendix for detailed variable definitions. All monetary variables are expressed in RMB, and the average exchange rate between RMB and USD during our sample period is around 0.159 USD per RMB. All monetary variables are winsorized at the 0.5% level. Differences in the means of each variable are reported in column (5) for Panels A and B. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table 2: Effect of Stock Investment Returns on Worker Performance

Panel A: Sales commission

	$Sales\ commission_t/Baseline\ commission$	
	(1)	(2)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}$	-0.382***	-0.392***
	(3.17)	(3.36)
$Sales\ commission_{t-1}/Baseline\ commission$		0.053*
		(1.69)
Constant	3.941***	3.752***
	(4,069.00)	(30.20)
Observations	40,620	39,369
R-squared	0.38	0.38
Year*Month FE	Yes	Yes
Worker FE	Yes	Yes

Panel B: Job status and insurance policy withdrawal

	Promotion (%)	*Demotion (%)*	*Exit (%)*	*Withdraw (%)*
	(1)	(2)	(3)	(4)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}$	0.212	-0.499	-0.078	0.003
	(0.64)	(1.25)	(0.45)	(0.01)
$Sales\ commission_{t-1}/Baseline\ commission$	0.173***	-0.027***	-0.014**	0.002
	(10.49)	(3.33)	(2.02)	(0.33)
Constant	4.331***	4.986***	2.620***	2.622***
	(56.79)	(225.88)	(133.95)	(204.10)
Observations	39,369	39,369	39,369	39,369
R-squared	0.10	0.17	0.19	0.14
Year*Month FE	Yes	Yes	Yes	Yes
Worker FE	Yes	Yes	Yes	Yes

Panel C: Effect persistence

	$Sales\ commission_t/Baseline\ commission$	
	(1)	(2)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}$	-0.403**	-0.539**
	(2.04)	(2.61)
$Stock\ inv.return_{t-2}/Stock\ mkt\ wealth_{t-3}$	0.094	0.128
	(0.30)	(0.39)
$Stock\ inv.return_{t-3}/Stock\ mkt\ wealth_{t-4}$	0.319	0.388
	(1.09)	(1.24)
$Sales\ commission_{t-1}/Baseline\ commission$		0.031
		(1.11)
$Sales\ commission_{t-2}/Baseline\ commission$		0.016
		(0.64)
$Sales\ commission_{t-3}/Baseline\ commission$		0.048*
		(1.76)
Constant	3.906***	3.604***
	(198.72)	(12.09)
Observations	36,135	32,877
R-squared	0.38	0.38
Year*Month FE	Yes	Yes
Worker FE	Yes	Yes

Notes: This table reports the average effect of the last-month stock investment returns (scaled by lagged stock market wealth) on investors' work performance. Panel A reports the effect on sales commission (scaled by the baseline commission). Panel B reports the effect on four indicator variables: promotion, demotion, exit the firm, and insurance contract withdrawal. Panel C investigates the persistence of the effect by including stock investment returns (scaled by lagged stock market wealth) in the past three months. Please refer to the appendix for detailed variable definitions. Months used to calculate the baseline commission are excluded from the regressions. Individual and year-month fixed effects are included. T-statistics are reported in parentheses. Standard errors are clustered at the individual and year-month level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.
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Table 3: Falsification Test

	$\frac{Installment\ commission_t}{Baseline\ installment\ commission}$
	(1)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}$	0.097
	(1.47)
$Installment\ commission_{t-1}/Baseline\ installment\ commission$	-0.000
	(0.00)
Constant	1.576***
	(46.67)
Observations	23,998
R-squared	0.41
Year*Month FE	Yes
Worker FE	Yes

Notes: This table reports the effect of the last-month stock investment returns (scaled by lagged stock market wealth) on the Installment commission (scaled by the baseline installment commission). Please refer to the appendix for detailed variable definitions. Months used to calculate the baseline installment commission are excluded from the regression. Individual and year-month fixed effects are included. T-statistics are reported in parentheses. Standard errors are clustered at the individual and year-month level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table 4: Disentangling Confounding Economic Factors

Panel A: Random assignment of stock investment returns (iterate 100 times)

	Investor's returns to a random non-investor (1)	Investor's returns to a random investor (2)	Random return time within investor (3)
Mean of coefficients: $Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}$	-0.004	0.000	0.003
T statistic	(-0.13)	(0.01)	(0.13)

Panel B: Exogenous variation in stock investment returns

	$Sales\ commission_t/Baseline\ commission$	
	Exclude local stocks (1)	Exclude high skill investors (2)
$Stock\ inv.return\ ex.\ local_{t-1}/Stock\ mkt\ wealth\ ex.local_{t-2}$	-0.339**	
	(2.67)	
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}$		-0.421**
		(2.49)
$Sales\ commission_{t-1}/Baseline\ commission$	0.054*	0.014
	(1.70)	(0.52)
Constant	3.754***	3.970***
	(29.85)	(37.93)
Observations	38,915	25,056
R-squared	0.38	0.41
Year*Month FE	Yes	Yes
Worker FE	Yes	Yes

Notes: This table presents the results for tests disentangling the confounding economic factors. Panel A reports the mean and t-statistics of the 100 estimated coefficients for the last-month stock investment returns (scaled by lagged stock market wealth) from three sets of random matches. Column (1) reports the result when one investor's stock investment returns are assigned to a random non-investor. For the randomly picked non-investor, the baseline commission is calculated as the average monthly sales commission before the corresponding investor's first stock investment return in the sample, or the first positive sales commission if all sales commissions before the corresponding investor's first stock investment return are 0. Column (2) reports the result when one investor's stock investment returns are assigned to a random investor. Column (3) reports the result when the time of receiving stock investment returns is randomly assigned within each investor. Panel B restricts the analysis to the subsample of stocks or investors that the stock investment return variations are more exogenous. Column (1) excludes the local-city stocks from the analysis. Column (2) excludes the high-skill investors, who generates at least three months of positive stock investment returns during the first six investment months. Returns from the first six investment months are excluded from this regression. Please refer to the appendix for detailed variable definitions. Months used to calculate the baseline commission are excluded from the regressions. Individual and year-month fixed effects are included. T-statistics are reported in parentheses. Standard errors are clustered at the individual and year-month level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table 5: Alternative Explanation: Liquidity Needs

	$Sales\ commission_t/Baseline\ commission$	
	Control for realized stock investment returns	Exclude months with only stock sales
	(1)	(2)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}$	-0.353***	-0.350***
	(3.40)	(3.03)
$Realized\ stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}$	-0.371	
	(0.57)	
$Sales\ commission_{t-1}/Baseline\ commission$	0.053*	0.056*
	(1.69)	(1.79)
Constant	3.757***	3.742***
	(29.93)	(29.82)
Observations	39,369	36,651
R-squared	0.38	0.38
Year*Month FE	Yes	Yes
Worker FE	Yes	Yes

Notes: This table investigates whether the effect is driven by individuals' liquidity needs. Column (1) controls for the effect of the last-month realized stock investment returns (scaled by lagged stock market wealth). Column (2) excludes the individual-month if the last month has only stock sales. Please refer to the appendix for detailed variable definitions. Months used to calculate the baseline commission are excluded from the regressions. Individual and year-month fixed effects are included. T-statistics are reported in parentheses. Standard errors are clustered at the individual and year-month level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table 6. External Validity Tests

Panel A: Full time vs. part time workers

	$Sales\ commission_t/Baseline\ commission$	
	Full-time workers defined as:	
	Longer work time	Manager or above
	(1)	(3)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: part\ time$	-0.219	-0.284*
	(1.22)	(2.00)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: full\ time$	-0.516*	-1.092**
	(1.95)	(2.46)
$Sales\ commission_{t-1}/Baseline\ commission$	0.053*	0.053
	(1.69)	(1.68)
Constant	3.752***	3.753***
	(30.07)	(30.06)
Observations	39,369	39,369
R-squared	0.39	0.39
Worker group*Year*Month FE	Yes	Yes
Worker FE	Yes	Yes

Panel B: Workers with higher vs. lower income volatility

	$Sales\ commission_t/Baseline\ commission$
	(1)
$Stock\ inv\ return_{t-1}/Stock\ mkt\ wealth_{t-2}: lower\ income\ vol.$	-0.471**
	(2.15)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: higher\ income\ vol.$	-0.310**
	(2.26)
$Sales\ commission_{t-1}/Baseline\ commission$	0.053*
	(1.69)
Constant	3.753***
	(30.12)
Observations	39,369
R-squared	0.39
Worker group*Year*Month FE	Yes
Worker FE	Yes

Notes: This table examines the external validity of the main result. Panel A reports the effect of the last-month stock investment returns (scaled by lagged stock market wealth) on sales commission (scaled by the baseline commission) for part-time and full-time workers, respectively. Column (1) defines a full-time worker as an individual whose number of working months and fraction of positive sales-commission time during the sample period are both above the sample median. Column (2) defines a full-time worker as an individual who has ever been a manager or above during our sample period. Panel B investigates the heterogeneous effect for workers by income volatility. A worker is defined as with higher income volatility if his/her scaled total income standard deviation (=time series standard deviation of total income/time series mean of total income) is higher than the cross-sectional sample median. Please refer to the appendix for detailed variable definitions. Months used to calculate baseline commission are excluded from the regressions. Individual and worker group-specific year-month fixed effects are included. T-statistics are reported in parentheses. Standard errors are clustered at the individual and year-month level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table 7. The Economic Mechanism

Panel A: Higher-income vs. lower-income workers

	$Sales\ commission_t/Baseline\ commission$
	(1)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: lower\ income$	-0.331**
	(2.59)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: higher\ income$	-0.835***
	(3.18)
$Sales\ commission_{t-1}/Baseline\ commission$	0.052
	(1.65)
Constant	3.756***
	(29.97)
Observations	39,369
R-squared	0.39
Worker group*Year*Month FE	Yes
Worker FE	Yes

Panel B: Distracted by the stock market?

	$Sales\ commission_t/Baseline\ commission$		
	Inv. vs. non-inv.period	Active vs. inactive investor	Volatile vs. non-volatile market
	(1)	(2)	(3)
$Investment\ period_{t-1}$	0.003		
	(0.01)		
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: inactive\ investors$		-0.602**	
		(2.65)	
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: active\ investors$		-0.282	
		(1.27)	
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: nonvolatile\ mkt$			-0.429***
			(2.73)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: volatile\ mkt$			-0.362***
			(4.07)
$Sales\ commission_{t-1}/Baseline\ commission$	0.088***	0.043	0.053*
	(2.78)	(1.61)	(1.69)
Constant	2.967***	3.758***	3.754***
	(16.33)	(35.64)	(30.04)
Observations	68,505	33,281	39,369
R-squared	0.41	0.41	0.38
Year*Month FE	Yes	No	Yes
Worker group*Year*Month FE	No	Yes	No
Worker FE	Yes	Yes	Yes

Notes: This table investigates the economic mechanism of the effect. Panel A investigates the wealth-effect channel. Specifically, it reports the effect of the last-month stock investment returns (scaled by lagged stock market wealth) on sales commission (scaled by the baseline commission) for higher-income and lower-income workers, respectively. Panel B investigates the distraction-effect channel. Column (1) tests the effect of stock investments on sales commission (scaled by the baseline commission). Column (2) reports the effect of the last-month stock investment returns (scaled by lagged stock market wealth) on sales commission (scaled by the baseline commission) for inactive and active investors, respectively. A worker is defined as an active investor if he/she buys or sells, on average, no less than two stocks per month in the first six investment months. Returns from the first six investment months are excluded from this regression. Column (3) reports the effect of the last-month stock investment returns (scaled by lagged stock market wealth) on sales commission (scaled by the baseline commission) during volatile and non-volatile market times. Please refer to the appendix for detailed variable definitions. Months used to calculate baseline commission are excluded from the regressions. Individual and worker group-specific year-month fixed effects are included in Panel A, and column (2) of Panel B; individual and year-month fixed effects are included in columns (1) and (3) of Panel B. T-statistics are reported in parentheses. Standard errors are clustered at the individual and year-month level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table 8. Heterogeneity by Worker Demographics

	$Sales\ commission_t/Baseline\ commission$		
	Gender	Age	Education
	(1)	(2)	(3)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: male$	-0.229		
	(0.87)		
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: female$	-0.460**		
	(2.60)		
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: \leq 40\ years\ old$		0.041	
		(0.31)	
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: > 40\ years\ old$		-0.837***	
		(2.78)	
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: less\ educated$			0.113
			(0.56)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: more\ educated$			-0.885***
			(3.60)
$Sales\ commission_{t-1}/Baseline\ commission$	0.053*	0.054*	0.053*
	(1.69)	(1.71)	(1.68)
Constant	3.753***	3.751***	3.752***
	(30.44)	(30.23)	(30.22)
Observations	39,369	39,369	39,369
R-squared	0.38	0.39	0.38
Worker group*Year*Month FE	Yes	Yes	Yes
Worker FE	Yes	Yes	Yes

Notes: This table investigates the heterogeneous effect by worker demographics. Column (1) reports the effect of the last-month stock investment returns (scaled by lagged stock market wealth) on sales commission (scaled by the baseline commission) for male and female workers, respectively. Column (2) reports the heterogeneous effect for workers with age below and above 40 years old, respectively. Column (3) reports the heterogeneous effect for less educated and more educated workers respectively. Please refer to the Appendix for detailed variable definitions. Months used to calculate baseline commission are excluded from the regressions. Individual and worker group-specific year-month fixed effects are included. T-statistics are reported in parentheses. Standard errors are clustered at the individual and year-month level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table 9: Effect of Negative vs. Positive Investment Returns

Panel A: Full sample

	$Sales\ commission_t/Baseline\ commission$
	(1)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: negative\ return$	0.234
	(1.08)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: positive\ return$	-0.567***
	(3.07)
$Sales\ commission_{t-1}/Baseline\ commission$	0.053*
	(1.69)
Constant	3.817***
	(32.44)
Observations	39,369
R-squared	0.38
Year*Month FE	Yes
Worker FE	Yes

Panel B: By gender

	$Sales\ commission_t/Baseline\ commission$	
	Male	Female
	(1)	(2)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: negative\ return$	2.174***	-0.733*
	(3.07)	(1.94)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: positive\ return$	-0.862**	-0.381*
	(2.28)	(1.83)
$Sales\ commission_{t-1}/Baseline\ commission$	0.084	0.038
	(1.08)	(1.57)
Constant	3.849***	3.799***
	(13.57)	(41.78)
Observations	12,531	26,838
R-squared	0.39	0.38
Year*Month FE	Yes	Yes
Worker FE	Yes	Yes

Panel C: By age

	$Sales\ commission_t/Baseline\ commission$	
	≤ 40 years old	> 40 years old
	(1)	(2)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: negative\ return$	1.009**	-0.510
	(2.15)	(0.90)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: positive\ return$	-0.223	-0.929**
	(1.66)	(2.41)
$Sales\ commission_{t-1}/Baseline\ commission$	0.097	0.031
	(1.32)	(1.18)
Constant	2.569***	4.912***
	(13.31)	(36.32)
Observations	18,332	21,037
R-squared	0.34	0.40
Year*Month FE	Yes	Yes
Worker FE	Yes	Yes

Panel D: By education

	$Sales\ commission_t/Baseline\ commission$	
	Less educated	More educated
	(1)	(2)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: negative\ return$	1.338**	-0.540
	(2.26)	(1.18)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: positive\ return$	-0.181	-0.967***
	(0.62)	(3.38)
$Sales\ commission_{t-1}/Baseline\ commission$	0.114**	-0.016
	(2.19)	(0.61)
Constant	3.866***	3.816***
	(17.57)	(45.82)
Observations	18,467	20,902
R-squared	0.45	0.30
Year*Month FE	Yes	Yes
Worker FE	Yes	Yes

Panel E: By income

	$Sales\ commission_t/Baseline\ commission$	
	Lower income	Higher income
	(1)	(2)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: negative\ return$	0.325	-0.418
	(1.44)	(0.46)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: positive\ return$	-0.511**	-0.984**
	(2.62)	(2.43)
$Sales\ commission_{t-1}/Baseline\ commission$	0.054	0.038
	(1.50)	(1.03)
Constant	3.469***	6.077***
	(29.11)	(21.46)
Observations	33,978	5,391
R-squared	0.38	0.40
Year*Month FE	Yes	Yes
Worker FE	Yes	Yes

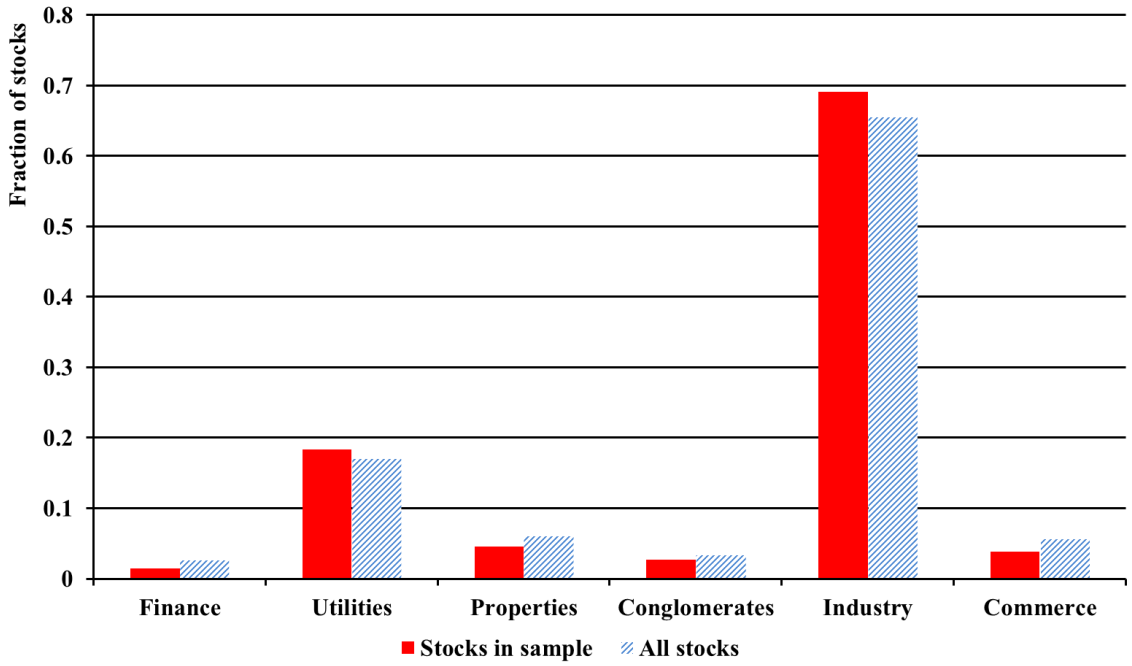
Notes: This table investigates the asymmetric output response to negative versus positive stock investment returns. Panel A reports the effect of negative and positive last-month stock investment returns (scaled by lagged stock market wealth), respectively, for the full sample. Panels B to E report the asymmetric effect for subsamples divided by gender, age, education, and total income, respectively. Please refer to the Appendix for detailed variable definitions. Months on and before those used to calculate the baseline commission are excluded from the regressions. Individual and worker group-specific year-month fixed effects are included. T-statistics are reported in parentheses. Standard errors are clustered at the individual and year-month level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

INTERNET APPENDIX

FOR
STOCK MARKET WEALTH AND WORKER OUTPUT

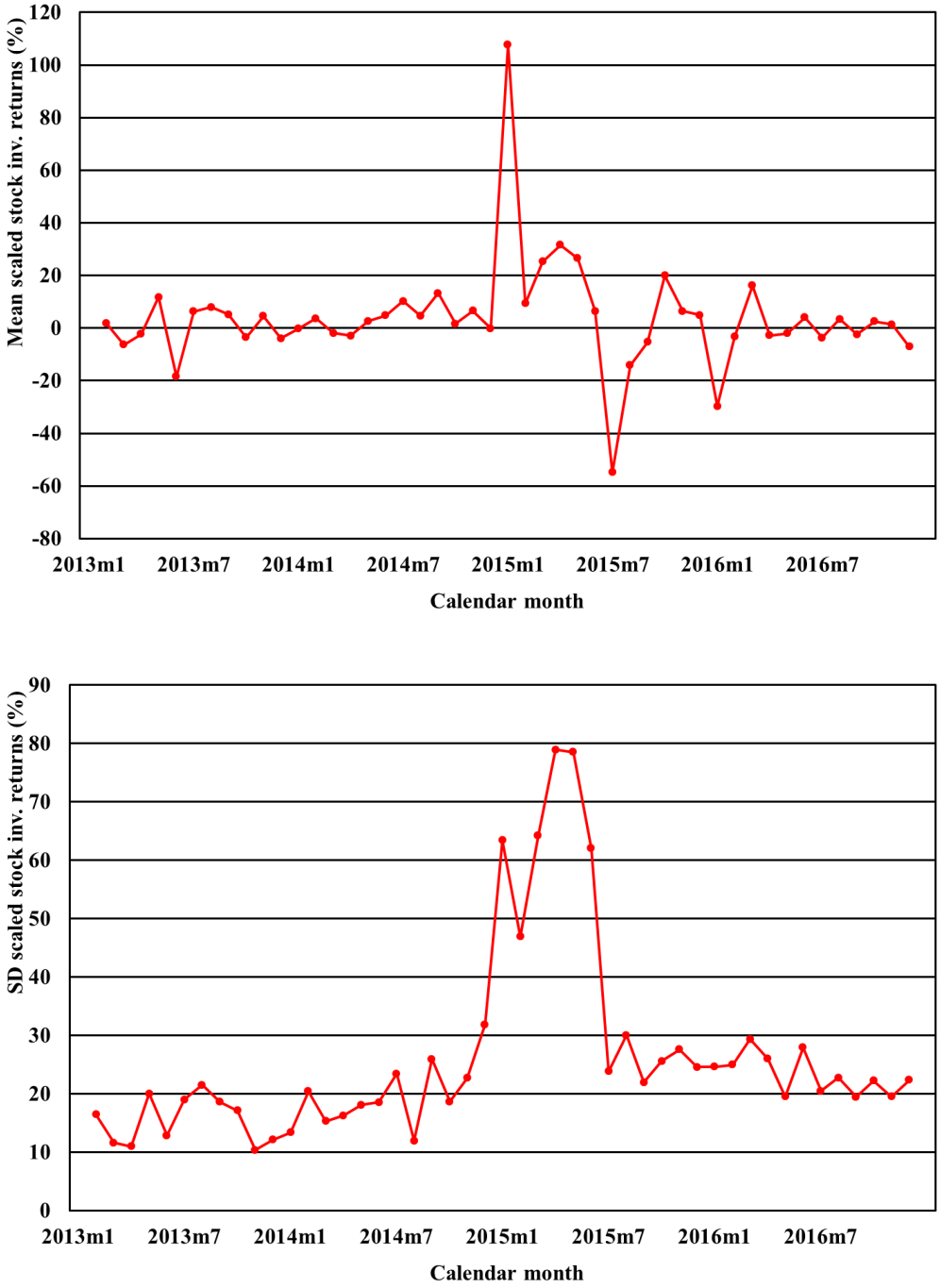
NOT FOR PUBLICATION

Figure IA1: Stock Industry Distribution



Notes: This figure plots the industry distribution of stocks held by workers in the sample and all A-share stocks in the Chinese stock market during the sample period (i.e., 2013–2016).

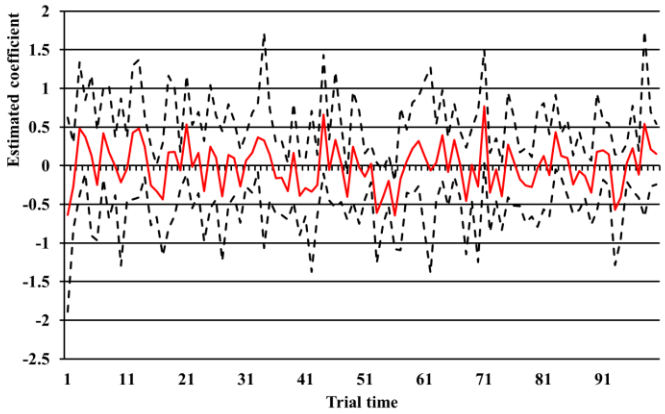
Figure IA2: Variation of Stock Investment Returns over Time and across Investors



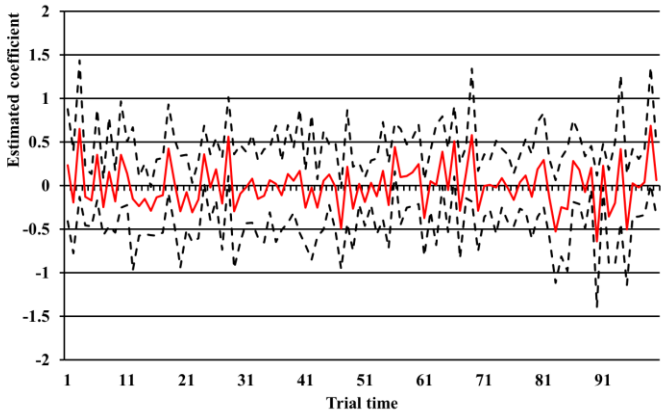
Notes: This top panel plots the monthly average of stock investment returns (scaled by the investor's stock market wealth, proxied by the stock holdings at the end of the last month) of all investors during our sample period (2013:01-2016:12). The bottom panel plots the standard deviation of the scaled stock investment returns across all investors for each month during our sample period. Please refer to the appendix for detailed variable definitions.

Figure IA3: Estimated Coefficients from Random Match

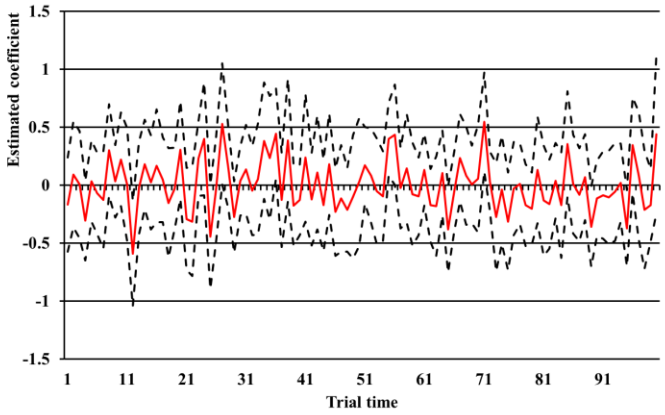
Panel A: Assigning stock investment returns to a random non-investor



Panel B: Assigning stock investment returns to a random investor



Panel C: Assigning random time for stock investment returns within each investor



Notes: This figure plots the distributions of estimated coefficients with 95% confidence intervals from random return assignment tests. Panel A assigns one investor's investment returns to a random non-investor, and iterates 100 times. Panel B assigns one investor's investment returns to a random investor, and iterates 100 times. Panel C randomly assigns the time of stock investment returns within each investor, and iterates 100 times.

Table IA1. Additional Summary Statistics

Panel A: Demographics (non-investors)

	Mean	Median	Std. Dev.
	(1)	(2)	(3)
Age	35.8	35.0	8.6
Female (%)	64.8	100.0	47.8
Years of education	14.2	15.0	1.4
Tenure (months)	18.6	4.5	37.7
Team manager and above (%)	1.1	0.0	10.2
No. of workers	14.345		

Panel B: Worker performance (non-investors)

	Mean	Median	Std. Dev.
	(1)	(2)	(3)
Sales commission (RMB)	609	264	1,093
Promotion (%)	5.1	0.0	6.9
Demotion (%)	2.6	0.0	4.4
Exit (%)	5.8	0.0	12.2
Withdraw (%)	1.8	0.0	6.0
No. of workers	14.345		

Panel C: Stock characteristics in 2012

	Stocks held by investors in the sample		Other A-share stocks		Difference in means: (1)-(3)
	Mean	Median	Mean	Median	
	(1)	(2)	(3)	(4)	(5)
Market capitalization (RMB, in billions)	4.7	2.5	12.5	4.3	-7.8***
Price-to-earnings ratio	61.5	30.4	62.5	25.2	-1.0
Market-to-book ratio	2.7	2.2	3.0	1.9	-0.3*
Share turnover rate (%)	27.1	19.4	25.7	17.8	1.4
No. of firms	1,498		934		

Notes: This table reports additional summary statistics. Panels A-B provide the summary statistics of demographic characteristics and work performance for the non-investors without any stock investment during our sample period respectively. Panel C compares the stock characteristics for A-share stocks that have ever been held and that have never been held by investors in our sample by December 31, 2012. Please refer to the appendix for detailed variable definitions. All monetary variables are expressed in RMB, and the average exchange rate between RMB and USD during our sample period is around 0.159 USD per RMB. All non-dummy variables are winsorized at the 0.5% level. Differences in means of each variable are reported in column (5). ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table IA2. Heterogeneity by Return Magnitude Relative to Income

	$Sales\ commission_t/Baseline\ commission$		
	Large return if $\lvert Stock\ inv.return_{t-1}/Baseline\ total\ income \rvert > X$		
	X=1	X=6	X=12
	(1)	(2)	(3)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: small\ return$	-0.260	-0.447	-0.351
	(0.48)	(1.47)	(1.48)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: large\ return$	-0.403***	-0.375***	-0.414***
	(3.10)	(2.75)	(2.73)
$Sales\ commission_{t-1}/Baseline\ commission$	0.053*	0.053*	0.053*
	(1.69)	(1.69)	(1.69)
Constant	3.751***	3.752***	3.752***
	(30.34)	(30.35)	(30.32)
Observations	39,369	39,369	39,369
R-squared	0.38	0.38	0.38
Year*Month FE	Yes	Yes	Yes
Worker FE	Yes	Yes	Yes

Notes: This table reports the heterogeneous effect by the magnitude of stock investment returns relative to total income. Stock investment returns with absolute dollar value higher than *X* times one's baseline total income are defined as large stock investment returns. *X* takes the value of 1, 6, and 12 in columns (1)–(3) respectively. Please refer to the appendix for detailed variable definitions. Months used to calculate baseline commission and baseline total income are excluded from the regressions. Individual and year-month fixed effects are included. T-statistics are reported in parentheses. Standard errors are clustered at the individual and year-month level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table IA3: Effect of Stock Investment Returns on Insurance Policy Sales

	$Total\ premium\ sold_t/Baseline\ premium$
	(1)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}$	-0.342***
	(3.15)
$Total\ premium\ sold_{t-1}/Baseline\ premium$	0.048
	(1.40)
$LongTerm\ premium\ sold_{t-1}/Baseline\ premium$	
$ShortTerm\ premium\ sold_{t-1}/Baseline\ premium$	
Constant	3.552***
	(28.10)
Observations	39,369
R-squared	0.40
Year*Month FE	Yes
Worker FE	Yes

Notes: This table reports the average effect of the last-month stock investment returns (scaled by lagged stock market wealth) on investors' total insurance premiums sold (scaled by the baseline premium). Please refer to the appendix for detailed variable definitions. Months used to calculate baseline premiums are excluded from the regressions. Individual and year-month fixed effects are included. T-statistics are reported in parentheses. Standard errors are clustered at the individual and year-month level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table IA4. Asymmetric Effect by Worker Characteristics

	$Sales\ commission_t/Baseline\ commission$			
	Gender: male=0, female=1	Age: ≤40 years old=0, >40 years old=1	Education: less edu. =0, more edu. =1	Income: lower income=0, higher income=1
	(1)	(2)	(3)	(4)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: group\ 0, neg.ret.$	2.159***	1.048**	1.343**	0.325
	(3.14)	(2.04)	(2.23)	(1.45)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: group\ 0, pos.ret.$	-0.853**	-0.233	-0.195	-0.511**
	(2.27)	(1.53)	(0.65)	(2.62)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: group\ 1, neg.ret.$	-0.739*	-0.496	-0.551	-0.430
	(1.95)	(0.88)	(1.16)	(0.49)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: group\ 1, pos.ret.$	-0.379*	-0.935**	-0.988***	-0.967**
	(1.82)	(2.42)	(3.39)	(2.67)
$Sales\ commission_{t-1}/Baseline\ commission$	0.053*	0.054*	0.053*	0.052
	(1.70)	(1.71)	(1.68)	(1.65)
Constant	3.812***	3.820***	3.829***	3.820***
	(32.53)	(32.40)	(32.27)	(32.27)
Observations	39,369	39,369	39,369	39,369
R-squared	0.38	0.39	0.39	0.39
Worker group*Year*Month FE	Yes	Yes	Yes	Yes
Worker FE	Yes	Yes	Yes	Yes

Notes: This table reports the asymmetric effect of negative versus positive stock investment returns for worker groups divided by various characteristics. In columns (1)–(4), worker groups are divided by gender, age, education, and total income, respectively. Please refer to the appendix for detailed variable definitions. Months used to calculate baseline commission are excluded from the regressions. Individual and worker group-specific year-month fixed effects are included. T-statistics are reported in parentheses. Standard errors are clustered at the individual and year-month level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table IA5. Heterogeneity by Stock Market Entry Time

	$Sales\ commission_t/Baseline\ commission$
	(1)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: later\ entry$	-0.001
	(0.00)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}: earlier\ entry$	-0.555***
	(3.30)
$Sales\ commission_{t-1}/Baseline\ commission$	0.053*
	(1.70)
Constant	3.756***
	(30.48)
Observations	39,369
R-squared	0.38
Worker group*Year*Month FE	Yes
Worker FE	Yes

Notes: This table reports the heterogeneous effect by the stock market entry time of the investors in the sample. Please refer to the appendix for detailed variable definitions. Months used to calculate baseline commission are excluded from the regressions. Individual and worker group-specific year-month fixed effects are included. T-statistics are reported in parentheses. Standard errors are clustered at the individual and year-month level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table IA6. Alternative Specification: Including Non-investors as the Control Group

	$Sales\ commission_t/Baseline\ commission$	
	All non-investors	PS matched non-investors
	(1)	(2)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}$	-0.397***	-0.435***
	(3.71)	(4.32)
$Sales\ commission_{t-1}/Baseline\ commission$	0.085***	0.074***
	(3.77)	(2.97)
Constant	2.542***	3.134***
	(39.74)	(36.67)
Observations	166,248	84,498
R-squared	0.37	0.38
Year*Month FE	Yes	Yes
Worker FE	Yes	Yes

Notes: This table reports the average effect of the last month stock investment returns (scaled by lagged stock market wealth) on workers' sales commission (scaled by the baseline commission) when non-investors are included in the regression. Column (1) includes all non-investors without stock investments during our sample period in the regression. Column (2) includes the PS-matched non-investors in the regression. The PS matching is based on a logistic regression using a set of worker characteristics including age, gender, education level, urban status, average tenure, job level, and team identifier during our sample period. We use the nearest-neighbor matched non-investors for each investor in the sample. Stock investment return for all non-investors is assigned 0. The baseline commission for non-investors is the average sales commission for the three months starting with the first positive sales commission. Please refer to the Appendix for detailed variable definitions. Months on and before those used to calculate baseline commission are excluded from the regressions. Individual and year-month fixed effects are included. T-statistics are reported in parentheses. Standard errors are clustered at the individual and year-month level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table IA7. Robustness Tests: Alternative Specifications

Panel A: Alternative specifications

	$\Delta\frac{Sales\ commission_t}{Baseline\ commission}$ (1)	$\frac{Sales\ commission_t}{Baseline\ commission}$ (2)
$\Delta Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}$	-0.468**	
	(2.41)	
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}$		-0.405***
		(2.92)
$Stock\ inv.return_t/Stock\ mkt\ wealth_{t-1}$		0.159
		(0.67)
$Sales\ commission_{t-1}/Baseline\ commission$		0.053*
		(1.72)
Constant	-0.103***	3.777***
	(112.68)	(30.55)
Observations	37,264	37,933
R-squared	0.01	0.38
Year*Month FE	Yes	Yes
Worker FE	No	Yes

Panel B: Alternative SE clustering units

	$Sales\ commission_t/Baseline\ commission$		
	Cluster SE by worker (1)	Cluster SE by team (2)	Cluster SE by team and year-month (3)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}$	-0.392**	-0.392*	-0.392***
	(2.03)	(1.95)	(3.31)
$Sales\ commission_{t-1}/Baseline\ commission$	0.053*	0.053	0.053
	(1.70)	(1.61)	(1.60)
Constant	3.752***	3.752***	3.752***
	(29.66)	(27.83)	(29.31)
Observations	39,369	39,369	39,369
R-squared	0.38	0.38	0.38
Year*Month FE	Yes	Yes	Yes
Worker FE	Yes	Yes	Yes

Panel C: Restrict to active workers

	$Sales\ commission_t/Baseline\ commission$	
	At least 6 months of work	At least 12 months of work
	(1)	(2)
$Stock\ inv.return_{t-1}/Stock\ mkt\ wealth_{t-2}$	-0.406***	-0.408***
	(3.48)	(3.31)
$Sales\ commission_{t-1}/Baseline\ commission$	0.055*	0.060*
	(1.76)	(1.84)
Constant	3.752***	3.959***
	(29.96)	(28.66)
Observations	39,103	35,569
R-squared	0.38	0.38
Year*Month FE	Yes	Yes
Worker FE	Yes	Yes

Notes: This table investigates three sets of robustness tests. Panel A employs alternative specifications of the regression. Column (1) tests the effect of the first difference of last-month stock investment returns (scaled by lagged stock market wealth) on the first difference of investors' sales commission (scaled by the baseline commission). Column (2) further controls for the current-month stock investment returns (scaled by lagged stock market wealth) in the regression. Panel B investigates alternative standard-error clustering units. Standard errors are clustered at the individual level, team level, and team and year-month level in columns (1)-(3) respectively. Panel C restricts the analysis to active workers. Active workers are defined as individuals with at least six months or 12 months of work in columns (1)–(2) respectively. Please refer to the appendix for detailed variable definitions. Months used to calculate baseline commission are excluded from the regressions. Individual and year-month fixed effects are included, except for column (1), Panel A. T-statistics are reported in parentheses. Standard errors are clustered at the individual and year-month level, except for Panel B. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.