Entrepreneurial Wealth and Employment: Tracing Out the Effects of a Stock Market Crash

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Abstract

I provide novel evidence that shocks to the wealth of business owners during the Financial Crisis had large effects on their firms' financing, employment and investments. I use Norwegian ownership registers to link investors to both private and public firms. By observing investors' exact holdings of listed stocks, I am able to quantify idiosyncratic shocks to their wealth during the Financial Crisis of 2008–09. I then trace out the effects to the private firms they own and the workers they employ through ownership and employer-employee registers. I find that private firms whose owners suffered large wealth losses during 2008–09 were less likely to receive more equity financing, and experienced large reductions in employment growth and investments. These investment and employment effects are primarily driven by young firms, who, relative to mature firms, obtain considerably less bank financing following an owner wealth shock. Utilizing the employment registers, I decompose employment growth into separations and new hires, and find that the effect primarily manifested itself through a reduction in hiring, and conditional on hiring new workers, young firms were significantly less likely to hire college educated workers. My results show that the procyclicality of entrepreneurial wealth is an important amplifier of adverse economic shocks, and that stock market crashes affect the real economy.

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1 Introduction

Recent research has shown that credit market contractions have large effects on employment during an economic crisis. This has had important policy implications and has underlined the importance of securing the supply of credit from financial institutions, particularly banks, to firms. However, economic crises, such as the Financial Crisis of 2007–08, also saw large drops in the wealth of investors and entrepreneurs. In the presence of financial frictions, this procyclicality of entrepreneurial wealth may work to amplify the consequences of adverse economic shocks. This idea lies at the heart of the financial accelerator framework by Bernanke, Gertler, and Gilchrist (1998), an important underpinning of modern macroeconomics. Yet evidence of how shocks to entrepreneurial wealth affect the real economy, through the employment and investments of their firms is lacking. This presents a limitation to our understanding of how economic shocks amplify and thereby which policies should be pursued to curtail unemployment during a crisis. Since small businesses often rely on owners rather than banks for financing in bad times, securing the supply of credit from banks may be the wrong medicine to curtail employment losses at many firms.[1]

The limited research on the link between household financial shocks and firm outcomes is likely caused by data limitations. First, data that links data on business owners' wealth with the characteristics of their firms is limited. To the extent that it is obtainable, we face the issue that any changes in the owners' wealth is likely highly correlated with, or even endogenous to, their firms' investment opportunities. I overcome this challenge by utilizing administrative tax data from Norway containing information on wealth, by asset classes, for all Norwegian residents. The data also includes security-level data on ownership in listed stocks, allowing me to quantify idiosyncratic wealth shocks while including a wide range of controls, such as the individual's over-all stock market exposure and past portfolio returns. Linking this data to firms and their employees through ownership and employment registries allows me to perform a detailed investigation of the real effects of adverse shocks to the entrepreneur's wealth. Using stock market losses as the identifying variation in wealth has the novel contribution of informing us of the real economic effects of stock market crashes, by tracing out the effect of the stock market crash of 2008–09 to investors, the private firms they own, and their employees.

This empirical setting allows me to address a number of key questions. First, how strong is the link between household and corporate finance? Do owners respond to adverse wealth shocks outside their firm by extracting equity, requiring more dividends, or providing less loans? The answer is not obvious as it may depend on both the inter-temporal and risk preferences of the business owner, elements that are clearly distinct from the mechanisms governing the effects of bank balance sheet shocks on bank

[1] Private business owners are important providers of both finance and management to small and medium-sized firms. The 2016 Small Business Credit Survey finds that the most common source of financing for the 61% of employer firms facing financial challenges was the personal funds of the owners. Recent research also shows that the owners of privately-held firms actively contribute in managing these firms (Smith, Yagan, Zidar, and Zwick, 2017).

lending. Second, how severely do shocks to entrepreneurial wealth affect the real outcomes of firms? There are at least two reasons why we may suspect that effects from a disruption to entrepreneurial finance are more severe than a disruption to bank credit supply. (i) Owners are "ideal" providers of finance to small firms: There is little asymmetric information or potential for moral hazard, allowing the owners to provide funding at a lower cost of capital. It may therefore be harder to substitute away from entrepreneur-provided than bank-provided financing to other sources. (ii) Risk-averse owners may choose to take less risk when they experience an adverse wealth shock, and thus curtail hiring and investments beyond what is necessitated by a pure liquidity shock.

My analysis centers around the Financial Crisis of 2008–09, a period that saw large, and often persistent, drops in the value of stock market portfolios. These losses varied substantially across investors and it is this cross-sectional variation I leverage to identify the effects of wealth losses. I use the portfolio composition of investors at the end of 2007, and keeping this portfolio composition fixed, I calculate the returns these investors would experience during 2008 and 2009. This side-steps the problem that changes in wealth may be endogenous to the economic prospects of the firm.[2] These returns have considerable cross-sectional variation: ranging from -74% in the 5th percentile to 8% in the 95th. I then multiply these returns by the fraction of the investor's financial wealth that was invested in the stock market. This provides my continuous treatment variable that I utilize throughout my analysis and provides a valuable source of exogenous variation in wealth, while allowing us to control for the initial over-all stock market exposure of the investor.

I first examine how wealth shocks to owners affect the equity financing of these firms. This can primarily happen in two ways: (1) Owners can defund the firms by requiring more dividends; or (2) they can fund the firm by increasing Paid-in Capital. I find that a wealth loss of 10% reduces the probability of increasing Paid-in Capital (PIC) by 1.37 percentage points, a sizable effect relative to the mean probability of 6.1 percent. These effects are significantly stronger for more levered firms. I then investigate the effects on dividend payments, and find that while there is little effect for the average firm, there exists significant heterogeneity. Less severley affected, more levered firms pay out less dividends than the firms whose owners experienced wealth losses. I also find evidence that more liquid firms respond by paying out higher dividends to offset the owners losses by NOK 0.33 for every NOK lost.

I then proceed to investigate owner-provided debt financing, which is an important source of financing for Norwegian firms. The average firm has approximately 2.5 times more short-term debt provided by owners than by banks. I find that firms with less shocked owners receive more investor loans whenever their liquidity is low. I find the opposite effect for more levered firms who we found to obtain

[2]For example, entrepreneurs may save more when they expect higher cash-flows in the future. They may also save more if their expected return on capital decreases and income effects dominate inter-temporal substitution effects as in Ring (2020).

differentially more equity financing. This is consistent with equity, rather than debt, is the preferred instrument to finance more levered firms. This seems particularly reasonable in the Norwegian context where book-leverage is publicly observable in business registries and may thus easily be used by, e.g., suppliers to argue for stricter payment schedules.

I continue to explore the real economic effects in terms of employment outcomes. I find that wealth shocks only affect employment when the wealth of the owner is of a comparable magnitude as the potential financing needs of firm. For owners with very little ex-ante private wealth relative to the firm's operating expenditures, I would expect – and find – small to no effects. For owner's with large wealth relative to the firm, I also find no effects. Since most of the adversely affected investors in my sample do not lose more than 50% of their wealth, an owner whose ex-ante wealth greatly exceeds the firm's financing needs would still be able to provide financing after suffering an adverse wealth shock. However, outside of these cases I find statistically significant and economically large effects: A loss of 10% of the owner's financial wealth (equal to one standard deviation of my wealth shock variable) reduces employment growth by almost 5 percentage points.

I also utilize the detailed nature of the Employer-Employee register to decompose employment growth into separations and new hires. To my knowledge, the literature on finance and employment has provided little evidence on how financial frictions may affect these two components of employment growth differently. While separating workers from the firm may mitigate financing short-falls by reducing payroll costs, and have longer-term positive effects on average productivity, it may have significant short-term costs due to potential legal costs and the 1–3 month notice period.[3] It is therefore unclear how attractive job separations are for financially constrained firms. The easier way to reduce operating expenditures would seem to limit hiring, which is typically associated with initial on-the-job training period with potentially little short-term value added. My results are consistent with this intuition. The effect of wealth shocks on employment growth is primarily driven by decreases in hiring. I find that approximately three-quarters of the effect on employment growth is through hiring, and that I cannot reject the null of no effect on job separations.

Employment is a two-way contract. Thus it is unclear whether the wealth shocks limit firm hiring decisions or just their ability to obtain new employees, since new employees may be unwilling to work for firms whose growth prospects seem diminished due to financial constraints. This is unlikely to be the case for fixed assets, thus to complement my analysis I next examine capital expenditures. I find that older firms' over-all investments are not affected by wealth shocks, while a wealth loss of 10% reduces the two-year investments to lagged assets ratio by 4.2 percentage points (or 84% relative to the mean) for young firms. When considering the probability of investing in Plant or Property, I find that a 10% wealth loss reduces the probability by 2.5 percentage points (or 35.7% relative to the mean) for the average firm, and 5.3 percentage points for young firms.

[3]Notice periods are 1–3 months, and are increasing in the age and tenure of the employee.

I find that the adverse real effects of wealth shocks on employment and investments are primarily driven by younger firms (< 10 years). These findings are consistent with Petersen and Rajan (1994) who suggest that firms may follow a pecking-order of borrowing over time with an initial high reliance on funding from the owners. Other financial multipliers, such as leverage, do not interact with the wealth shocks with similar force. To explore this heterogeneity further, I examine the differential ability of young versus old firms to substitute towards other sources of financing. These analyses reveal that older firms are able to substitute towards bank-financing, while younger firms see a reduction in the financing from banks. This is consistent with the notion that younger firms face more expensive external financing due to having had less time to develop creditor relationships or a financial track record, and are therefore more vulnerable to financing disruptions.

What is the main economic mechanism behind my results? I find that my results are only present when the owner's ex-ante wealth suggests that he or she were in a position to provide financing for the firm. This result is in favor of the mechanism being one of harsher financial constraints for the firm. This mechanism is further supported by the fact that effects are primarily driven by younger firms, who I find to be less able to substitute towards bank financing following an owner wealth shock. I also find that wealth shocks affect owner-provided financing. These results are consistent with shocked firms experiencing harsher financial constraints.[4] Finally, my results are specific to the Financial Crisis. I repeat my analysis both before (2005–07) and after (2009-10) and do not find any significant employment responses to concurrent business owner wealth shocks during these periods. This suggests that wealth shocks work to amplify adverse economic shocks, such as reduced availability of credit, business uncertainty and lower demand.

My identification of the effects of wealth shocks on firm outcomes has two potential issues, which are related to the selection of listed stocks. First, investors may select into listed stocks that operate in the same or related industries.[5] This may cause his listed stocks and private firms to be subject to common shocks. Second, unobservable traits, such as ability or risk-aversion, of the investors may lead to correlated outcomes between the listed stocks in his portfolio and the private firm he owns. The richness of the data allows me to address these concerns in multiple ways. Firstly, I show that the results are robust to controlling for a wide range of a wide range of firm and investor characteristics,

[4] There are at least three alternative stories. First, wealth losses could affect the investor's consumption demand. For example, lowered wealth may induce lower consumption of leisure. The owner may therefore wish to work more himself which can crowd out the firm's demand for labor. However, it is not clear how this would be more important for younger firms. Second, updated beliefs about the future may limit the owner's willingness to grow the stock of capital or labor. If this channel were important, I do not see how it would provide the heterogeneous results that my analyses uncover. Third, experiencing a loss of wealth may induce owner-managers to take less risk due to a wealth effect. This is hard to distinguish from a pure liquidity effect since the owners choose the amount of liquidity to provide, and thus also contributes to increasing financial constraints. In that sense it is not necessarily an alternative mechanism.

[5] Døskeland and Hvide (2011) show that Norwegian stock market investors tend to invest in firms that are close both in terms of geography and industry of employment.

such as past portfolio returns or even realized future profitability. I even show my identifying variation in wealth is uncorrelated with pre-crisis observables. Second, I perform placebo-tests by examining the correlation between portfolio losses and firm outcomes when the initial stock market exposure is was too low for any real financing effects to be expected. These tests reveal a precisely estimated correlation of zero. Other than this, the absence of pre-trends and the observed heterogeneity in the treatment effects are more consistent with a story of harshened financial frictions rather than some alternative confounding mechanism driving my results.

My paper contributes to multiple related literatures. By showing how shocks to business owners' wealth affect firm-level employment, likely through increasing financial constraints, I am adding to a growing literature on financial frictions and employment (see, e.g., Berton, Mocetti, Presbitero, and Richiardi 2018, Chodorow-Reich 2013, Benmelech, Frydman, and Papanikolaou 2017, Baghai, Silva, Thell, and Vig 2017 Greenstone, Mas, and Nguyen 2014, Duygan-Bump, Levkov, and Montoriol-Garriga 2015). My results of the importance of business owner wealth for the outcomes of young firms contributes to a large literature on financial frictions and entrepreneurship (see, e.g., Adelino, Schoar, and Severino 2015, Schmalz, Sraer, and Thesmar 2017, Kerr, Kerr, and Nanda 2015, Corradin and Popov 2015). In the broader entrepreneurship literature, it complements research on angel financing (Lindsey and Stein 2019, Kerr, Lerner, and Schoar 2014, Denes, Howell, Mezzanotti, Wang, and Xu 2020) by highlighting the importance of the financial circumstances of investors on firm outcomes. It is also consistent with the findings of Townsend (2015) that financial shocks may propagate through common ownership and the findings of Hanspal (2017) that the loss of wealth for sole-proprietors may inhibit business growth. My analyses of age-heterogeneity in the responses to economic shocks contribute to recent studies of differential effects of economic shocks on firm employment (see, e.g., Adelino, Ma, and Robinson 2017, Brown, Earle, and Morgulis 2015). Finally, this paper contributes to a new literature establishing a causal link from stock market fluctuations to the real economy (Maggio, Kermani, and Majlesi 2018, Chodorow-Reich, Nenov, and Simsek 2019, Crane, Koch, and Lin 2019)

My paper proceeds as follows: Section 2 describes the data. Section 3 provides a discussion of the empirical strategy. Section 4 provides owner-provided financing results. Section 5 considers firm-level employment outcomes. Section 6 investigates investment outcomes. Section 7 shows additional financing results, and Section 8 concludes.

2 Data

2.1 Data sources

This paper utilizes Norwegian administrative data collected by Statistics Norway and the Norwegian Tax Authorities. The different datasources are linked by using (de-identified) consistent personal identification and business identification numbers. It covers the universe of Norwegian residents and

incorporated domestic firms, and is virtually attrition free.[6] Below I provide an overview of my data sources. While this dataset is novel in my setting of examining the effects of owner wealth shocks on firm outcomes, these data sources have been previously combined and used for economics research. One recent example is Fagereng, Guiso, and Pistaferri (2017) who use this data to investigate the effects of uninsurable wage risk on employees' portfolio choices.

Individual Tax Records (1993–2012): These records contain detailed information about individuals' income, broken down into various sources such as wage income, capital income and government transfers. It includes data on individuals' wealth, broken down into different asset classes, such as bonds, mutual funds, listed stocks, non-listed stocks, primary and secondary real-estate, debt and deposits. This data is primarily reported by third-parties, such as firms, banks and other financial intermediaries.

Stockholder Register (2001–2013): This database contains yearly snapshots of ownership positions in all listed and non-listed limited liability companies, from 2004 and 2001, respectively. It contains security (share type and firm) and owner (firm or person) identifiers, and provides the number of shares held at the end of the year and the dividends that were paid.

Employer-Employee Register (1995–2011): This register contains data on each employment relationship between individuals and firms. A record in this dataset is on the firm-plant-employee-year level. For each record I observe firm, plant and employee identifiers, the start and stop dates within the year, as well as the earliest recorded employee-employer relationship, total compensation, and location of work.

Firm Tax Returns (2004–2013): These records contain detailed data on firms' income and assets in the form of approximately 400 accounting variables, and additional variables especially collected for tax purposes. This database covers the universe of incorporated firms.

Supplementary data includes: Records of family links, addresses, gender and marital status from the **Central Population Register** (1993–2010); Educational attainment for all residents from the **National Education Database** (1993–2012).

I obtain industry identifiers for firms from the tax returns, employer-employee register and the stockholder register, in the form of NACE codes, the standard industry classification in the European Union. NACE codes are based on the 4th revision of the U.S. ISIC classification system.

2.2 Sample construction

I describe the construction of my dataset below.

[6] Except from migration and death.

Stock Market Wealth. I obtain stock market wealth and stock returns from the Stockholder register. For listed stocks that are owned by firms, I iterate once on ownership links in order to attribute these shares to private individuals.[7] I utilize this to calculate the two-year forward return, $R_{v,t,t+2}$ of an investor's portfolio, based on his portfolio composition at time t (December 31st of that year). This does not account for any portfolio adjustments the investor does after time t. I also compute his portfolio HHI as the sum of squared portfolio weights within his portfolio, and the average of the natural log of the total market cap of the stocks in his portfolio. I drop investors who own a large share ($\geq$0.5%) of a listed stock. Some securities have missing price data, I omit these and owners who on average hold more than 3 such stocks.

Private firm ownership. I start with the stockholder register for limited liability companies, which is on the owner-firm-year level. I exclude all firms that have been or become publicly listed firms at some point. The owner can be a firm, thus I iterate once on the ownership links to uncover individuals who own firms indirectly. I exclude firms where I cannot attribute ownership to at least 75% of the shares in a company after this procedure. After finalizing, I expand the data along the time dimension, replacing ownership shares with 0, in order to, e.g., be able to observe lagged firm variables before the investor became an owner.

Firm employment. I link all employees to firms using the Employer-Employee register, which is on the firm-plant-employee-year level. I first aggregate all variables to the firm-level. For start and end dates I use the min and max, respectively. I then merge this data with the Central Population Register and the National Education database, both of which are on the individual level. I merge this data again, on the firm-individual-year level with the stockholder register to distinguish between regular employees and owner-employees. I calculate employee tenure by utilizing the variable for the employees earliest employment relationship with the firm, or the earliest observed payroll transaction. I then aggregate this data to the firm-year level. I create means of education and gender variables by weighting individuals by the duration of their within-year employment.

Firm-Owner-Year level dataset. My main analysis dataset is then created by merging the Private firm ownership dataset (firm-owner-year) with the the employment data in order to know whether the owner is employed (on the firm-employee-year level); I then obtain firm-level employment characteristics by merging this with the firm-year level employment data; I merge this with firm tax records (firm-year); owner tax returns (individual-year); owner education (individual); owner gender and other demographics (individual); and finally with the Stock Market Wealth data (owner-year).

I then only keep firm-investor observations that satisfy the following criteria in 2007: (1) Firm profitability must be between -75% and 75%; (2) The investor must own at least 1% of the firm; the firm must employ at least 1 non-owner. This leaves us with 67,000 firm-investor level observations in

[7] Investor's may choose to own stocks and other financial assets through LLCs for tax smoothing reasons.

2007, and approximately 32,000 firms employing around 300,000 non-owner employees.

For my analyses I focus on the subset of firm-investor observations where I observe that the investor owns listed stocks. This reduces my sample to 20,000 firm-investor observations. I make the additional restriction that the owner must have at least 1% of his gross financial wealth (GFW) in listed stocks, and his stock market holdings make up at least 1% of the average of the past 2 years operating expenditures of the firm he owns. This reduces the number of firm-investor observations in 2007 to approximately 4,700.

2.2.1 Key variables

Gross Financial Wealth (GFW). This is the sum of all domestically held financial assets: deposits, bonds, mutual fund holdings, listed stocks, taxable value of private equity holdings, and outstanding claims.[8] Deposits, bonds, mutual funds and listed stocks are third-party reported (e.g., banks or other financial intermediaries) and are marked to market. Private equity holdings are provided in the firm's tax returns to the tax authorities and is then pre-filled onto investors' tax returns. It is roughly computed as the investors ownership share * (historical cost of firm assets + market value of financial assets - firm debt).[9]

Stock Market Exposure. This is the fraction of the investor's Gross Financial Wealth that is invested in listed stocks.

$$\frac{Stocks_{v,t}}{GFW_{v,t}} \tag{1}$$

Returns. Throughout this paper I will refer to "intended returns" as just returns. Intended returns are the returns that the investor would experience from time t to $t+j$ assuming that his portfolio composition does not change after time t, i.e. the weight, $w_{v,s,t}$, of investor, v's, holdings of stock, s, does not change between time t and $t+j$.

$$R_{v,t,t+j} = \sum_s R_{v,s,t,t+j} \cdot w_{v,s,t} \tag{2}$$

Stock Market Wealth Shock. My main explanatory variable is the product of (1) investor's intended returns, based on his portfolio composition at the end of 2007, from 2007 to 2009, and (2) the investor's stock market exposure. This product gives us the fraction of the investor's wealth that he is "intended" to lose.

$$\frac{Gains_{v,t+1,t+2}}{GFW_{v,t}} = R_{v,t,t+2} \cdot \frac{Stocks_{v,t}}{GFW_{v,t}} \tag{3}$$

[8] These correspond to the following items on the tax return form for individuals: 4.1.1 (Deposits), 4.1.4 (Mutual funds), 4.1.5 (Bonds), 4.1.6 (Outstanding claims), 4.1.7 (listed stocks), 4.1.8 (taxable value of private equity holdings)

[9] It is perhaps a poor proxy for actual private equity wealth, but it proxies well for financial (and liquid) assets that the investor may dispose over in the firms he owns.

2.3 Firm summary statistics

The average firm in my sample has NOK 2.8M (USD 360,000) in assets, and employs 8.54 individuals, out of which 6.96 are regular employees and not owners in the firm. My results thus mostly speak to my understanding of smaller firms. These firms, nevertheless, make up a sizable fraction of employment in most countries.[10]

Table 1: Firm characteristics

	N	mean	sd	p10	p25	p50	p75	p90
log(Assets)	4051	14.89	1.14	13.54	14.12	14.84	15.57	16.38
Firm Age	4051	13.77	11.56	2.00	6.00	11.00	19.00	26.00
Paid Dividends	4051	0.29						
Leverage (LT)	4026	0.09	0.17	0.00	0.00	0.00	0.10	0.34
Leverage (ST)	4026	0.41	0.21	0.15	0.25	0.39	0.54	0.70
Profitability	4026	0.10	0.15	-0.02	0.02	0.08	0.17	0.28
Cash/OpEx	4026	0.24	0.26	0.02	0.06	0.15	0.31	0.61
# Owners	4026	2.76	1.81	1.00	1.00	2.00	4.00	5.00
Employee Characteristics								
# Owner-employees	4051	1.58	1.30	0.00	1.00	1.00	2.00	3.00
# Reg. employees	4051	6.96	11.99	1.00	1.00	3.00	7.00	15.00
Avg. Age	4051	40.53	10.71	27.00	33.00	40.00	47.40	55.50
Avg. Years of Edu.	4051	13.11	2.06	11.00	11.86	12.75	14.00	16.75

All variables are measured as of end-of-year 2007. Firm owns listed stocks is a dummy for whether or not the firm is listed as owning any public equity in the Stockholder Register. LT refers to long-term, and ST refers to short-term. Cash/OpEx is the sum of bank deposits and cash divided by the average of the firm's past two years operating expenditures. # Owners counts the number of owners in the firm, including owners that are not in my analysis sample.

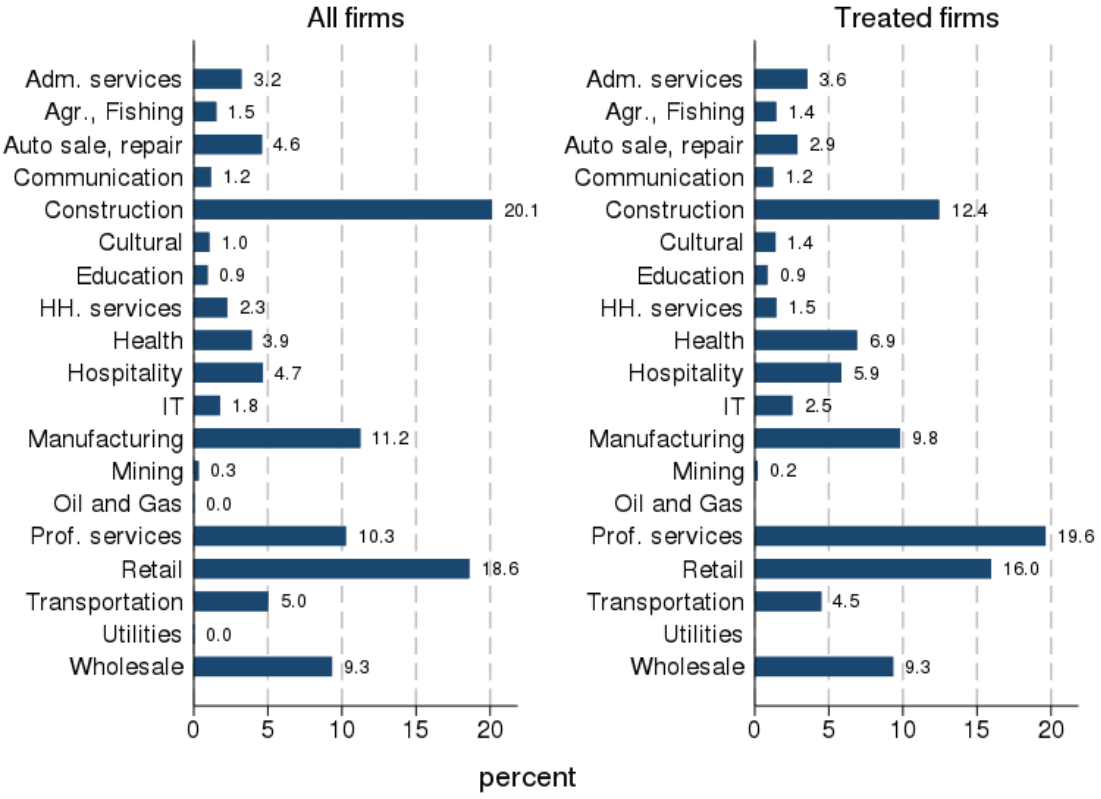
2.4 Industry composition of firms

I find that the industry composition of firms in my sample is comparable to that of the population of closely-held employer firms in Norway. The main sample restriction (to be included in the sample of **Treated firms**) is that the firm must have one or more owners who own listed stocks. This leads my sample to overweight professional services, and downweight the construction industry. I also observe that oil and gas companies are not highly present in my data. This is related to the fact that oil and gas

[10] As mentioned in the introduction, in 2017, 28% of U.S. private sector employees worked at firms employing less than 50 people. In Norway this fraction is closer to 50%.

companies tend to be very large, and are often listed on the stock exchange or have more complicated ownership structures with a large presence of foreign ownership. Firms where I cannot link a majority of ownership shares to private, domestic individuals through at most one holding company are are excluded from my data. The largest industry group in my sample is professional services. This group consists mostly of accounting firms (30%), engineering services (25%) and auditing firms (10%).

Figure 1: Industry Composition of Firms



Due to the large overrepresentation of Professional Services in my treatment sample (firms whose investors own listed stocks), and that these industries are made up of mostly smaller firms with little employment or investment activity, I downweight these firms by a factor of 0.5 in my analyses on employment and investment effects.[11]

2.5 Firm-Investor pairs

This section provides summary statistics on the firm-investor ownership links in 2007. On the firm-owner level, the mean ownership share is 55%, when including spousal co-ownership. I find that

[11] This is not crucial. My main results on employment are highly robust to different weighting schemes. These results are reported in Table 27 in the Appendix.

most of my owners were also present in previous years: Conditional on the firm existing in 2004, 92% of owners were present also in 2004. I find that a large fraction of shares are owned via holding companies, which I define to be ownership through another LLC. I find that 16% (11%) of owners have increased (decreased) the number of shares they own since 2004. I observe that 71% of owners live in the same city as their firm, and 85% live in the same county or region.

There is a large presence of "family businesses" in my sample. Conditional on not being a sole-owner, 21% of investors co-own with a sibling, 17% is the parent of an owner, while 11% is the child of another owner.[12]

Most (59%) of my owners are also employed in the firm. On average, they have worked in the firm for 11.71 years, and their wage-earnings from the firm make up 96% of their total wage earnings, implying that few owner-employees are also employed elsewhere. 30% of my firms pay dividends, and on average (including those who do not pay dividends) these dividends are equal to 5% of their Gross Financial Wealth in 2007, and the sum of dividends in 2008 and 2009 made up, on average, 17% of their 2007 Gross Financial Wealth, implying that dividend payments increased for the treated firms during the financial crisis.

Table 2: Firm-Owner Pair Statistics

	N	mean	sd	p10	p25	p50	p75	p90
Ownership (Share)	4783	0.55	0.34	0.10	0.25	0.50	1.00	1.00
Employed	4783	0.60						
Employment Tenure (Years)	2669	11.75	8.47	2.00	5.00	10.00	18.00	24.00
GFW/OpEx	4783	0.75	0.77	0.08	0.18	0.44	1.05	2.45
Stocks/GFW	4783	0.20	0.22	0.02	0.05	0.11	0.27	0.53
Gains_{08-09}/GFW	4783	-0.06	0.11	-0.16	-0.07	-0.02	-0.01	-0.00

All variables are measured as of end-of-year 2007, except Gains_{08-09}, which utilizes data on stock returns from 2007 to 2009. The unit of observation is the firm-investor level, and each observation is weighted by the investor's stock market exposure such that the weights sum to 1 for each firm.

2.6 Business Owners in the sample

In this section I provide summary statistics for the owners in my sample. My sample investors are primarily men between 35 and 65 years old. I see that very few of the owners in the sample own many firms, with a mean of 1.08, I am therefore unlikely to observe many professional investors, e.g., angel investors, in my analysis sample. I also see that the business are on average fairly well-educated, with 45% having a at least a college degree, considerably more than in Schmalz, Sraer, and Thesmar (2017). In their sample of french entrepreneurs, only 23% have a college diploma. However, my number is very

[12] I have fewer children than parents in my final sample, since minors are not included in my analysis.

consistent with Levine and Rubinstein (2017) who find that 46% of incorporated entrepreneurs in the Current Population Survey (1996-2012) have a college degree.[13]

Table 3: Business owner characteristics

	count	mean	sd	p10	p25	p50	p75	p90
log(GFW)	4150	14.42	1.36	12.69	13.56	14.41	15.30	16.11
log(Earnings)	4150	12.88	1.00	11.86	12.73	13.04	13.37	13.70
Age	4150	52.38	10.94	37.00	45.00	53.00	60.00	65.00
Male	4150	0.85	0.36					
HighSchool	4150	0.91	0.28					
College	4150	0.45	0.50					
Owns $>$ 50% of a firm	4150	0.49	0.50					
# Firms owned	4150	1.26	0.70	1.00	1.00	1.00	1.00	2.00

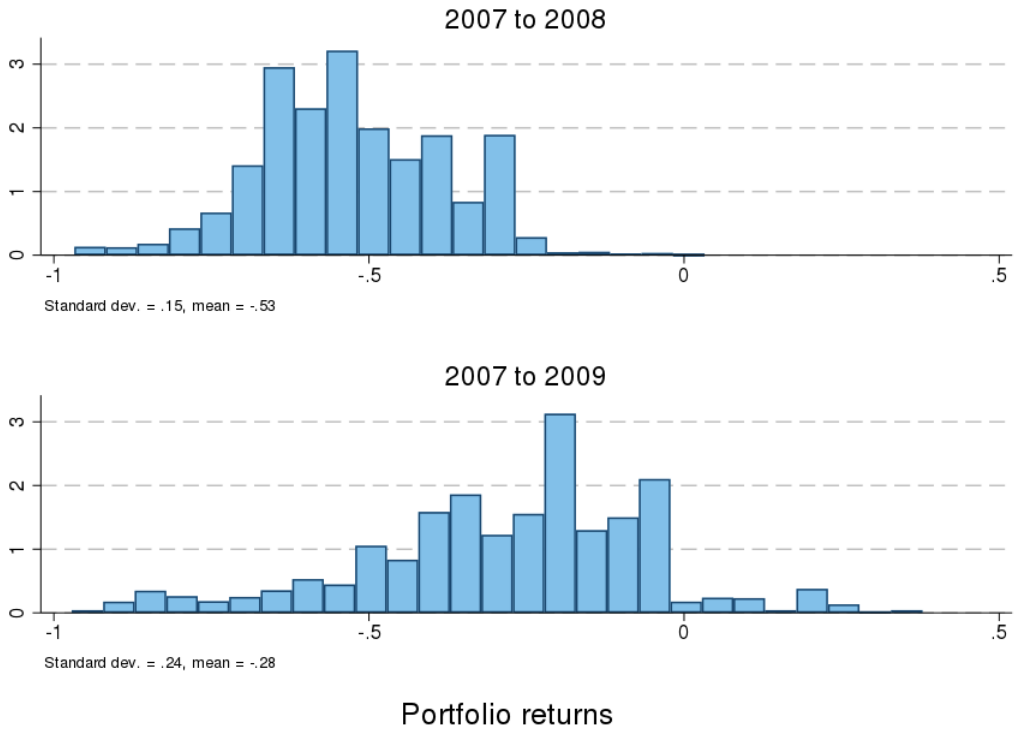
All variables are measured as of end-of-year 2007. The unit of observation is the investor level. # Firms owned counts the number of firms where the owner owns $\geq$ 1% of the shares, including firms that may not be in the analysis sample. College indicates completed higher education. Earnings are total taxable wage earnings and sole-proprietor income.

2.6.1 Owners' Stock Portfolios

Figure 2 provides the distribution of my instrumented stock returns from 2007 to 2008, and from 2007 to 2009. I see that almost all investors had negative portfolio returns from 2007 to 2008, and there is only moderate dispersion in returns (sd=15%). From 2007 to 2009, on the other hand, there is a large dispersion (sd=25%), with almost 5% of investors experiencing positive returns, and 5% of investors losing almost three-quarters of their stock portfolio value.

[13]For incorporated entrepreneurs in the NLSY (1982-2012), they find that 36% of incorporated entrepreneurs have a college degree.

Figure 2: Stock Market Portfolio Returns



3 Empirical Strategy

My main regression specification to measure the effect of owner wealth shocks on firm outcomes, $Y_{f,v}$, is as follows:[14]

$$Y_{f,v} = \alpha_n + \alpha_r + \alpha_n + \beta \frac{Gains_{v,08,09}}{GFW_{v,07}} + \gamma \frac{Stocks_{v,07}}{GFW_{v,07}} + \rho' P_{v,07} + \eta' V_{v,07} + \zeta' F_{f,07} + \epsilon_{f,v} \tag{4}$$

Where α_r and α_n are region and industry fixed effects, respectively. I utilize either two or three digit NACE codes, and regions are the 19 Norwegian counties. My main explanatory variable is $Gains_{v,08,09}/GFW_{v,07}$, which tells us the fraction of the business owner's financial wealth gained (or mostly lost) in the stock market during 2008 and 2009.[15] My main control variable is the fraction of

[14] $Y_{f,v}$ includes a subscript v, since for some outcomes the variable is measured on the firm-investor level, e.g., dividend flows.

[15] I choose 2008–09 for the follow two key reasons. First, while the largest losses occurred during 2008, the correlation between 2008 and 2009 portfolio returns is approximately -1, driven by a similar autocorrelation in the underlying stocks on the Oslo Stock Exchange. Thus the portfolios that performed the worst during 2008 performed fairly well during

wealth invested in the stock market per December 31st 2007, $Stocks_{v,07}/GFW_{v,07}$, which I also include as a squared term.

P is a vector of portfolio controls, including the portfolio HHI and the average log size, as defined by stock market capitalization, of the firms in the portfolio. It also includes a variable indicating the fraction of listed stocks held through a holding company (a separate LLC). In some of my specifications, I also condition on past returns by including 1st through 4th order polynomials in demeaned portfolio returns between 2005 and 2007.[16]

V is a vector of investor controls, including age bins (20-35; 36-45 ;46-55 ;55-67 ;67+)[17], log(GFW), log(Debt), log(Wage or business income), dummies for educational attainment (cumpulsory, high-school, and college), and the share of financial wealth invested in mutual funds.

F is a vector of firm controls including long-term (LT) and short-term (ST) leverage, log(Assets), log(OpEx), log(Total wages), Profitability[18], and liquidity, as measured by Cash/OpEx, which is the sum of cash and bank deposits divided by the firm's average operating expenditures over the past two years. In specifications including both F and V controls, I also include the relative size of the investor, as measured by the ratio of the investor's GFW to the firm's OpEx.

In my regressions on firm-level outcomes I apply weights so that each firm is equally weighted in the presence of multiple investors. While the average firm has 2.75 owners, most of these owners will not appear in the regression at the same time, since I only include owners with a stock market exposure (Stocks/GFW) exceeding 0.01. Only a handful of firms have multiple business-owners satisfying this requirement, and for those firms I weight the investors according to the size of their stock market portfolio. For my main results on employment, I also show the results of multiple robustness tests with different weighting schemes, including only keeping the most exposed investor per firm.

In my baseline approach I two-way cluster standard errors on the firm and investor level. I find that my estimated standard errors *shrink* slightly when instead two-way cluster on both the level of the largest firm in the investor's stock portfolio or the firm's three digit NACE code.

2009, making wealth shocks based on 2008 returns alone highly transitory. Second, I opt to not use returns over an even longer period since my portfolio compositions are based on the 2007 portfolio, thus the further out I go the weaker my "instrument" becomes as investors have more time to change their stockholdings.

[16] I do not do this in my main specifications as it reduces my sample size by about 12%. However, I find that my results are unaffected by including these controls.

[17] 67 is the most common retirement age in Norway.

[18] In one specification I also include future profitability, as measured in 2010. Since future profitability is endogenous to the wealth shock this variable is not part of my main set of controls. Reassuringly, however, I find that my results are robust to including this as a control.

3.1 Discussion of internal validity

The main threat to my empirical strategy is that owners may select into listed stocks that are exposed to similar shocks as the private firms they own. Another potential issue is that investor characteristics, such as risk-tolerance or perhaps ability, may be correlated with both portfolio returns and firm performance (or expectations) during the financial crisis. I address these concerns in turn below.

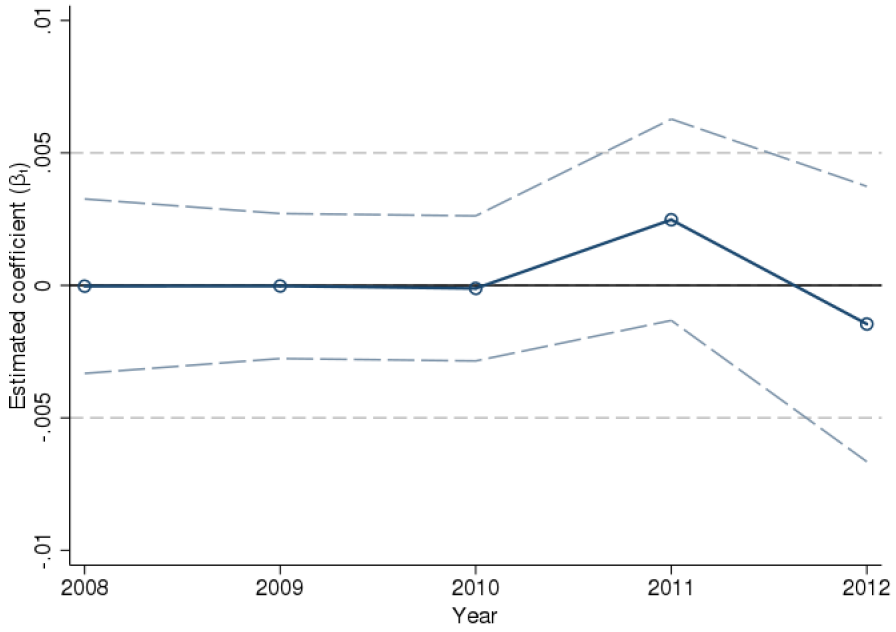
3.1.1 Correlation between Stock market returns and firm outcomes

If investors are biased towards selecting listed stocks that are geographically close or operate the same or related industries, correlations between stock market wealth shocks and firm outcomes may be confounded if my region and industry fixed effects do not fully capture this selection. For example, an investor may own an engineering consulting firm that specializes in the oil industry, but the industry code only specifies his firm as a structural engineering consultancy.

These shocks may confound my estimates both by affecting the cash flow of the firms I seek to analyze, or their expectations of future business opportunities. To address this I focus on a sample of business owners whose stock market exposure is low, thus the effect of any wealth shocks are likely to be highly limited. More specifically, I restrict the sample to owners with stock market exposures between 0.25% and 10% of their total financial wealth. I require at least 0.25% exposure to limit the number of investors with trivially small portfolios, yielding a sample of 5,648 firm-owner pairs.[19] I report the results in Figure 3 and find no significant correlation between stock returns and either concurrent or future revenue growth. I perform the same exercise for changes in profitability and find no economically meaningful or statistically significant correlations. These results are presented in the Appendix in Figure 7.

[19] In my analysis samples I only include investors with at least 1% exposure, here I include less exposed investors to increase the sample size and precision. Excluding the the investors with $< 1\%$ exposure yields the same results, but larger standard errors.

Figure 3: Placebo test: Correlation Between Portfolio Returns And Revenue Growth when Stock Market Exposure is Low



Results are obtained by performing the following regression for each year t: $\frac{Revenue_{f,t}-Revenue_{f,t-1}}{0.5\cdot(Revenue_{f,t}+Revenue_{f,t-1})} = \alpha_{n,t}+\alpha_{r,t}+\alpha_{n,t}+\beta_t R_{v,07,09}+\rho'_t P_{v,07}+\eta'_t V_{v,07}+\zeta'_t F_{f,07}+\epsilon_{f,v,t}$. The plot shows the coefficient on the portfolio return from 2007 to 2009. The analysis is limited to investors with a stock market exposure between 0.25% and 10%, the other sample criteria are identical to those in my other specifications.

3.1.2 Investor Characteristics and Stock Market Returns

Investors who lost more during the 2008–09 may have picked more procyclical listed stocks *and* private firms. However, I show in my results on employment that this does not seem to be the case. Wealth losses during 2008–09 predict lower employment growth during 2008–10, but not before. My results are also highly robust to controlling for past returns, and their higher order moments. One may also worry that effects are confounded by ability. However, I do not find much consistent evidence with this. Table 20 in the Appendix reveals that profitability is uncorrelated with future stock returns. This results hold through when I condition on the owner having been present in the firm for multiple years, thus giving the investor's ability time to materialize into profitability for the firm. My main results on employment are also robust to controlling for both past and future profitability. Finally, the heterogeneity of my results do not seem consistent with these confounders driving my results.

3.2 Differences on Observables

I now investigate whether firms whose owners were more exposed to the stock market or experienced larger wealth losses were different on observable characteristics. I regress these characteristics on my

main exposure and shock variables and industry and region fixed effects. Taking out these fixed effects allow us to interpret the coefficients as indicators of how these firms differ from other firms in the same region or area.

Reassuringly, I find that my shock variable is not predictive of pre-shock observable characteristics of the firm. However I do find, perhaps unsurprisingly, that firms whose investors had allocated a larger share of their financial wealth to the stock market (Stocks/GFW) are different. I find that these differences are best characterized by a second order polynomial in Stocks/GFW, and to accommodate readability I provide the predicted differences in my Y variables based on increasing Stocks/GFW by one standard deviation (0.22) from the mean (0.20).

Firms with more exposed owners (one standard deviation from the mean) are less profitable (2 percentage points or 21%), smaller (0.11 log points), more levered (4.4 percentage points, or 10%), less liquid (5.1 percentage points or 22%), and slightly younger (0.06 log points). I do not find that that these firms differ on the fraction of workers with a college degree. I note that this is conditional on a sample of firms whose owners had a stock market exposure $\geq$ 1%. These differences serve to reduce the gap between non-treated, i.e., firms whose owners did not own stocks, and the treated firms in my analysis sample, as can be seen in Table 22 in the Appendix. Here I also show that more exposed firms had higher past employment growth than less exposed firms, but in the fourth quartile of exposure past employment growth is identical as to the over-all population of firms. Conclusions are similar for leverage and profitability.

Table 4: Differences on Observables. How Wealth Shocks Predict Lagged Observables

	(1) Profitability	(2) log(Assets)	(3) Leverage	(4) Cash/OpEx	(5) log(Firm Age)	(6) Frac. College
$\text{Gains}_{t,t+2}/\text{GFW}_t$	-0.032	-0.339	-0.049	0.016	0.121	0.044
	(0.024)	(0.218)	(0.049)	(0.041)	(0.157)	(0.060)
$\text{Stocks}_t/\text{GFW}_t$	-0.143***	-0.850***	0.351***	-0.418***	-0.455**	0.042
	(0.031)	(0.261)	(0.053)	(0.050)	(0.181)	(0.060)
$(\text{Stocks}_t/\text{GFW}_t)^2$	0.090**	0.595**	-0.240***	0.304***	0.310	-0.006
	(0.036)	(0.300)	(0.061)	(0.057)	(0.212)	(0.070)
$E[\Delta Y \mid \Delta Stocks/GFW = 1 \text{ sdev}]$	-.02	-.107	.044	-.051	-.059	.008
mean(Y)	.096	14.927	.498	.228	2.424	.195
sdev(Y)	.146	1.15	.234	.252	.777	.304
FE	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R
R2	0.154	0.200	0.124	0.192	0.114	0.272
N	4750	4750	4750	4750	4750	4750

Standard errors are two-way clustered on the firm and investor level (when applicable) and are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. $Gains_{t,t+2}/GFW_t$ is amount of stock market gains the investor experienced during 2008 and 2009, fixing portfolio weights in 2007, scaled by his 2007 Gross Financial Wealth. The difference in Y based on changing $Stocks/GFW$ by one standard deviation evaluates $Stocks/GFW$ at the mean. Frac. College refers to the fraction of employees with a college degree.

4 Owner Financing

I now examine how wealth shocks affect the the owner-provided financing of firms. I consider three main outcome variables: (1) A dummy for whether or not the firm received an equity injection; (2) A reduction in retained earnings, through dividend payments to the investor; (3) the change in owner-provided loans.

First, I study how how owners actively change the firm's equity, as opposed to "passively" by making decisions that affect the firm's profits and thus the retained earnings portion of equity. There are essentially three ways that owners can actively affect the amount of equity financing in their firms. First, they can pay out dividends, which is essentially a reduction in the firm's retained earnings portion of total stockholder equity. Second, they can increase equity by paying in additional Paid-in Capital (PIC). Third, they can reduce their equity holdings by paying out PIC. However, Norwegian limited liability companies (LLCs) were required to hold at least NOK 100,000 in Common Stock during my sample period, and since approximately 40% of the firms in my sample have this exact value of PIC, this is unlikely to be a suitable vehicle for disinvestment. Then I investigate how wealth shocks affect owners' propensity to provide loan financing to the firms.

In this part of my analysis I limit the sample to firms that do not own any listed stocks. For tax smoothing reasons, business-owners may choose to invest in the stock market and attribute the ownership of these stocks to the firm. Thus, from a tax accounting perspective, the financial shock would appear within the firm, and I would not expect to observe any effect on the flow of financing from the investor's outside wealth and the firm. Approximately 14% of firms in my sample are recorded owning listed stocks.

I present the results in Table 5. Columns (1)-(2) report the effects of wealth shocks on whether or not the firm received new equity during 2008 or 2009.[20]. A wealth shock of -10% leads to a reduced probability of an equity injection of 1.37 percentage points, or 22% relative to the mean. This effect is stronger for more levered firms. In columns (3)-(4) I report results on how wealth shocks affect dividend payments. I scale dividend payments to the investor GFW, allowing a kroner-for-kroner interpretation. While wealth shocks do not affect dividend payments on average, there are large heterogenous responses along the dimensions of leverage and liquidity. NOK 1 of lost wealth increases dividend payments by 0.156 NOK and 0.325 NOK with a one standard deviation increase in leverage and liquidity, respectively. The heterogeneity along leverage can be consistent with two hypotheses: (a) risk-shifting incentives may cause stock market losers to defund more levered firms more, or (b) more-levered firms have a stronger need for an equity injection, and investors who lost less, are more able, and more likely, to provide equity

[20] I create a dummy variable equal to one if Paid-in-Capital$_{09}$ >Paid-in-Capital$_{07}$, only 6.1% of the firms in my treated sample received an equity injection during 2008–09, forcing us to utilize a dummy variable to statistically identify effects. The variable is on the firm-level, thus if firms could perfectly substitute towards less-affected investors, I would not observe any effect.

to these firms. The heterogeneity along liquidity suggests that stock market losers are more likely to offset losses by increasing dividend payments when the firm's liquidity is sufficient.

Table 5: The Effect of Wealth Shocks on Firm Financing: Equity-Injections, Dividend flows and Owner-Provided Loans

	Financing Outcomes During 2008–09					
	ΔPaid-in-Capital > 0		Dividends/GFW		ΔInvestor Loans/GFW	
	(1)	(2)	(3)	(4)	(5)	(6)
$\text{Gains}_{t,t+2}/\text{GFW}_t$	0.137*	0.103*	-0.071	-0.125	-0.055	-0.054
	(0.070)	(0.058)	(0.098)	(0.104)	(0.108)	(0.096)
$\text{Gains}_{t,t+2}/\text{GFW}_t$ * Leverage		0.146**		-0.156*		-0.341***
		(0.074)		(0.086)		(0.126)
$\text{Gains}_{t,t+2}/\text{GFW}_t$ * Cash/OpEx		0.023		-0.325**		-0.331**
		(0.073)		(0.141)		(0.129)
$\text{Gains}_{t,t+2}/\text{GFW}_t$ * Profitability		-0.141		-0.043		0.168
		(0.089)		(0.136)		(0.145)
mean(Y)	.061	.061	.148	.148	-.001	-.001
Pcontrols	Y	Y	Y	Y	Y	Y
Fcontrols	Y	Y	Y	Y	Y	Y
Vcontrols	Y	Y	Y	Y	Y	Y
FE	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R
R2	0.1303	0.1376	0.4721	0.4860	0.1976	0.2080
N	3722	3722	3408	3408	3722	3722

Standard errors are two-way clustered on the firm and investor level (when applicable) and are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. $Gains_{t,t+2}/GFW_t$ is amount of stock market gains the investor experienced during 2008 and 2009, fixing portfolio weights in 2007, scaled by his 2007 Gross Financial Wealth. Interaction variables are normalized to have a zero mean and a standard deviation of one, and are included as controls, as well as interactions with $Stocks/GFW$. Controls include $Dividends_t/GFW_t$, a $Dividends_t > 0$ dummy, an $InvestorLoans_t > 0$ dummy, $InvestorLoans_t/GFW_t$. ΔPaid-in-Capital > 0 is equal to one if PIC_{09} >PIC_{07}. Dividends refer to dividends paid during 08 or 09. ΔInvestorLoans = $\text{InvestorLoans}_{09}$-$\text{InvestorLoans}_{07}$. Paid-in-Capital and Investor loans are measured on the firm-level (from firms' tax returns), while dividends are on the firm-investor level (from the Stockholder Register).

In columns (5)-(6) I report the results on investor loans. This type of owner-provided financing is similar to equity in that it has very low seniority. The dependent variable that I examine is the change in investor loans on the firm's balance sheet from 2007 to 2009, scaled by the investor's GFW, also allowing a kroner-for-kroner interpretation. While I find no effects on average (Column 5), this masks significant heterogeneity with respect to liquidity and leverage. A wealth loss of NOK 1 is associated with a 0.33 NOK decrease in investor loans for a firm with $Cash/OpEx$ one standard deviation below the mean. However, this effect is cancelled out if I also increase leverage by one standard deviation. This lowered sensitivity of funding for more levered firms is at first sight in contradiction with my results of equity financing. However, providing loans is likely to be an undesirable form of financing for more levered firms, since it will increase the firm's *observable* leverage. In Norway, and most other European

countries, private firm accounting data is public information. Increasing leverage might thus send an observable, and potentially negative, signal to suppliers and customers.

My analysis covers the, perhaps most important, observable sources of owner-provided financing. There may also be other important ways owners may finance their firms. First, owners may delay the payment of their own wages. This may appear as investor loans, but may also appear as liabilities to employees on the firms balance sheet, which I cannot separate from liabilities to other employees. Owners may also finance firm investments by purchasing them privately and then renting them out (and adjusting rent payments) to the firm. Finally, owners may also pledge personal collateral to reduce the firm's cost of external financing.

To verify that my results are not driven by a violation of the parallel-trends assumption, I repeat my analysis while considering outcome variables during 2005–06, and find no effects. These results are provided in Table 18 in the Appendix.

5 Employment

5.1 Definition of Employment Growth

My sample consists of mostly small businesses with fewer than 20 employees. Since many of the employees in my sample are also owners, I omit them when measuring differences in employment levels. Owners who do not suffer adverse wealth shocks (or enjoy positive returns) may be more likely to finance their firms by removing themselves from the firm's payroll, helping the firm finance the employment of another worker. Thus if I include owners in the numerator in my employment growth measure, I would potentially cause a downward bias in my estimates.

My main measure of employment growth is defined as follows[21]:

$$EG^{D}_{f,t,t+j} \equiv \frac{\#\text{Non-owner Employment Days}_{f,t+j} - \#\text{Non-owner Employment Days}_{f,t}}{\#\text{Employment Days}_{f,t}} \tag{5}$$

This measure will capture within-year changes in employment. I believe this is important for industries in my sample that may have highly seasonal employment, such as retail. If financial frictions

[21] I choose to use the standard formula for percentage change, rather than the symmetric growth rate or log differences for two main reasons. First, using symmetric-growth rates for very small firms that move between 0,1 and 2 employees can vigorously overstate employment decline. I found that the average employment growth rate from 2007 to 2010 in my sample increased in magnitude from -2.8% to -16.1% when using the symmetric growth rate.[22] Measuring growth rate using log differences has similar issues, as well as not being able to accomodate firms with zero post-period employment. Log differences are beneficial to reduce the impact of outliers in the presence of positive growth, when there is employment, however, *decline* it will increase magnitudes. In my sample there are very few firms with large positive employment growth, and to minimize their impact I bind employment growth to be $\leq 200\%$.

are more important in determining the level of non-peak season employment, measuring employment at the end of the year could be problematic if this coincides with a peak season (e.g., Christmas and New Years). Utilizing the number of days of employment per employee rather than the number of employees during the year alleviates the concern that replacing an employee could be counted as employment growth.

Table 6: Employment Summary Statistics

	N	mean	sd	p10	p25	p50	p75	p90
2007 Employment								
# Owner-employees	4051	1.58	1.30	0.00	1.00	1.00	2.00	3.00
# Reg. employees	4051	6.96	11.99	1.00	1.00	3.00	7.00	15.00
Avg. Age	4051	40.53	10.71	27.00	33.00	40.00	47.40	55.50
Avg. Years of Edu.	4051	13.11	2.06	11.00	11.86	12.75	14.00	16.75
Employment Growth								
EG^D 05-07	3713	0.116	0.481	-0.314	-0.117	0.000	0.208	0.610
EG^D 07–08	4051	0.015	0.369	-0.332	-0.100	0.001	0.106	0.335
EG^D 07–09	4051	0.001	0.458	-0.500	-0.199	0.000	0.154	0.457
EG^D 07–10	4051	-0.028	0.498	-0.643	-0.281	-0.002	0.167	0.499
EG^D 07–10, Symmetric	4051	-0.161	0.593	-0.947	-0.328	-0.002	0.154	0.399
Decomposing EG^D 07–10								
New hires	4051	0.260	0.388	0.000	0.000	0.086	0.392	0.723
Separations	4051	-0.291	0.321	-0.750	-0.500	-0.250	-0.020	0.000

5.2 When do wealth shocks matter for firm employment?

If the firm owner has substantial private wealth relative to the financing needs of the firm, he would be able to provide financing even after suffering a large negative wealth shock. Consider a firm that has financing needs of \$100, and the owner holds \$300 in wealth. Even after suffering a 50% wealth loss, the owner still has \$150 > \$100 to cover the firm's financing needs. On the other hand, consider an owner who only has \$10 in private wealth. Regardless of whether or not he loses 50% of his wealth, he would only be able to cover a small fraction of the firm's financing needs.

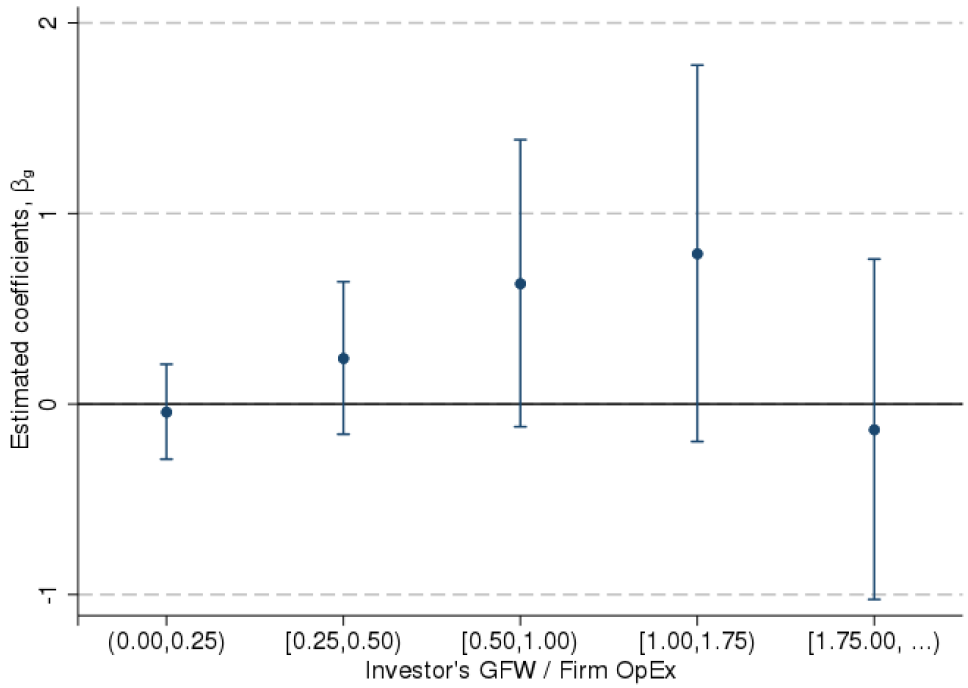
If an owner of a firm has little wealth relative to the potential financing needs of the firm ex-ante, any shocks to his wealth is unlikely to have impact on the financing available to the firm, ex-post. Similarly, if the owner has substantial wealth relative to the firm, any shocks to his ability, or perhaps willingness, to provide financing may not be large enough to affect the flow of funds to the firm. Thus the largest effects are to be expected when the investor's status as a viable financier is changed.[23]

[23] As an example, consider an investor who has \$1 of wealth, but the firm has financing needs of \$100. If he loses his

This is exactly what I observe in the data. I create bins for different ratios of owner financial wealth to firm operating expenditures, and estimate the effect on wealth shocks, as fraction of the owner's financial wealth, separately within these bins. The results are reported in Figure 4 below, and are based on estimation equation 6. I find that wealth shocks have no effect on firm employment growth when the ratio is less than 25% or above 175%. While a 100% loss for owners with large wealth relative to the firms financing needs would surely constrain them, the owner's in my portfolio rarely experience losses exceeding 50% of financial wealth.

$$\frac{E_{f,2010} - E_{f,2007}}{E_{f,2007}} = \alpha_n + \alpha_r + \alpha_g + \beta_g \frac{Gains_{v,08,09}}{GFW_{v,07}} + \gamma_g \frac{Stocks_{v,07}}{GFW_{v,07}} + \rho' P_{v,07} + \eta' V_{v,07} + \zeta' F_{f,07} + \epsilon_{f,v} \quad (6)$$

Figure 4: Differential Effects of Wealth Shocks on Employment Growth Based on Relative Investor/Firm Size



Thus in the remainder of my analysis on the effects on employment growth, I restrict my sample to firm-owner pairs where the financial wealth of the owner is between 25% and 175% (100% ± 75%) of

dollar, this would not affect the firm through a financing channel, since he was already inviable as a financier. Now consider an owner who has $300 of wealth. In my sample, investors rarely lose more than 50% of their wealth. Thus after a large wealth loss, the owner would still have $150 less, considerably more than the firm's financing needs.

the firm's average operating expenditures in 2006 and 2007. My results are qualitatively similar (but I find smaller effects) when also including firm-investor pairs with $GFW/OpEx > 1.75$.

5.3 Main employment regressions

In Table 7 I find that my estimated coefficient, once controlling for industry fixed effects, is fairly robust to changes in the set of controls. I also find, in column (7) that my standard errors shrink when I two-way cluster on firm's 3 digit industry (114 clusters) code and the largest firm in the investor's portfolio (88 clusters), as opposed to on the firm (F) and investor (V) level in columns (1) through (6). My regression sample consists of approximately 2,500 firm-owner observations, which is made up by approximately 2,250 firms and 2,320 owners, after limiting my analysis to firm-investor pairs where the investor's GFW makes up between 25% and 175% of the firm's pre-period operating expenditures.

Some important take-aways from traveling from column (1) to column (8) is that my estimated coefficient grows consistently, albeit only slightly, when adding more fine-grained industry and geographic controls. If my results were confounded by industry, regional or industry-region shocks, I would expect to see a noticeable *decrease*, not increase, in my estimated coefficient, when adding fixed effects to account for these confounders. The largest change is observed when I initially introduce 2-digit industry fixed effects in column (3), suggesting that correlations between stock returns and industry shocks work in the opposite direction of what I were initially worried about.

My preferred specification is column (6), and will be used through-out my subsequent analyses.

Table 7: Main Employment Regressions.

The Effects of Wealth Shocks on Employment Growth From 2007 to 2010

$EG^{D}_{07,10}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Gains_{08-09}/GFW	0.323*	0.332*	0.435**	0.452**	0.458**	0.488**	0.488***	0.522***
	(0.188)	(0.181)	(0.182)	(0.184)	(0.187)	(0.192)	(0.179)	(0.200)
Stocks/GFW	0.027	-0.015	0.049	0.048	0.012	-0.075	-0.075	0.042
	(0.086)	(0.185)	(0.181)	(0.180)	(0.181)	(0.189)	(0.210)	(0.250)
$(\text{Stocks/GFW})^2$		0.064	0.042	0.037	0.102	0.229	0.229	0.070
		(0.232)	(0.221)	(0.221)	(0.217)	(0.223)	(0.314)	(0.305)
Profitability						0.311***	0.311***	0.210
						(0.118)	(0.107)	(0.150)
Leverage (ST)						0.183**	0.183**	0.177*
						(0.083)	(0.085)	(0.101)
Leverage (LT)						-0.080	-0.080	-0.070
						(0.089)	(0.077)	(0.112)
log(Assets)						0.075***	0.075**	0.069**
						(0.028)	(0.031)	(0.035)
Cash/OpEx						-0.176***	-0.176**	-0.078
						(0.064)	(0.078)	(0.079)
Lagged 1-Yr E.G.						-0.099**	-0.099**	-0.105**
						(0.041)	(0.038)	(0.047)
GFW/OpEx	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]
Pcontrols	-	-	-	-	-	Y	Y	Y
Fcontrols	-	-	-	-	-	Y	Y	Y
Vcontrols	-	-	-	-	-	Y	Y	Y
FE	-	-	NACE2	NACE2,R	NACE3,R	NACE3,R	NACE3,R	NACE3×R
Cluster	F,V	F,V	F,V	F,V	F,V	F,V	NACE3,LS	F,V
R2	0.0023	0.0023	0.0376	0.0490	0.0852	0.1340	0.1340	0.3118
N	2521	2521	2520	2520	2496	2496	2496	2099

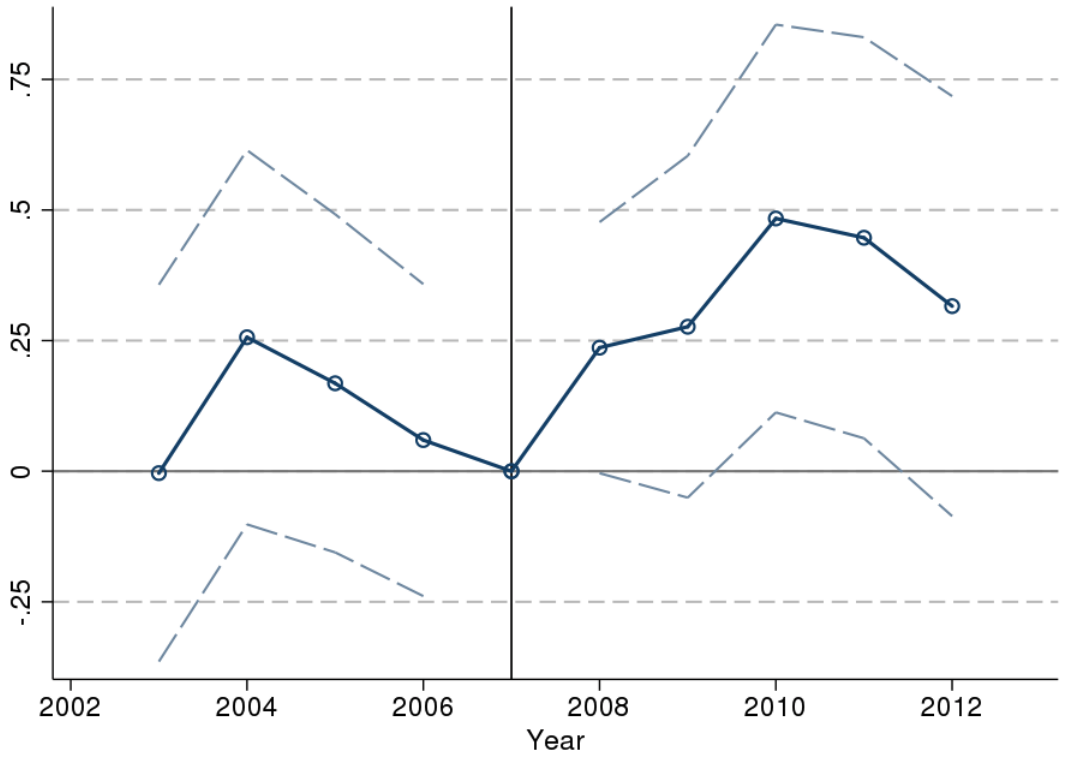
Standard errors are two-way clustered on the firm and investor level (when applicable) and are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. $Gains_{t,t+2}/GFW_t$ is amount of stock market gains the investor experienced during 2008 and 2009, fixing portfolio weights in 2007, scaled by his 2007 Gross Financial Wealth. ST and LT refer to short-term and long-term liabilities, respectively. Cash/OpEx is the sum of bank deposits and cash scaled by the average of the firm's past 2 year operating expenditures.

In Table 25 in the Appendix, I also provide results when controlling for *future* Profitability (measured in 2010), and find that my results are robust: The coefficient is reduced from 0.488 to 0.412, or by approximately 1/7th, and remains significant on the 5% level. Since profitability is possibly endogenous to the wealth shock, this change in the coefficient is not highly informative. However, the fact that the coefficient remains large and significant is reassuring. I also control for past, demeaned, returns from 2005 to 2007, including 2nd through 4th order polynomials, and find that my coefficient is unaffected.

5.4 Pre-trends and cumulative effects

A potential concern is that investors who lost a large amount of their wealth during the crisis had taken on significant risks, both in public and private equity. This might suggest that these investors expanded more rapidly during the crisis, and thus had to reduce their employment growth more following the onset of the crisis. An additional, but related, concern is that these investors had invested in both private and listed firms that were highly pro-cyclical. Both of these concerns would suggest that my treated firms had higher employment growth prior to experiencing wealth losses during 2008–09. I do not find this to be the case. In Figure 5 below, I find that treated firms had not have cumulative growth rates in employment since 2003. There is some suggestive (but statistically insignificant) evidence that adversely affected firms grew less from 2003 to 2004, and then more from 2004 to 2007. However, the lack of significance and consistency reassures us that this is not a source of concern.

Figure 5: The Effects of Wealth Shocks during 2008–09 on Cumulative Employment Growth



These coefficients come from estimating the following regressions, where $GFW/OpEx \in [0.25, 1.75]$:

$$\frac{E_{f,t} - E_{f,2007}}{E_{f,2007}} = \alpha_{n,t} + \alpha_{r,t} + \beta_t \frac{Gains_{v,08,09}}{GFW_{v,07}} + \gamma_t \frac{Stocks_{v,07}}{GFW_{v,07}} + \rho_t' P_{v,07} + \eta_t' V_{v,07} + \zeta_t' F_{f,07} + \epsilon_{f,v,t}$$

5.5 Heterogeneity

In order to better understand the mechanisms at work, I estimate the heterogenous effects of wealth shocks along the dimensions of Profitability, Liquidity (as measured by Cash/OpEx), Leverage and Firm age, and report this in Table 8. I find no statistically significant differences when considering Profitability, Liquidity or Leverage. I employ dummy variables for whether or not the variable is below or above some rounded cutoff near the median. I also employ a dummy variable for whether the firm does not have any long or short-term outstanding loans with a bank, $NoBankFinance$. While profitability may imply higher ability to self-finance out of retained earnings, profitability may also proxy for investment opportunities and thus make it more sensitive to changes in the supply of finance from owners. The same may apply to liqudity if the firm is storing cash in expectation of upcoming investment opportunities. More levered firms would likely be more adversely affected by a contraction in credit supply if lenders discriminate against more levered borrowers – however, more levered firms may also have superior creditor relationships, thus endogenously acquiring more leverage. What, however, seems less ambiguous are the theoretical predictions of how wealth shocks interacts with firm age. Younger firms have had less time to signal their quality, and have had less time to develop relationships with external financiers. I find that the effect of wealth shocks on employment are almost entirely driven by firms < 10 years old.[24]

In order to estimate the heterogenous effects, I run the following regressions, interacting my shock and exposure measure with one or multiple variables x:

$$\begin{aligned} EG^{D}_{07,10} &= \alpha_n + \alpha_r + \beta \frac{Gains_{v,08,09}}{GFW_{v,07}} + \gamma \frac{Stocks_{v,07}}{GFW_{v,07}} \\ &+ \sum_x \left(\xi_x \cdot x + \beta_x \cdot x \cdot \frac{Gains_{v,08,09}}{GFW_{v,07}} + \gamma_x \cdot x \cdot \frac{Stocks_{v,07}}{GFW_{v,07}} \right) \\ &+ \rho' P_{v,07} + \eta' V_{v,07} + \zeta' F_{f,07} + \epsilon_{f,v} \end{aligned}$$

[24] 10 years is the same threshold as used by Rajan and Zingales (1998) to distinguish the external financing needs of young and mature firms. In their context 10 years is the cutoff for time since IPO.

Table 8: Heterogenous effects of wealth shocks on employment growth from 2007 to 2010

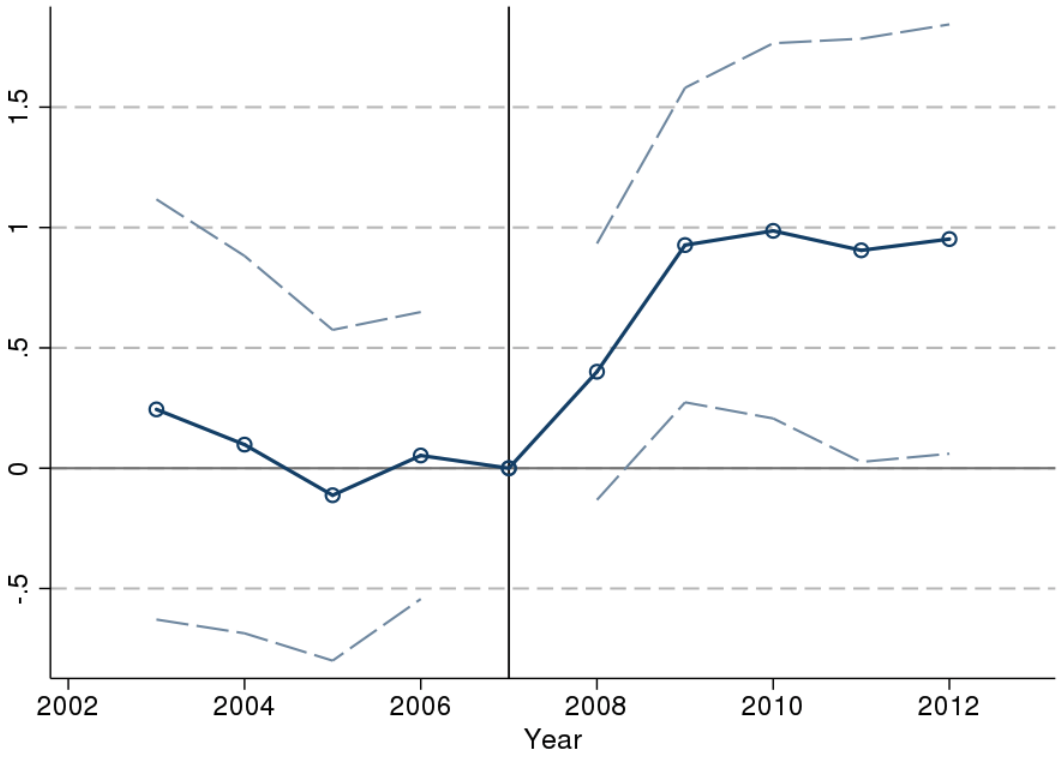
	(1)	(2)	(3)	(4)	(5)	(6)
Gains_{08-09}/GFW	0.488**	0.131	0.567*	0.238	0.472	0.076
	(0.192)	(0.192)	(0.333)	(0.279)	(0.325)	(0.402)
* Firm Age < 10		0.990**				0.808**
		(0.398)				(0.412)
* Profitability < 10%			-0.103			-0.371
			(0.396)			(0.460)
* Cash/OpEx < 10%				0.496		0.669
				(0.366)		(0.451)
* Leverage > 50%					0.035	0.102
					(0.399)	(0.419)
P, V, and F	Y	Y	Y	Y	Y	Y
FE	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R
R2	0.1340	0.1368	0.1345	0.1432	0.1343	0.1471
N	2496	2496	2496	2496	2496	2496

Standard errors are two-way clustered on the firm and investor level (when applicable) and are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. $Gains_{t,t+2}/GFW_t$ is amount of stock market gains the investor experienced during 2008 and 2009, fixing portfolio weights in 2007, scaled by his 2007 Gross Financial Wealth.

Previously I showed that, on average, affected firms were not on a different pre-trend. However, as most of my results are driven by younger firms, I proceed to investigate whether there may be a correlation between past employment growth and wealth losses for younger firms. To evaluate it this I repeat my exercise in Figure 5, but now report the coefficients on the interaction between $Gains/GFW$ and Firm Age < 10. Again, in Figure 6 I find no evidence of different cumulative employment growth prior to the wealth losses occuring during the financial crisis.

Figure 6: Additional Effect of Wealth Shocks on Employment Growth for Young versus Old Firms

Estimates of coefficent on interaction with Firm Age < 10



5.6 Decomposing Employment Growth into Existing and New Workers

In this subsection I investigate whether the effect on employment is driven by job separations among existing workers or a reduction in hiring, and find that it the effect primarily comes from constraining new hires in young firms. I decompose the numerator in my employment growth variable (Δ# Non-owner Employment Days) into new hires (# Non-owner Employment Days for workers not present at time t) and existing workers ((Δ# Non-owner Employment Days for workers present at time t)), keeping the denominator the same, I am able to decompose employment growth into these two parts. Columns (1)-(2) have my main employment growth variable as the dependent variable and is provided for comparison. Columns (3)-(4) focus on new hires, and columns (5)-(6) is limited to existing workers as of 2007.

Comparing columns (1), (3) and (4), I find that most of the effect is driven by new hires. The coefficient on growth attributable to new hires makes up 74% of the coefficient on over-all employment growth.

Table 9: The Effect of Wealth Shocks on Employment Growth during 2008–10 Decomposed into Changes Among Existing and New Workers

	$EG^{D}_{07,10}$		Change in denominator limited to New Hires		Change in denominator limited to Existing Workers	
	(1)	(2)	(3)	(4)	(5)	(6)
Gains_{08-09}/GFW	0.488**	0.131	0.359***	0.113	0.107	0.010
	(0.192)	(0.192)	(0.133)	(0.128)	(0.127)	(0.164)
* Firm Age < 10		0.990**		0.720***		0.226
		(0.398)		(0.254)		(0.258)
GFW/OpEx	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]
Lagged 1-Year EGD	Y	Y	Y	Y	Y	Y
P, F, and V controls	Y	Y	Y	Y	Y	Y
FE	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R
R2	0.1340	0.1368	0.1856	0.1896	0.2029	0.2053
N	2496	2496	2496	2496	2496	2496

Standard errors are two-way clustered on the firm and investor level (when applicable) and are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. $Gains_{t,t+2}/GFW_t$ is amount of stock market gains the investor experienced during 2008 and 2009, fixing portfolio weights in 2007, scaled by his 2007 Gross Financial Wealth. Columns (1)-(2) correspond to my main employment specification. In columns (3)-(4) I only utilize the change in employment arising from new hires, i.e. employees that were not present at time $t = 2007$. In columns (5)-6) I only consider changes in employment arising from workers who were present at time $t = 2007$. The dependent variable in columns (3)-(4) and (5)-(6) sum up to the dependent variable in columns (1)-(2) for approximately 99% of the observations, some deviations occurs due to separate winsorization.

5.7 Educational composition of workers

I now explore how wealth shocks affect the composition of the firm's work force in terms of employment. I report my results in Table 10, where column (1) reveals that there is no effect on average. However, when considering differential effects for young and small firms, I find that adversely affected small firms reduce the fraction of college educated workers in their firm. In columns (3)-(4) I find that this is mainly driven by differences in education among new hires. Also, perhaps surprisingly, I find that adversely affected mature firms *increase* their hiring of college educated workers. This essentially serves to limit (or reverse) the educational gap between young and old firms, as young firms, on average, had 24% college educated workers, versus 19% for mature firms.

Table 10: The Effects of Wealth Shocks on The Employment Composition of All, New and Existing Workers.

	All workers 2010		New Hires		Existing Workers	
	(1)	(2)	(3)	(4)	(5)	(6)
$Gains_{08-09}/GFW$	0.058	-0.030	0.022	-0.462***	-0.068	-0.024
	(0.069)	(0.070)	(0.184)	(0.149)	(0.072)	(0.067)
* Firm Age < 10		0.252*		1.163***		-0.164
		(0.132)		(0.236)		(0.171)
GFW2OpEx	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]
Lagged 1-Year EGD	Y	Y	Y	Y	Y	Y
P, F, V controls	Y	Y	Y	Y	Y	Y
FE	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R
R2	1	1	0	0	1	1
N	2036	2036	1274	1274	2036	2036

Standard errors are two-way clustered on the firm and investor level (when applicable) and are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. $Gains_{t,t+2}/GFW_t$ is amount of stock market gains the investor experienced during 2008 and 2009, fixing portfolio weights in 2007, scaled by his 2007 Gross Financial Wealth. Controls include 2007 fraction of workers with a college degree.

5.8 Total Pay and Subcontracting

In this section I briefly present results on changes in firm-level total pay and subcontracting expenditures. My outcome variables are changes in total pay paid to employees from 2007 to 2010, and increases in subcontracting expenditures. Both are scaled by total payroll in 2007 to allow us to gauge the relative effects. In column (1) I find that a 10% wealth shock reduces payroll expenditures by 3 percentage points. This is barely insignificant with a t-statistic of 1.63. Heterogeneity in column (2) with respect to firm age yield results consistent with out previous analyses.

In columns (2)-(3) I report the effect of wealth shocks on subcontracting. In column (3) I see that for the average firm, decreases in payroll are almost entirely offset by increased in subcontracting. Column (4) reveals that this is not the case for younger firms. While they too increase subcontracting, it only offsets payroll decreases by approximately 23%.[25]

[25] (0.266-0.031)/(-0.134+1.158)

Table 11: The Effects of Wealth Shocks on Total Payroll and Subcontracting Expenditures

	ΔTotalPay		ΔSubContracting	
	(1)	(2)	(3)	(4)
$Gains_{08-09}$/GFW	0.298	-0.134	-0.261**	-0.266*
	(0.183)	(0.186)	(0.122)	(0.149)
* Firm Age < 10		1.158***		0.031
		(0.387)		(0.246)
SubContracting/TotalPay			-0.293***	-0.292***
			(0.049)	(0.049)
GFW/OpEx	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]
Lagged 1-Year EG^D	Y	Y	Y	Y
P, F, V controls	Y	Y	Y	Y
FE	NACE3,R	NACE3,R	NACE3,R	NACE3,R
R2	0.1435	0.1478	0.1517	0.1525
N	2496	2496	2271	2271

Standard errors are two-way clustered on the firm and investor level (when applicable) and are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. ΔTotalPay and ΔSubContracting are scaled by 2007 total payroll. $Gains_{t,t+2}/GFW_t$ is amount of stock market gains the investor experienced during 2008 and 2009, fixing portfolio weights in 2007, scaled by his 2007 GFW.

5.9 Different time periods

I repeat my analysis in different time periods. The main results are reported in Table 12. Columns (1)-(2), (3)-(4) and (5)-(6) consider the effects of wealth shocks from 05 to 07, 07 to 09 (my main time period), and 09-11, respectively, on employment growth during these periods and the subsequent year. I find no statistically significant effects outside of the financial crisis. This can either be due to differences in the economic environment or differences in the distribution of wealth shocks across these periods, as 05–07 stock returns were largely positive, 07–09 mostly negative, while 09–11 were mixed. I also find no evidence of asymmetric effects in 2009-11.[26]

[26] I estimate the effects of wealth shocks using first through third order polynomial in $Gains/GFW$ and $Stocks/GFW$. The estimated coefficients (standard errors) on $Gains/GFW$ are 0.1359 (0.2404), 0.1064 (0.2566), -0.2422 (0.3598), plotting these coefficients reveal a symmetrically weak effects for both losses and gains.

Table 12: The Effects of Wealth Shocks on Subsequent Employment Growth during Different Time Periods

	$EG^{D}_{05,08}$		$EG^{D}_{07,10}$		$EG^{D}_{09,12}$	
	(1)	(2)	(3)	(4)	(5)	(6)
$Gains_{t,t+2}/GFW_t$	-0.014	-0.042	0.488**	0.131	0.076	-0.004
	(0.106)	(0.135)	(0.192)	(0.192)	(0.156)	(0.185)
* Firm Age < 10		0.072		0.990**		0.186
		(0.232)		(0.398)		(0.327)
GFW/OpEx	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]
LaggedOutcome	Y	Y	Y	Y	Y	Y
P, F, V controls	Y	Y	Y	Y	Y	Y
FE	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R
r2	0.1432	0.1449	0.1340	0.1368	0.1136	0.1139
N	2212	2212	2496	2496	2721	2721

Standard errors are two-way clustered on the firm and investor level (when applicable) and are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. $Gains_{t,t+2}/GFW_t$ is amount of stock market gains the investor experienced during t+1 and t+2, fixing portfolio weights at the end of year t, scaled by his year t Gross Financial Wealth. In columns (1)-(2) $t = 2005$, in columns (3)-(4) $t = 2007$, and in columns (5)-(6) $t = 2009$. Firm age, and all other controls measured at time t.

6 Investments

In this section I analyze the effects of wealth shocks on firm investment. Each year firms must report the transaction value of all investments and disinvestments in fixed assets, broken down by asset class, for the purposes of calculating tax deductions based on asset depreciation. A positive cash flow inducing sale of a fully depreciated asset triggers taxes, and future depreciation allowances depend on the historical (transaction) cost of the asset. Up until 2011 these yearly figures were reported in the firm's main tax return form to which I have access.[27] This allows me to analyze the effects on firm-level investments with likely minimal measurement error. In Table 13 I provide summary statistics for the firms' net investment in 2008 and 2009 scaled by assets in 2007.

[27] After 2011 these numbers enter a separate form entering as an appendix to the firm's tax return which is not a part of my dataset.

Table 13: Firm Investments during 2008–09

	N	mean	sd	p1	p5	p10	p25	p50	p75	p90	p95	p99
R&D /Assets	3671	-0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
Plant /Assets	3671	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.23
Property /Assets	3671	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
Auto /Assets	3671	0.01	0.05	-0.10	-0.00	0.00	0.00	0.00	0.00	0.03	0.09	0.23
OtherFixed /Assets	3671	0.03	0.08	-0.11	-0.01	0.00	0.00	0.00	0.04	0.11	0.18	0.37
Total Investments /Assets	3671	0.05	0.13	-0.28	-0.04	0.00	0.00	0.01	0.07	0.18	0.27	0.57

R&D includes net acquisitions of intangibles. Auto includes other vehicles, incl. planes, ships, etc. Only firms remaining in the sample until 2009 are included.

I find that the effect of a wealth shock on the average firm's overall investment ratio is statistically insignificant. However, this masks statistically significant heterogeneity with respect to firm age. I also find that adversely affected firms are less likely to undertake investments in Plant and Property. A wealth loss of 10% lowers the probability of investments in Plant and Property by 2.5 percentage points, or by 35.7% relative to the mean probability of 0.07. I report my estimates in Table **??**. Results are based on estimating Equation 7.

$$
\begin{aligned}
Investments_{07,09} &= \alpha_n + \alpha_r + \beta \frac{Gains_{v,08,09}}{GFW_{v,07}} + \gamma \frac{Stocks_{v,07}}{GFW_{v,07}} && (7)\\
&+ \sum_x \left(\xi_x \cdot x + \beta_x \cdot x \cdot \frac{Gains_{v,08,09}}{GFW_{v,07}} + \gamma_x \cdot x \cdot \frac{Stocks_{v,07}}{GFW_{v,07}} \right) && (8)\\
&+ \rho' P_{v,07} + \eta' V_{v,07} + \zeta' F_{f,07} + \epsilon_{f,v} && (9)
\end{aligned}
$$

Table 14: The Effects of Wealth Shocks on Firm Investments during 2008–09

	Total Inv/Assets			Plant&Prop > 0		
	(1)	(2)	(3)	(4)	(5)	(6)
$Gains_{08-09}$/GFW	0.121	-0.027	-0.124	0.250**	0.140	0.247
	(0.096)	(0.094)	(0.183)	(0.116)	(0.098)	(0.191)
* Firm Age < 10		0.447**	0.422*		0.388*	0.251
		(0.200)	(0.221)		(0.216)	(0.206)
* Profitability < 10%			0.605***			0.041
			(0.222)			(0.269)
* Leverage > 50%			-0.389*			-0.335
			(0.216)			(0.209)
* Cash/OpEx < 10%			-0.207			0.210
			(0.237)			(0.231)
Lagged Outcome	Y	Y	Y	Y	Y	Y
GFW/OpEx	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]
P, F, V controls	Y	Y	Y	Y	Y	Y
FE	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R
R2	0.1655	0.1706	0.1791	0.3385	0.3428	0.3458
N	2129	2129	2129	2129	2129	2129

R&D includes net acquisitions of intangibles. Auto includes other vehicles, incl. planes, ships, etc. Only firms remaining in the sample until 2009 are included.

7 Additional Financing Outcomes

7.1 Bank Financing

My results show that effects are driven by younger firms. A potential explanation for this is that younger firms have had less time to develop relationships with potential external financiers, e.g., banks, and are thus less able to substitute to external sources of financing. In this section, I present results consistent with this intuition. For affected mature firms, bank loans appear to be a partial substitute for owner-provided financing, while for affected young firms, it appears to be complementary.

I report my results in Table 15. I examine whether affected firms were (1)-(2) more likely to experience a nominal increase in long-term bank debt, (3)-(4) experienced an increase in long-term bank loans from 2007 to 2009 relative to 2007 assets, and (5)-(6) experienced an increase in over-all bank loans relative to 2007 assets.

A mature firm whose owner loses 10% of his wealth increases bank loans by 2 percentage points, or 39.8% relative to the average firm who had a non-negative increase in over-all bank loans during

this period.[28] Young firms, on the other hand, decrease by approximately 52%.[29]. Relative to the unconditional means these effects are much larger, but arguably not very informative, since the means are close to zero due to a large presence of firms paying down their bank loans.

Table 15: The Effects of Wealth Shocks on Bank-provided Financing during 2008–09
Extensive and Intensive Margin Effects

	Δ LT Bank Loans > 0		ΔLT Bank Loans/Assets$_{07}$		ΔAll Bank Loans/Assets$_{07}$	
	(1)	(2)	(3)	(4)	(5)	(6)
Gains$_{08-09}$/GFW	-0.249**	-0.255*	-0.101	-0.206*	-0.061	-0.203*
	(0.115)	(0.130)	(0.095)	(0.117)	(0.100)	(0.116)
* Firm Age < 10		0.122		0.368		0.468*
		(0.268)		(0.249)		(0.261)
mean(Y)	.116	.116	.004	.004	.008	.008
GFW/OpEx	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]
P, F, V controls	Y	Y	Y	Y	Y	Y
FE	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R
R2	0.1544	0.1583	0.1362	0.1432	0.1473	0.1534
N	2349	2349	2349	2349	2349	2349

Standard errors are two-way clustered on the firm and investor level (when applicable) and are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. LT refers to long-term liabilities. The differences refer to changes in bank loans over the two-year period between Dec 2007 and Dec 2009. Controls include stock market exposure (linear and squared), the FirmAge < 10 dummy, their interactions, A dummy for having no bank loans, and bank loans divided by assets, all measured in 2007. Only firms who have non-missing accounting data during both 2007 and 2009 are present. For columns (5)-(6): Conditional on having a non-negative change in over-all loans from 2007 to 2009, the mean change, scaled by 2007 assets is 0.051. Conditional on being strictly positive, the mean is 0.234.

7.2 Investor Exit

In this subsection, I first examine whether shocked owners liquidate their holdings in the stock market. This is useful to inform the possible extent of alternative mechanisms, such as a diminished willingness to growth the stock of labor or capital in response to negatively updated beliefs about the future. These results are reported in columns (1)-(2) of Table 16. Interestingly, there is no evidence of wealth shocks inducing a stock market exit. In column (3)-(4), I examine whether they exit their equity position in the private firm they own. I find no evidence of this either.

In column (5)-(6), I examine the effect on the ownership share in the private firm, conditional on still being an owner. Being unable to find an effect here is consistent with an inability of these firms to substitute towards equity financing from other investors, which would reduce their ownership share. This suggests that equity provision relationships are sticky. There does not however, appear to be much heterogeneity with respect to firm age.

[28] 0.203*0.1/0.051. Conditional on having a non-negative change in over-all loans from 2007 to 2009, the mean change, scaled by 2007 assets is 0.051. Conditional on being strictly positive, the mean is 0.234.

[29] -(0.203-0.468)*0.1/0.051

Table 16: Investor Exit

	Portfolio Stocks$_{2010} > 0$		Firm Ownership Share$_{2010} > 0$		Firm Ownership Share$_{2010}$	
	(1)	(2)	(3)	(4)	(5)	(6)
Gains$_{t,t+2}$/GFW$_t$	-0.104	-0.080	-0.101	-0.003	0.014	0.008
	(0.121)	(0.139)	(0.161)	(0.150)	(0.051)	(0.065)
Gains$_{t,t+2}$/GFW$_t$ * Firm Age < 10		0.042		-0.300		0.018
		(0.279)		(0.344)		(0.107)
GFW2OpEx	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]
Lagged 1-Year EGD	Y	Y	Y	Y	Y	Y
Pcontrols	Y	Y	Y	Y	Y	Y
Fcontrols	Y	Y	Y	Y	Y	Y
Vcontrols	Y	Y	Y	Y	Y	Y
FE	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R
r2	0.1247	0.1285	0.1410	0.1445	0.9032	0.9032
N	2496	2496	2285	2285	1970	1970

Standard errors are two-way clustered on the firm and investor level (when applicable) and are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. $Gains_{t,t+2}/GFW_t$ is amount of stock market gains the investor experienced during 2008 and 2009, fixing portfolio weights in 2007, scaled by his 2007 Gross Financial Wealth. Columns (4)-(5) show results on firm ownership share, conditional on still being an owner.

8 Conclusion

This paper presents novel evidence on how small, and especially young, firms are affected by changes in their owners' wealth. I show that shocks to the wealth of business owners have economically large effects on employment and investment. By utilizing shocks to stock market wealth I am, to my knowledge, the first paper to show how stock market crashes affect the real economy by lowering investments and employment growth for small and young incorporated firms. My data allows me to carefully identify these effects by leveraging plausibly exogenous but idiosyncratic portfolio shocks. I perform a multitude of tests showing that my results are unlikely to be driven by unobserved variables such as industry shocks or other investor characteristics.

The fact that wealth shocks affect firm financing, and that the effects on employment and investment are primarily driven by younger firms suggest that the main mechanism through which the owner's wealth affects the firm is by increasing financial constraints. By showing this I provide important new evidence on how financial frictions affect small businesses, and in particular their employment. My findings stress the importance of owners in providing financing to small firms. Given the importance of small-businesses in most economies, these findings stress that I should consider new potential avenues for policy responses to adverse economic shocks. Examples include policies that lead to (i) increased provision of loans to small, young businesses or to their owners, or (ii) increased incentives for investors to provide equity-financing to these firms.

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9 Appendix

9.1 Breakdown of firm liabilities

Table 17: Breakdown of firm liabilities

	Firm Age ≥ 10		Firm Age < 10	
% of Assets	mean	median	mean	median
Equity				
PIC	14.24	8.86	14.09	8.46
RetainedEarnings	3.09	3.84	3.57	4.22
Long-term liabilities				
BankDebt	10.40	0.00	9.98	0.00
Owners	4.08	0.00	4.35	0.00
Other	3.61	0.00	4.71	0.00
Short-term liabilities				
BankDebt	2.64	0.00	2.48	0.00
Owners	7.01	0.00	6.42	0.00
Suppliers	13.55	7.71	11.99	6.11
Wages	8.15	6.31	7.66	6.20
Other	33.21	25.89	34.74	29.07

All variables measured in 2007. PIC is Paid-in Capital. Other short-term debt includes Employer taxes and VAT.

9.2 Financing, Placebo Regressions

I repeat the analysis on financing outcomes, keeping all the RHS variables the same, but considering lagged financing outcomes (2005–06).

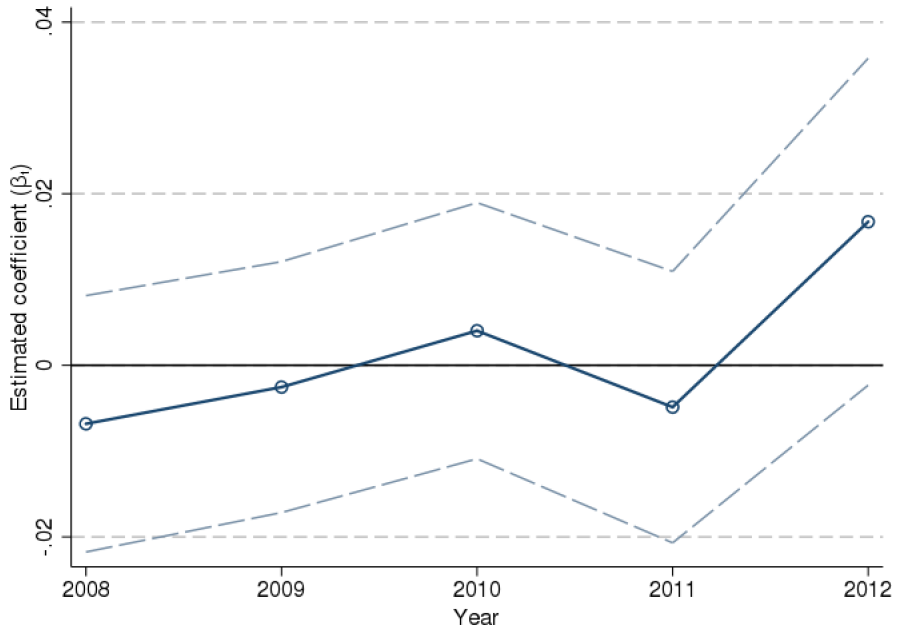
Table 18: Financing, Placebo Regressions

	Financing Outcomes During 2005–06					
	ΔPaid-in-Capital > 0		Dividends/GFW		ΔInvestor Loans/GFW	
	(1)	(2)	(3)	(4)	(5)	(6)
$\text{Gains}_{t,t+2}/\text{GFW}_t$	-0.044	-0.074	0.099	0.089	0.184	0.197
	(0.099)	(0.097)	(0.098)	(0.122)	(0.136)	(0.174)
$\text{Gains}_{t,t+2}/\text{GFW}_t$ * Leverage		0.143		-0.072		-0.247
		(0.105)		(0.091)		(0.156)
$\text{Gains}_{t,t+2}/\text{GFW}_t$ * Cash2OpEx		-0.047		-0.037		-0.094
		(0.120)		(0.198)		(0.290)
$\text{Gains}_{t,t+2}/\text{GFW}_t$ * Profitability		0.110		-0.034		-0.137
		(0.118)		(0.188)		(0.187)
mean(Y)	.13	.13	.156	.156	.005	.005
Pcontrols	Y	Y	Y	Y	Y	Y
Fcontrols	Y	Y	Y	Y	Y	Y
Vcontrols	Y	Y	Y	Y	Y	Y
FE	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R
R2	0.1400	0.1423	0.2021	0.2085	0.1442	0.1479
N	2956	2956	3557	3557	2953	2953

Standard errors are two-way clustered on the firm and investor level (when applicable) and are reported in parentheses. *, * and *** indicate significance at the 10%, 5% and 1% levels, respectively. $Gains_{t,t+2}/GFW_t$ is amount of stock market gains the investor experienced during 2008 and 2009, fixing portfolio weights in 2007, scaled by his 2007 Gross Financial Wealth. Interaction variables are scaled by their standard deviation, and are included as controls, as well as interactions with $Stocks/GFW$. Controls for lagged $Dividend/GFW$ ratio, and a dividend dummy, are included.

9.3 Correlation between portfolio returns and changes in profitability

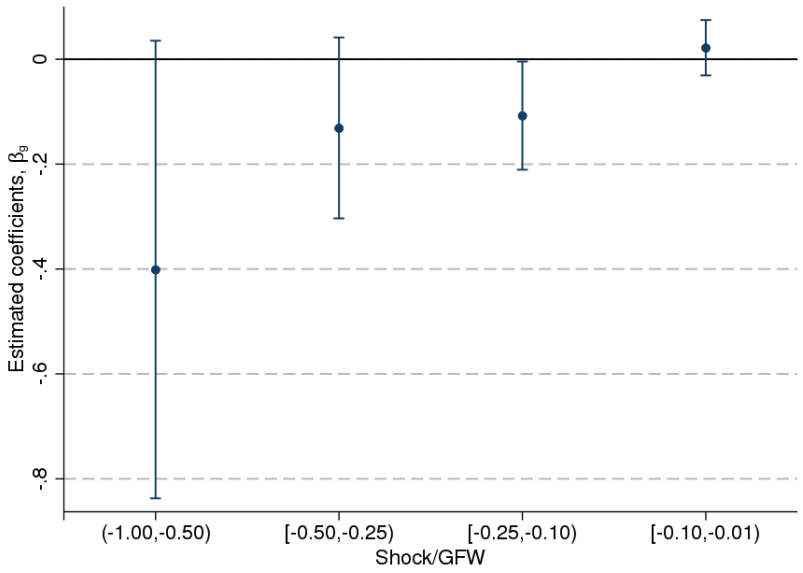
Figure 7: Correlation between portfolio returns and changes in profitability



I regress $\Delta Profitability_t$ on portfolio returns and my full set of controls. The plot shows the coefficient on the portfolio return from 2007 to 2009. The analysis is limited to investors with a stock market exposure between 0.25% and 10%, the other sample criteria are identical to those in my other specifications.

9.4 Non-linear effects on employment growth

Figure 8: Estimating effects of wealth shocks by bins



Results are obtained by performing the following regression for shock bin, $g \in G = \{(-1.00,-0.50),[-0.50,-0.25),[-0.25,-0.10),[-0.10,-0.01)\}$: $EG^{D}_{07,10} = \alpha_n + \alpha_r + \sum_g \beta_g \mathbb{1}\left[\frac{Gains_{v,08,09}}{GFW_{v,07}} \in g\right] + \gamma_1 \frac{Stocks_{v,07}}{GFW_{v,07}} + \gamma_2 \left(\frac{Stocks_{v,07}}{GFW_{v,07}}\right)^2 + \rho' P_{v,07} + \eta' V_{v,07} + \zeta' F_{f,07} + \epsilon_{f,v}$, where the excluded category consists of firm-investor observation where the owner lost less than 1% of GFW.

9.5 Quasi first-stage: Portfolio stickiness

The strength of my shock variable depends on some degree stickiness in the investors' portfolios, since I am assuming that investors experience returns from t to $t+j$ depending on their portfolio composition at time t. Thus if investors immediately sold off, or reshuffled, their portfolios right after time t, the investors would not be affected by the predicted returns. Since I do not observe within-year transactions of securities, only the yearly portfolio compositions, I construct the following test.

I regress $R_{v,08,09}$, which is the investor's portfolio returns from 2008 to 2009, based on his 2008 portfolio composition, on $\tilde{R}_{v,08,09}$, which are the returns based on his 2007 portfolio composition.

$$R_{v,08,09} = \pi_0 + \pi_1 \tilde{R}_{v,08,09} + \epsilon_v \tag{10}$$

The "worst case scenario" would be if investors randomly reshuffle their portfolios with frequent intervals. This would imply that $\hat{\pi}_1 = 0$. If there were no transactions, I would find that $\hat{\pi}_1 = 1$. In Table 19 below I report these estimates. In columns (1)-(3) I omit missing $R_{v,08,09}$. These would be

missing if the investors had exited the stock market. In columns (5)-(6) I replace missing portfolio returns with zeros. In order to inform us of whether portfolio stickiness varies with the experienced returns from 2007 to 2008 I also estimate $\hat{\pi}_1$ separately for investors who lost more than 60% or less than 40%. These returns are close to the 25th and 75th percentiles, respectively.

Table 19: Testing portfolio stickiness

	Only non-missing $R_{08,09}$			Missing $R_{08,09} \equiv 0$		
	(1)	(2)	(3)	(4)	(5)	(6)
$\tilde{R}_{08,09}$	0.649***	0.600***	0.648***	0.584***	0.532***	0.586***
	(0.011)	(0.020)	(0.040)	(0.011)	(0.020)	(0.040)
Intercept	0.226***	0.291***	0.193***	0.231***	0.301***	0.188***
	(0.009)	(0.023)	(0.016)	(0.009)	(0.023)	(0.016)
$R_{07,08}$	All	<-60%	>-40%	All	<-60%	>-40%
F	3306.39	905.20	260.17	2590.61	700.84	218.08
R2	0.4572	0.3986	0.2272	0.3844	0.3263	0.1873
N	3928	1368	887	4150	1449	948

Standard errors are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. $\tilde{R}_{v,08,09}$ is the return of the portfolio based on the investor's 2007 portfolio composition.

How do I interpret the coefficients? A coefficient of π_1 would suggest that the investor had reshuffled a fraction $1-\pi_1$ of his portfolio sometime during the year, and on average would not have experience $0.5 \cdot (1-\pi_1)$ of the predicted returns during that period. If I extend this to a two-year horizon, as in my empirical setting, I would expect the "non-compliance" would be approximately $2 \cdot 0.5 \cdot (1-\pi_1) = 1-\pi_1$. Alternatively phrased, I would expect a 2-year compliance of approximately π_1. Table 19 suggests that this would be approximately 60%. I find a strongly positive intercept, $\hat{\pi}_0 > 0$, due to the fact that stock markets rose dramatically from 2008 and 2009. Thus any investors who bought new stocks, not perfectly correlated with his existing portfolio, would contribute to the estimated positive intercept.

9.5.1 Investor Characteristics and Future Portfolio Returns

In order to understand whether risk-tolerance or ability may confound my results I estimate how observable investor characteristics (in 2007) predicts portfolio returns (from 2007 to 2009). I report these results in Table 20 and find that investors who held larger stocks in their portfolio enjoyed larger returns during the crisis. These large firms may likely have been perceived as safer ex-ante. I also see that investors who had a larger stock market exposure had lower returns. This is consistent with a correlation between risk-tolerance and stock market returns. However, if this were to materialize as realized private firm outcomes, I would expect to see a correlation between stock returns and firm-level revenue, which I do not find to be the case in Figure 3. I also consider other potential proxies for risk-

tolerance, namely portfolio HHI, the fraction of wealth invested in mutual funds and personal leverage, and find no predictive power.

A potential other concern is that an investor's stock market returns is correlated with his ability. This may be problematic if investors' who are able to pick superior stocks are also super managers or superior private equity investors. However, more than 90% of my owners only own one firm, the average investor owns 1.08 firms, and most investors are employed in the firms they own, and have been so for a long time, and are thus unlikely to be professional private equity investors.

I find that firm profitability does not predict stock market returns, either measured in 2007 or in 2009. Thus investors in profitable firms did not outperform the market in any significant way. I do observe that the signs of the estimated coefficients would be consistent with such a story, but I need to stress that profitability in 2007 could be endogenous to the returns the investor experiences, for example by affect his or her's ability to pursue profitable projects. If there is some individual fixed effect that affects both ability and firm performance, I would expect that stock returns correlated with ability, especially if the investor has been invested in the firm for a longer time period. In column (6) I limit to firm-owner pairs where the investor had already entered the firm during or before 2004, and still find that firm profitability as of 2007 does not predict superior stock market performance. Finally, if stock market returns are correlated with ability in my sample, one would expect a positive relationship between the investor's individual earnings or his wealth level and his stock market returns. However, I precisely estimate that higher earnings or wealth do not predict superior portfolio returns.

Interestingly, I observe that investors who owned a larger share of their portfolio via a holding company experienced larger portfolio returns. An owner holding 100% of his portfolio via a holding company, rather than 0%, is predicted to experience a 2% higher return, or 0.08 of the cross-sectional standard deviation. While owning stocks through a holding company may be a sign of financial (or more specifically tax optimiziation) sophistication, I do not believe that this rings the alarm bell, as all my results are robust to controlling for this variable, which I do in all of my main specifications.

Table 20: Predictability of Investors' Stock Portfolio Returns

$R_{v,2007,2009}$	Owner's first year in firm $\leq$ 2007					$\leq$ 2004
	(1)	(2)	(3)	(4)	(5)	(6)
$\text{Stocks}_t/\text{GFW}_t$	-0.0648***	-0.0662***	-0.0614***	-0.0769***	-0.0762***	-0.0827***
	(0.0166)	(0.0167)	(0.0171)	(0.0191)	(0.0195)	(0.0216)
Avg. log(mcap)	0.0302***	0.0302***	0.0309***	0.0307***	0.0305***	0.0277***
	(0.0019)	(0.0019)	(0.0020)	(0.0020)	(0.0020)	(0.0022)
Portfolio HHI	-0.0007	-0.0009	-0.0067	-0.0125	-0.0112	0.0017
	(0.0120)	(0.0120)	(0.0123)	(0.0128)	(0.0129)	(0.0140)
Fraction Holding	0.0167*	0.0170*	0.0145	0.0171*	0.0184*	0.0208*
	(0.0095)	(0.0095)	(0.0097)	(0.0098)	(0.0099)	(0.0107)
Mutualfund share	0.0260	0.0257	0.0309	0.0215	0.0224	0.0102
	(0.0282)	(0.0282)	(0.0291)	(0.0296)	(0.0297)	(0.0312)
Profitability		-0.0161		-0.0262	-0.0258	0.0151
		(0.0248)		(0.0293)	(0.0304)	(0.0297)
Profitability $_{t+2}$			0.0006	0.0092	0.0240	
			(0.0173)	(0.0191)	(0.0196)	
log(GFW)				-0.0052	-0.0073**	-0.0088**
				(0.0032)	(0.0037)	(0.0040)
log(Earnings)				-0.0025	-0.0005	-0.0026
				(0.0038)	(0.0039)	(0.0041)
Personal Leverage					-0.0246	-0.0260
					(0.0151)	(0.0166)
Male					-0.0010	0.0006
					(0.0112)	(0.0121)
IndustryFE	-	-	-	-	Yes	Yes
RegionFE	-	-	-	-	Yes	Yes
r2	0.0639	0.0640	0.0680	0.0690	0.1046	0.0903
N	4150	4150	3866	3866	3862	3476

Standard errors are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. If a business-owner owns multiple firms, the Profitability variable is associated with the firm in which he has the highest ownership share. All RHS variables, except $\text{Profitability}_{t+2}$ are measured in 2007.

9.6 Firm-Owner Pair Statistics, Long version

Table 21: Firm-Owner Pair Statistics, long version

	N	mean	sd	p10	p25	p50	p75	p90
Ownership(%)	4747	0.55	0.34	0.10	0.25	0.50	1.00	1.00
Ownership(%), excl. spouse	4747	0.51	0.33	0.10	0.25	0.50	0.90	1.00
WasOwner2004	4306	0.92						
WasOwner2006	4783	0.97						
OwnViaHolding	4747	0.35						
IncrOwnershipSince2004	3946	0.16						
DecrOwnershipSince2004	3946	0.11						
SameCity	4783	0.71						
SameCounty	4783	0.85						
SiblingOwners	3393	0.21						
ParentOwner	3393	0.17						
ChildOwner	3393	0.12						
Employed	4783	0.60						
EmploymentTenure	2669	11.75	8.47	2.00	5.00	10.00	18.00	24.00
Owner's pay (NOK)	2848	462214	256918	138860	304723	435033	596156	781988
% of Owner's Earnings	2848	0.96	0.16	1.00	1.00	1.00	1.00	1.00
$\text{Dividends}_t > 0$	4783	0.29						
$\text{Dividends}_t/\text{GFW}_t$	4162	0.05	0.12	0.00	0.00	0.00	0.02	0.15
$\text{Dividends}_{t+1,t+2}/\text{GFW}_t$	4162	0.17	0.47	0.00	0.00	0.00	0.14	0.47

OwnViaHolding is a dummy for whether any of the owner's shares were held through another LLC. Dummies for increases and decreases in ownership share are only defined for those who were owners in both 2004 and 2007. For non-100% owners, ParentOwner=1 if the owner is the parent of another shareholder. ChildOwner is for children of another owner. SiblingOwner is similarly defined if one of your siblings is present as an owner. Dividends are recorded as they appear on the owner's tax records. The USD/NOK exchange rate was approximately 6 in 2007.

9.6.1 Firm Characteristics and Investor Stock Market Exposure

Most of the identifying variation in my analyses will come from firms whose investors have larger stock market exposures. In order to inform my later discussion of external validity, I provide summary statistics of all the firms in my sample (first column), all treated firms (second column), and by quartiles of exposure for the treated firms (4 last columns) in Table 22.

I find that treated firms do not differ dramatically from the other firms in my data. Most notably, treated firms tend to be slightly older, have a larger number of owners, fewer employees, and lower past employment growth. These differences in employment growth, however, are decreasing in the investor's

stock market exposure.

The lower part of Table 22 provides the distribution of my continuous treatment variable, $\frac{Gains_{t+1,t+2}}{GFW_t}$ for my entire treated sample, as well as by quartiles of stock market exposure.

Table 22: Stock Market Exposure and Firm Characteristics

	All firms	Treated	By Treated Quartile of Exposure			
Means			1	2	3	4
log(Assets)	14.96	14.89	14.98	14.89	14.89	14.81
Leverage (ST)	0.45	0.41	0.37	0.39	0.41	0.45
Leverage (LT)	0.11	0.09	0.07	0.08	0.09	0.11
Profitability	0.07	0.10	0.12	0.11	0.10	0.08
Firm Age	12.38	13.75	14.68	14.35	13.34	12.60
# Owners	2.22	2.76	2.57	2.71	2.84	2.90
# Owner-Employees	1.59	1.57	1.29	1.55	1.76	1.71
# Regular Employees	9.29	6.93	7.09	6.55	6.36	7.74
Empl. Growth $_{t-2,t}$	0.17	0.11	0.07	0.10	0.12	0.17
$\text{Investments}_{t-1,t}/\text{Assets}_{t-2}$	0.11	0.09	0.08	0.09	0.09	0.10

Employment Growth is measured as growth in number of days of within-year employment at the firm. I discuss this measure in greater detail in the Employment section of the paper. Investments include investments in vehicles, plant, property, and other fixed assets. Summary statistics are based on one observation per firm, and stock market exposure is assigned based on the owner with the largest ownership share.

9.6.2 Stock market exposure and investor characteristics

In my analysis, most of my identifying variation will come from investors with greater exposure to the stock market. While I control for this exposure in my regression specifications, knowledge of how these investors differ from the less-exposed will guide the interpretation of my results.

I find that business owners with positive stock market exposure are wealthier, older, more educated and have lower personal leverage. Once conditioning on positive exposure, I find that these differences are decreasing, except for education, which does not vary with stock market exposure.

The observation that stock market investors are wealthier and less leveraged points in the direction that these investors, and likely also their firms, are less ex-ante financially constrained than the population of firms.

I also see that the standard deviation of returns is the same for different quartiles of stock market

exposure.[30]

Table 23: Stock Market Exposure and Investor Characteristics

	All owners	Treated	By Treated Quartile of Exposure			
Means			1	2	3	4
Stocks/GFW	0.02	0.21	0.03	0.08	0.18	0.53
GFW_log	13.01	14.42	15.17	14.61	14.28	13.60
PersonalLeverage	0.44	0.29	0.20	0.26	0.30	0.41
Earnings_log	12.89	12.88	12.84	12.91	12.89	12.87
Age	46.90	52.38	54.87	52.86	51.58	50.21
Norwayborn	0.96	0.96	0.96	0.97	0.95	0.96
Male	0.77	0.85	0.87	0.86	0.84	0.84
HighSchool	0.86	0.91	0.92	0.93	0.91	0.89
College	0.29	0.45	0.46	0.45	0.43	0.45
st.dev($R_{t,t+2}$)		0.24	0.25	0.24	0.24	0.24
$Gains_{t,t+2}/GFW_t$						
sd		0.11	0.01	0.02	0.05	0.17
p1		-0.50	-0.04	-0.08	-0.19	-0.76
p5		-0.28	-0.02	-0.06	-0.14	-0.49
p10		-0.17	-0.02	-0.05	-0.12	-0.40
p25		-0.07	-0.01	-0.03	-0.07	-0.24
p50		-0.02	-0.01	-0.02	-0.04	-0.13
p75		-0.01	-0.00	-0.01	-0.02	-0.06
p90		-0.00	-0.00	-0.00	-0.01	-0.02
p95		0.01	0.00	0.01	0.01	0.04
p99		0.08	0.01	0.03	0.06	0.15

9.7 Other outsourcing measures

To proxy for the use of temporary workers, I utilize the accounting post "Other Personnel costs", which includes expenses related to the use of temporary labor from staffing services. However, this aggregated account also contains posts such as gifts to employees. Thus this proxy has significant measurement error that is likely affected shock variable.[31] To account for other types of outsourcing,

[30]This is allowing the mean return to vary with quartile of exposure. I find that individuals with higher exposure tend to experience lower returns from 2007 to 2009, this is discussed in the section on stock return predictability.

[31]The measurement error could be costs related to, e.g., gifts to employees or payment of gym memberships, which is likely affected by my wealth shock variable, thus this measurement error would bias my estimates towards not rejecting a

including the use of external administrative services (incl. book-keeping and legal services), I utilize the accounting post called "External services (accounting, auditing, consulting, etc.)" This variable likely has similar measurement error issues as other personnel costs.[32]

Table 24: Temporary Workers, and External Services

	Δ Other Personnel Costs		Δ External Services	
	(1)	(2)	(3)	(4)
$\text{Gains}_{t,t+2}/\text{GFW}_t$	-0.055	-0.055	0.067	0.025
	(0.053)	(0.060)	(0.091)	(0.097)
$\text{Gains}_{t,t+2}/\text{GFW}_t$ * Firm Age < 10		-0.052		0.112
		(0.132)		(0.213)
OtherPersonnelCosts/TotalPay	-0.284***	-0.283***		
	(0.092)	(0.092)		
ExternalServices/TotalPay			-0.142**	-0.142**
			(0.060)	(0.060)
GFW2OpEx	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]
Lagged 1-Year EG^D	Y	Y	Y	Y
Pcontrols	Y	Y	Y	Y
Fcontrols	Y	Y	Y	Y
Vcontrols	Y	Y	Y	Y
FE	NACE3,R	NACE3,R	NACE3,R	NACE3,R
r2	0.1570	0.1589	0.1378	0.1388
N	2052	2052	2279	2279

Standard errors are two-way clustered on the firm and investor level (when applicable) and are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. $Gains_{t,t+2}/GFW_t$ is amount of stock market gains the investor experienced during 2008 and 2009, fixing portfolio weights in 2007, scaled by his 2007 Gross Financial Wealth. Dependent variables are scaled by TotalPay_{2007}. Columns (2), (4), and (5) include a dummy for Firm Age < 10 as a RHS variable.

null of no effect of adverse wealth shocks on using temporary workers.

[32]While constrained firms may wish to outsource more of their administrative work, this may reduce over all economic activity in the firm, thus reducing the need for outside services.

9.8 Robustness

9.9 Additional controls for main employment growth regressions

Table 25: Additional controls for main employment growth regressions

$EG^D_{07,10}$	(1)	(2)	(3)	(4)
$\text{Gains}_{t,t+2}/\text{GFW}_t$	0.486**	0.412**	0.481**	0.498**
	(0.192)	(0.186)	(0.206)	(0.210)
Profitability	0.312***	0.073	0.323**	0.324**
	(0.118)	(0.142)	(0.129)	(0.130)
$\text{Profitability}_{10}$		0.191**		
		(0.080)		
$r_{v,05,07} - \bar{r}_{05,07}$			-0.038*	-0.046
			(0.022)	(0.049)
$(r_{v,05,07} - \bar{r}_{05,07})^2$				0.082
				(0.129)
$(r_{v,05,07} - \bar{r}_{05,07})^3$				0.018
				(0.110)
$(r_{v,05,07} - \bar{r}_{05,07})^4$				-0.073
				(0.157)
$\text{GFW}_t/\text{OpEx}_t$	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]
P,F,V controls	Y	Y	Y	Y
FE	NACE3,R	NACE3,R	NACE3,R	NACE3,R
Cluster	F,V	F,V	F,V	F,V
r2	0.1341	0.1333	0.1459	0.1461
N	2496	2254	2187	2187

Standard errors are two-way clustered on the firm and investor level (when applicable) and are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. $Gains_{t,t+2}/GFW_t$ is amount of stock market gains the investor experienced during 2008 and 2009, fixing portfolio weights in 2007, scaled by his 2007 Gross Financial Wealth. $\bar{r}_{05,07}$ is the mean portfolio returns from 2005 to 2007 for investors in the sample.

9.9.1 Different measures of employment growth

I now explore whether my results are robust to changing the definition of employment growth. EG^N is defined similarly as EG^D, but does not account for the duration of employment within the year. EG^Y is year-on-year employment growth, considering the changes in the number of employees from December to December. In Table 26 I find that my preferred measure of employment growth is the measure most sensitive to wealth shocks. Disregarding the employment duration (EG^N) lowers my coefficient by 24%, but reveals very similar heterogeneity with respect to firm age. Year-on-year employment growth is the measure least sensitive to wealth shocks. We, somewhat surprisingly, find a much lower (and not statistically significant, $t = 1.63$) sensitivity of total wages. As can be inferred from the fairly high t-statistic, this lack of significance is highly sensitive to my choice of control variables and clustering. However, this lack of statistical (or economical) significance does not carry over to younger firms.

Table 26: Different measures of employment growth

	$EG^D 07,10$		$EG^N 07,10$		$EG^Y 07,10$		Total Pay Growth 07-10	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Gains_{t,t+2}/GFW_t$	0.488**	0.131	0.371*	0.054	0.170	-0.072	0.298	-0.136
	(0.192)	(0.192)	(0.210)	(0.199)	(0.198)	(0.193)	(0.183)	(0.187)
* Firm Age < 10		0.990**		0.952**		0.751*		1.161***
		(0.398)		(0.381)		(0.447)		(0.386)
GFW2OpEx	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]
LaggedOutcome	Y	Y	Y	Y	Y	Y	Y	Y
Pcontrols	Y	Y	Y	Y	Y	Y	Y	Y
Fcontrols	Y	Y	Y	Y	Y	Y	Y	Y
Vcontrols	Y	Y	Y	Y	Y	Y	Y	Y
FE	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R
r2	0.1340	0.1368	0.1398	0.1432	0.1331	0.1351	0.1424	0.1467
N	2496	2496	2496	2496	2496	2496	2496	2496

Standard errors in parentheses. GFW/OpEx $\in [0.25, 1.75]$.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

9.9.2 Weighting

This section explores whether my results are robust to my weighting scheme. I report my results in Table 27. Column (1) is my main specification. Column (2) Weights by ownership share, excluding the spouse's share. If a firm only appears in the sample with one investor owning $< 100\%$, then this firm will be down-weighted relative to other firms. Column (3) does not down-weight professional services. Column (4) excludes professional services. Columns (5)-(6) do not use weighting, instead I select only one investor per firm. The selection criteria is that his weight, when not down-weighting professional services, was $> 50\%$. Columns (4) and (5) differ in that column (5) excludes professional services.

Table 27: Robustness to weighting

$EG^{D}_{07,10}$	(1)	(2)	(3)	(4)	(5)	(6)
$\text{Gains}_{t,t+2}/\text{GFW}_t$	0.488**	0.436**	0.430**	0.561***	0.458**	0.603***
	(0.192)	(0.195)	(0.186)	(0.213)	(0.193)	(0.225)
Weighting	Stocks	Own %	Stocks	Stocks	-	-
DownweightPS	Y	-	-	-	-	-
OnlyOneInv	-	-	-	-	Y	Y
IncludePS	Y	Y	Y	-	Y	-
GFW2OpEx	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]	[0.25,1.75]
LaggedOutcome	Y	Y	Y	Y	Y	Y
Pcontrols	Y	Y	Y	Y	Y	Y
Fcontrols	Y	Y	Y	Y	Y	Y
Vcontrols	Y	Y	Y	Y	Y	Y
FE	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R	NACE3,R
r2	0.1340	0.1446	0.1285	0.1434	0.1303	0.1468
N	2496	2479	2496	1981	2085	1655

Standard errors are two-way clustered on the firm and investor level (when applicable) and are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. $Gains_{t,t+2}/GFW_t$ is amount of stock market gains the investor experienced during 2008 and 2009, fixing portfolio weights in 2007, scaled by his 2007 Gross Financial Wealth. Weighting by stocks implies weighting by the amount of stock wealth the investor has relative to the total stock wealth of all investors who also own shares in the firm and are in the regression sample. Weighting by ownership percent excludes spouse's ownership share. OnlyOneInv implies that per firm I only select investors whose non-downweighted weight was $> 50\%$, leaving us with one observation per firm. IncludePS indicates whether or not I included Professional Services firms (NACE2 codes 69-75).