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RESEARCH ARTICLE

Do businesses benefit from labor hoarding?

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Abstract This paper examines whether firms that retained more employees than predicted during the Great Recession, often termed "labor hoarding," experienced benefits over 7 years. Using establishment-level data from the Infogroup Historical Business Database, we estimate labor hoarding and assess its impact on firm survival, employment, and sales in the recovery period. We find that labor hoarding firms were significantly more likely to survive, with the effect strongest for women-owned and women-led businesses. However, these firms grew more slowly in both employment and sales than non-hoarding counterparts, who needed to rehire post-recession. Our results suggest that retaining workers acts less as an added cost and more as a strategy of "workforce preservation," providing stability at the expense of rapid post-recession growth. These findings highlight that policies supporting workforce retention, such as the Paycheck Protection Program, may improve business survival and economic resilience, especially for women-led firms.

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Plain English Summary We examine whether firms realize any benefits of "labor hoarding" during a recession by looking at their performance measure in the period after the recession. Businesses may face higher labor costs during a period of low demand when they choose to hoard labor during a recession, which could have long-term negative effects on their business during the recovery. On the other hand, businesses may reduce long-term turnover, building loyalty and skills in their workforce, acting as a kind of "workforce preservation." We find that labor hoarding amongst firms led to increased survival rates of firms after recessions; however, those firms also experienced slower growth rates in employment and sales after the recession. We also examine these effects across gender and find that women-led labor hoarding firms survived at higher rates than men-led labor hoarding firms. Our results suggest that "workforce preservation" may be a more accurate label than "labor hoarding" for firms trying to improve their chances of surviving a recession.

Keywords Labor hoarding · Recession · Business survival · Workforce preservation

JEL Classification E24 · E32 · J65 · L21

1 Introduction

The Paycheck Protection Program (PPP) established by the CARES Act in 2020 was implemented by the

Small Business Administration to provide small businesses with loans to help them cover payroll during the COVID-19 pandemic-induced recession. The goal of the PPP was to save jobs by subsidizing labor hoarding. Estimates vary greatly on the number of jobs saved by the program, ranging from 2 million (Autor et al., 2022) to as many as 18.6 million jobs (Faulkender et al., 2020). There are benefits to workers in avoiding unemployment and avoiding the long-run scarring effects of unemployment (see for example, Gonalons-Pons & Gangl, 2022; Oreopoulos et al., 2012; Kahn, 2010; Sullivan & von Wachter, 2009), but less is known about whether the firm may benefit from labor hoarding or if it is merely an added cost, specifically coming out of a recession.

Similar to the concept of "efficiency wages," whereby firms pay higher than equilibrium wages to attract and keep a skilled workforce and increase productivity or efficiency, labor hoarding may act as a type of "efficiency labor" or "workforce preservation." By keeping employees on the payroll especially during a recession, firms may build firm-specific human capital and loyalty in employees that similarly boosts productivity or efficiency. It is too early to test whether there may be longer term benefits or costs to businesses of this type of labor hoarding that the PPP subsidized. Instead, to test this idea, we examine the effect of labor hoarding in the Great Recession on firm performance after the Great Recession using the Infogroup Historical Database. We estimate labor hoarding by comparing 2010 actual employment compared to predicted 2010 employment based on existing firms' employment and sales trajectories before the recession from 2004 and 2007.

A challenge to studying labor hoarding is that it is endogenous to firm survival, employment, and sales growth because the decision to retain excess workers is jointly determined. Firms could hoard labor for several possibly endogenous reasons including when they anticipate stronger future demand; expect a stronger recovery; possess valuable firm-specific human capital; or face higher rehiring or training costs. These same expectations and assets also raise the odds of surviving and growing. Additionally, access to finance further links labor hoarding and future business outcomes. Firms with better capitalization or better access to banking can absorb short-run losses to preserve workforce capacity, and liquidity itself predicts subsequent performance. Without some sort of natural experiment that randomly causes some firms to hoard labor, researchers are forced to try to minimize these concerns through econometric and methodological choices. Our approach is to match firms that hoard labor with firms that do not, using propensity score matching. We require a match to be within the same county and operating in the same industry, with the hope that it minimizes geographic variability, differences in local economies, and growth changes in industries. We hope this minimizes differences in anticipating future demand, expectations in recovery, and similar rehiring or training costs. Additionally, we match on employment and sales from 2004 through 2007, meaning these businesses were growing in both employment and sales at the same rate before the recession and were similar in size. We further attempt to control for additional firm-specific attributes, like productivity and marketing expenditures. It is important to note that we can never fully address omitted variable bias because we have no information on managerial quality, customer relationships, or informal credit access.

Firms that retain employees during downturns may benefit from reduced turnover costs, stronger employee loyalty, and preserved firm-specific human capital. By maintaining a stable workforce, firms avoid the costs and risks associated with rehiring and retraining once demand recovers. This continuity can also preserve organizational knowledge and customer relationships, which may be critical to survival. In this sense, labor hoarding acts less as an added cost and more as an insurance policy, which helps firms weather downturns and positions them for smoother recovery.

Previous research finds that women entrepreneurs were more likely to hoard labor during the Great Recession (Matsa & Miller, 2014) and that the share of women-owned and managed establishments in counties increased economic stability in the Great Recession (Deller, Conroy, and Watson, 2017). The status of women, beyond mere ownership, may impact business outcomes such as employment, innovation, and profit. Therefore, we examine both women-owned and women-led firms, where the latter more directly measures women's influence over managerial and leadership decisions. We find that women-led firms were more likely to hoard labor during the Great Recession. We further examine whether the advantages of labor hoarding

differed for women-owned/led firms compared to men-owned/led firms. If women-owned/led firms experienced larger benefits from labor hoarding, this may explain why women-owned/led firms were more likely to hoard labor. We find that labor hoarding firms in general have significantly better survival rates after the Great Recession. Accounting for gender differences, we find that women-owned/led labor hoarding firms survive at higher rates than male-led labor hoarding firms; however, we find that women-led labor hoarding firms experience slower growth after the Great Recession. It seems that *both* men-led and women-led firms who hoarded labor during the Great Recession were more likely to survive and grow in the wake of the Great Recession.

In what follows, we review the literature on labor hoarding and on firm survival; then, we describe our data and methodology in more detail, followed by our results and conclusion.

2 Literature review

There is a well-documented relationship between entrepreneurial activity and the health of the economy (Glaeser et al., 1992; Rosenthal & Strange, 2003, 2009; Acs & Armington, 2004; Stephens et al., 2013, for example). However, concerns have been mounting over the impact of the declining role of startups (defined as firms less than 1 year old) in the US economy (see Fig. 1). The negative demand shock of the Great Recession affected sales (and employment) forcing many firms to close (Fairlie, 2013; Shane, 2011). The Great Recession also significantly reduced the establishment startup share (shown in Fig. 1).

Following a long trend of the declining share of startups, the number of startups dropped dramatically, more than 25% between 2006 and 2009 as establishment entry rates dropped and establishment exit rates increased (U.S. Census Business Dynamics Survey). Because new and small firms tend to be more flexible and open to change (and associated with innovation and growth in the economy), the declining role of startups in the US economy may affect the economic dynamics in how the USA recovers from recessions. Clementi and Palazzo (2016) find that the drop in the number of establishments contributed to the slow recovery from the Great Recession. Many businesses were simply unable to survive the severity

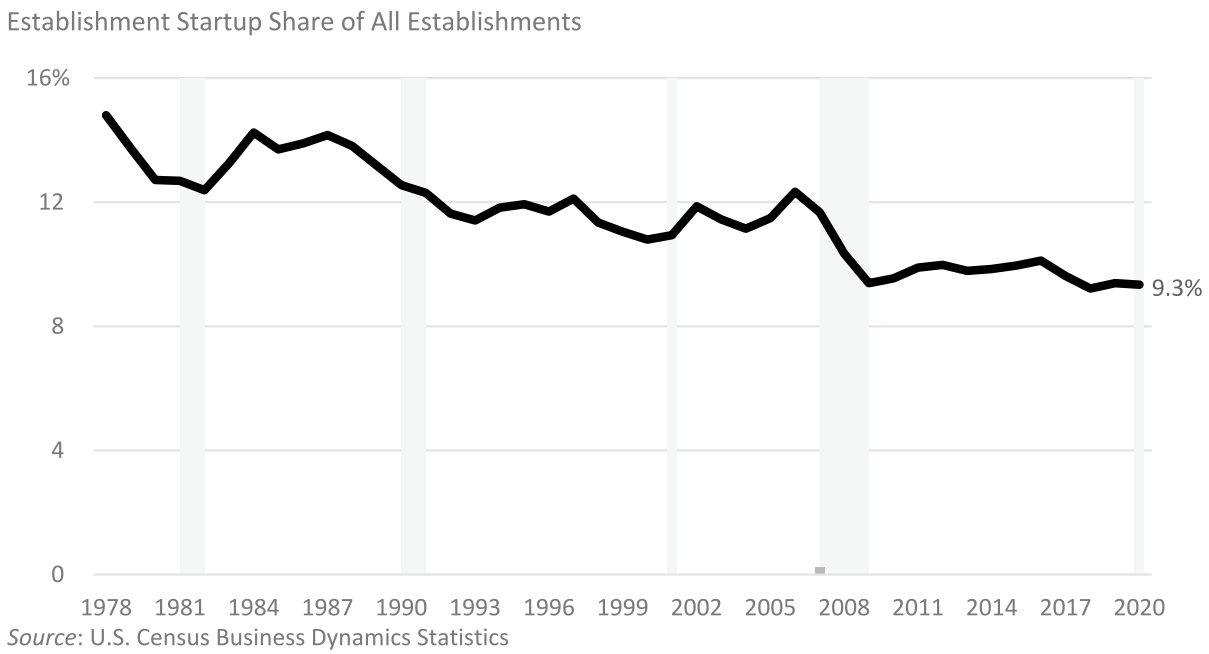


Fig. 1 The decline in the share of startups, 1978–2020. Note: Establishments less than 1 year old are considered startups. The figure looks similar when we use firms instead of establishments

of the Great Recession or were slow to recover from the recession. Thus, policies that increase firm survival during a recession may also help spur a quicker recovery.

In addition to the business cycle, firm survival rates are affected by other industry and market dynamics (see for example, Agarwal & Gort, 1996, 2002). Firm survival is also affected by firm characteristics. For example, growing firms are more likely to survive (Phillips & Kirchoff, 1989). More diverse firms in terms of education, age, and gender also have higher survival rates (Backmand and Kohlhase, 2020). Yet, the literature is mixed on whether firm survival rates (as well as other firm performance measures) differ between women-owned and men-owned firms, with some finding women-owned businesses have lower survival rates (see for example, Robb, 2002) while others find no difference (see for example, Robb & Watson, 2010, 2012).

Lending especially to small businesses fell dramatically during the Great Recession which increased downsizing particularly for firms that depended on external financing (Duygan-Bump et al., 2015). Men-owned businesses have outperformed women-owned businesses, in part, because men-owned firms have higher startup capital (Fairlie & Robb, 2009) and women-owned firms rely more on family and networks dominated by kin (Renzulli et al., 2000). During the Great Recession, however, when capital was constrained, women may have had an advantage, being used to operating with less capital and relying more on family.

Differences in business leadership styles may also affect how a business responds to a recession, which may affect business performance during a crisis such as during a recession. For example, Mano-Negrin and Sheaffer (2004) find that women's more participatory style of decision-making is advantageous for women business leaders during times of crises. Women tend to be more cautious and more oriented toward the long run (Silverman, 2003). Women also tend to be more averse to inequality, preferring fairness and exhibiting more altruistic behavior, taking into account the interest of others (Adams & Funk, 2012; Andreoni & Vesterlund, 2001; Croson & Gneezy, 2009; Eagly & Carli, 2007). This may also mean that women may prefer to avoid necessary layoffs in the face of a recession to the detriment of their business.

On the other hand, Bartoloni et al. (2021) find that firms focusing more on skill accumulation rather than cost retrenchment are better able to cope during a recession, thereby increasing survival. Firms focused on skill accumulation may be more likely to pay above equilibrium wages, "efficiency wages," to reduce turnover and retain skilled workers to increase productivity or efficiency (see for example, Campbell, 1993). Wage cuts (even during a recession) are infrequent as wages tend to be rigid or "sticky" (Barattieri et al., 2014; Bewley, 2002). Interviews with business executives suggest that they avoided wage cuts during a recession to help maintain morale (and the productivity of their employees)—Bewley (2002). Business leaders may choose to pay above equilibrium wages, "efficiency wages," even during a recession to maintain productivity, especially in the long term. When businesses choose to keep above equilibrium numbers of workers, they may be choosing to do this to similarly maintain morale or productivity long term. It may be more of a strategy of "efficiency labor" or "workforce preservation" rather than "labor hoarding" as it is typically referred to in the literature. Layoffs are also associated with reduced morale for the employees that remain at the firm (Iverson & Zatrick, 2011).

Matsa and Miller (2014) find that women business owners, all else equal, were less likely than their male counterparts to reduce employment during the Great Recession (in their words, more likely to "hoard labor"). With layoffs less likely in women-owned businesses during the Great Recession, counties with a higher share of women-owned businesses maintained higher stability during the recession (Deller, Conroy, and Watson, 2017). Yet, the question of whether this provided more benefits (as a type of "efficiency labor" or "workforce preservation") or costs (from "labor hoarding") to the businesses themselves has yet to be answered in the literature. We estimate how this labor hoarding strategy affected business outcomes post-recession and how these outcomes differed between men- and women-owned/led firms in the wake of the Great Recession. Specifically, we test whether the labor hoarding strategy improved survival rates and business performance measures during the recovery from the Great Recession.

We also contribute to the literature on non-traditional/marginalized person's business ownership and potential resources that should be offered to help these businesses survive. Chatterjee et al. (2022) find that amongst rural women in poverty, having both

work experience and supportive environments leads to realistic expectations and more successful businesses, while those without support and experience tend to have unrealistic expectations about the business environment. For transgender business owners, Darden et al. (2022) find that they face more economic disparities and that they value safe working environments. Additionally, they find that their fear of failure drives them in different ways than traditional business owners, and they suggest that there should be additional assistance for transgender businesses. Yu et al. (2024) using an experimental design find that after the Great Recession, which they refer to as the Great Financial Crisis, there was an increase in funding for women businesses, while using observational data, they find the opposite trend when the COVID-19 pandemic hit the market.

3 Data and methodology

Our source of business information comes from the Infogroup's Historical Business Database and contains longitudinal data on all establishments in the USA, with the unit of observation being the establishment. The data consist of yearly information on every business from 1997 to 2017 and are extensive, with approximately 30 million establishments each year. These data contain a wealth of information, including exact location, address, age of each establishment, number of employees, sales volume, detailed industry code (up to six digits), and corporate linkages.

To measure labor hoarding, we first predict the employment level immediately following the Great Recession (2010) for every establishment (i) given their industry, location, and growth in employment and sales before the recession to estimate the expected or predicted amount of employment in 2010 given their size, trend, location, and industry (Eq. 1). We chose 2010 because 2009 had the largest loss of employment across all major industries, which can be seen in Table 11 in the Appendix.[1] Specifically, we include every establishment's level of employment and sales in 2007, 2006, and 2004, which accounts for differences in size both in levels and trends and is represented by β_1 and β_2.[2] We also include firm-specific measures of productivity (sales per employee) and a measure of marketing expenditure (size of yellow page advertisement). We also utilize two-digit SIC fixed effects to account for their industry, *IndFE*, and US county fixed effects to account for their location, *CountyFE*.

$$\begin{aligned} Employment_{i,2010} = {} & \beta_1 Employment_{2004,2006,2007} \\ & + \beta_2 Sales_{2004,2006,2007} \\ & + \beta_3 X_{i,2007} + + IndFE_i \\ & + CountyFE_l + \varepsilon_i \end{aligned} \tag{1}$$

We then use the residual (the difference in the predicted employment change and their actual employment change during the recession) as a measure of labor hoarding. We define a binary variable ($hoard_i$) equal to one if the business had higher employment than predicted in 2010 (at the end of the recession) and equal to 0 if they had lower employment than predicted. As robustness, we defined a firm as labor hoarding if the firm's residual is in the top quartile. We first examine how labor hoarding affects a firm's economic outcomes (survival rate, employment and sales), Y, after the recession (2010 to 2017). Equation 2 shows that we regress these outcome variables on the previous controls of employment and sales, represented as X for simplicity, as well as the location and industry fixed effects:

$$\begin{aligned} \Delta Y_{2017-2010} = {} & \beta_1 Hoard_i + \beta_1 X_{2004,2006,2007} \\ & + \beta_3 X_{i,2007} + IndFE_i + CountyFE_l \\ & + \varepsilon_i \end{aligned} \tag{2}$$

We then test whether the relationship between labor hoarding and post-recession outcomes differs for women-owned/led firms. For these regressions, Eq. 3 shows we include an indicator for whether the firm is owned/led by a woman and an interacted term between labor hoarding and female, in addition to our previous controls:

[1] In results not shown, we changed the reference to 2011 for manufacturing, construction, and information because 2010 had some minor employment losses but this did not impact the results. Just for consistency, we choose to keep the reference year as 2010 for all industries.

[2] We also examine what happens to new firms in 2007. For those regressions, we obviously condition on 2007 levels since they did not exist in prior years.

$$\Delta Y_{2017-2010} == \beta_0 + \beta_1 Hoard_i + \beta_2 Female_i + \beta_3 HoardxFemale_i + \beta_4 X_{it} + IndFE_i + CountyFE_l + \varepsilon_i \quad (3)$$

Similar to Matsa and Miller (2014), we find that women-led businesses are more likely to hoard.[3] Whereas Matsa and Miller (2014) focus on women-led firms, we focus our analysis on establishments that are either owned by women or led by women. The ability of women in firms to affect significant change, innovative, or otherwise depends on the empowerment of women within the firm. Previous research has found that the proportion of women in top management positions has a positive effect on business outcomes, including closing the gender wage gap within companies, especially as women managers achieve higher status within the firm (Cohen & Huffman, 2007; Smith et al., 2006). Thus, the status of women, more than the mere presence of a woman (through ownership, for example) within a firm, may affect business outcomes from employment to innovation and profit. Thus, we examine both women-owned and women-led firms, where women-led firms may be a more direct measure of women's influence over the managerial and leadership decisions of the firm.

Table 1 presents descriptive statistics on employment, sales, and number of businesses for all establishments in our data set and across genders, whether they hoarded labor or not. The first four columns are statistics without using propensity score matching, while the last four columns are for businesses that were matched to find better matches between hoarders and non-hoarders. We present employment and sales in the pre-periods (2004, 2006, 2007) and immediately after the Great Recession in 2010. Overall, a few themes emerge. First, labor hoarding firms, those with higher employment than predicted given their county, and two-digit industry, as well as their employment and sales in 2004, 2006, and 2007, are quite large compared to non-labor hoarding firms (roughly five to six times larger). This persists throughout the pre-period. Second, we find that male-owned/led firms are larger than women-owned/led firms, which is consistent with the literature on female entrepreneurship. Lastly, men-owned/led firms are twice as likely to be in manufacturing than their counterparts. Columns 5 through 8 show descriptive statistics of firms selected after using nearest-neighbor matching with three matches using a 0.1 caliper. Generally, we find the comparison between the labor hoarding firms and those who did not much closer than without matching. However, we do find that labor hoarding firms are still slightly larger than the counterfactual firms regardless of gender. However, the industrial mix is similar between the two groups.

Given the observable differences between firms that hold onto their employees during a recession and firms that do not, we supplement our analysis by using propensity score matching to select only those non-labor hoarding comparison firms who are similar to the labor hoarding firms. Specifically, we use nearest-neighbor matching to select three non-labor hoarding firms that are within the same US county, in the same two-digit SIC industry, and matching on employment and sales in 2004, 2006, and 2007 with a 10% caliber.[4] Panel B of Table 1 displays the differences between labor hoarding and non-labor hoarding firms after removing firms without common support. We drop 120,077 or 3.4% of the firms for the existing business analysis and 2648 or 2.48% of firms for the new business analysis, which makes sense given how different these groups of firms were prior to the matching.

4 Results

The results presented in this paper include location fixed effects (US counties) and two-digit standard industrial code (SIC) fixed effects. We present estimates of firms who have been in business for 4 years or more in 2007 as "existing" firms first and then present estimates for businesses that were started in 2007, which we define as "new" firms. For "existing" firm regressions, we control for the level of

[3] Matsa and Miller (2014) examine labor hoarding by examining the degree of downsizing for firms (setting the variable to zero for firms with no downsizing or with employment growth). We will examine similar measures of downsizing in our robustness section.

[4] Our results are quite robust to alternative methods including the number of matches, the size of the caliber, matching within the same state (which is what Matsa and Miller (2014) do), and one-digit SIC industry.

Table 1 Summary statistics by labor hoarding and gender for existing (4 years or older) firms in 2007

	Without Propensity Score Matching				With Propensity Score Matching			
	Labor Hoarding Firm		Not Labor Hoarding Firm		Labor Hoarding Firm		Not Labor Hoarding Firm	
	Male	Female	Male	Female	Male	Female	Male	Female
Pre-period	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
# of Establishments in 2007	656,077	243,900	1,946,760	788,496	331,330	153,976	1,699,909	788,496
Average # of Employees in 2007	38.57	26.72	6.68	5.37	15	14.05	4.18	4.23
	(136.45)	(97.16)	(48.8)	(29.6)	(16.16)	(12.9)	(6.23)	(6.76)
Average Sales (thousands) in 2007	10261.42	4349.65	1608	881.1	2376.1	1620.7	838	619.2
	(44272)	(22464.9)	(58970)	(11487)	(3793.8)	(2118.3)	(1731)	(1089.38)
Average # of Employees in 2006	37.62	25.84	6.77	5.53	15.27	13.96	4.19	4.24
	(133.57)	(88.10)	(47.3)	(31.8)	(16.19)	(13.02)	(6.23)	(6.77)
Average Sales (thousands) in 2006	9931.4	4158	1665.7	910.67	2357.9	1593.8	835.3	614.87
	(43310)	(21965)	(59343)	(11796)	(3795.0)	(2110.2)	(1728.9)	(1081.8)
Average # of Employees in 2004	35.93	24.5	6.77	5.62	14.96	13.67	4.18	4.25
	(128.48)	(86.75)	(70.42)	(30.66)	(16.25)	(13.07)	(6.21)	(6.78)
Average Sales (thousands) in 2004	8183.5	3752.45	1353.6	812.14	1955.1	1524.02	696.58	545.19
	(37960)	(21926)	(21298)	(8401.6)	(3004.7)	(2058.8)	(1377.1)	(1023.0)
% Manufacturing in 2007	11.42%	2.99%	6.60%	2.94%	5.04%	1.44%	4.58%	2.13%
% Retail in 2007	30.46%	32.92%	26.50%	29.16%	36.66%	35.69%	27.31%	29.28%
% Services in 2007	23.05%	47.52%	32.50%	44.70%	26.10%	47.29%	34.46%	45.87%
Post-period								
# of Establishments in 2010	656,077	243,900	1,946,760	788,496	331,330	153,976	1,699,909	788,496
Average # of Employees in 2010	45.89	32.52	4.88	4.37	20.06	18.79	3.74	3.85
	(165)	(117.7)	(22.44)	(10.05)	(47.28)	(52.41)	(4.03)	(4.33)
Average Sales (thousands) in 2010	12063	5622.5	1218.4	713.3	3325.1	2289.4	764.02	567.32
	(109528)	(168437)	(45862)	(2965)	(9085.5)	(10147.7)	(1497.0)	(781.26)

employment and sales variables in 2007, 2006, and 2004 to account for observable differences in pre-trends. Effectively, we are comparing firms that are in the same county, in the same two-digit SIC industry, and we account for differences in employment and sales before the Great Recession. Of course, for "new" firm regressions, we can only include employment and sales in 2007. A reminder is that our "labor hoarding" variable is determined by first regressing employment in 2010 (after the Great Recession) on the 2004, 2006, and 2007 employment and sales with both location (US county) and industry (two-digit SIC) fixed effects and then differencing the predicted 2010 employment with their actual employment. The idea is that the predicted level of 2010 employment is what was expected given their employment and sales trajectory, location, and industry. Finally, because we are working with a data set that has all establishments in the USA, the number of observations in the regressions is of such magnitude that all of our coefficients

Table 2 The effect of labor hoarding during the 2009 Recession on the likelihood of survival in 2017

	OLS diff-in-diff			PSM diff-in-diff		
Existing firms in 2007	LH indicator	LH indicator	Top quartile LH	LH indicator	LH indicator	Top quartile LH
	(1)	(2)	(3)	(4)	(5)	(6)
Labor hoarding (LH)	0.0916***	0.0900***	0.100***	0.0416***	0.0159***	0.0629***
	(0.000583)	(0.000677)	(0.000623)	(0.000817)	(0.00159)	(0.000824)
Women-owned and LH		0.00525***	0.00292**		0.0367***	0.00902***
		(0.00126)	(0.00116)		(0.000958)	(0.00138)
Women-owned		−0.0151***	−0.0149***		−0.0142***	−0.0140***
		(0.000658)	(0.000689)		(0.000708)	(0.000740)
Constant	0.663***	0.667***	0.657***	0.641***	0.645***	0.645***
	(0.000281)	(0.000339)	(0.000357)	(0.000336)	(0.000397)	(0.000397)
Observations	3,635,229	3,635,229	3,635,229	2,898,454	2,898,454	2,898,454
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 04, 06, 07	Yes	Yes	Yes	Yes	Yes	Yes

Labor hoarding (LH) is a measure of employment in 2010 minus the expected employment in 2010 conditioned on the location (county), 2-digit SIC industry, and employment and sales in 2004, 2006, and 2007. Columns 1 and 2 use an indicator variable of labor hoarding while columns 3 and 4 use an indicator variable of whether they are in the top tercile or quartile of labor hoarding.

are statistically significant, so much of our discussion is focused on whether they are economically meaningful.[5]

4.1 Survival

We begin by examining whether keeping more employees than expected, "labor hoarding," affects the likelihood a business is still operating in 2017 (7 years after the Great Recession). Starting with "existing" businesses in 2007, which have been in business for at least 4 years, the constant term in Column 1 of Table 2 can be interpreted as the survival rate for non-hoarding firms, which was 66.3%. Meanwhile, the indicator variable (dummy variable) for labor hoarding firms suggests those firms were 9.16% more likely to survive. This higher survival rate likely reflects the benefits of workforce preservation by reducing costly turnover, maintaining firm-specific human capital, and ensuring firms were better positioned to recover when demand returned. While this is interesting in its own right, we also want to understand whether there are differences for women-owned/led versus men-owned/led businesses when they choose to labor hoard, especially coming out of a recession. Matsa and Miller (2014) find there are differences in downsizing rates between genders, and the previous literature has also found that differences between men and women, such as risk aversion, may also lead to differences (see Flippin (2022) and Holden and Tilahun (2022) as examples of the research on women being more risk averse).

Column 2 of Table 2 adds in the interaction term for being a labor hoarding firm with being women-owned/led, while column 3 uses a more restrictive measure of labor hoarding by indicating only those firms in the top quartile of labor hoarders. We find very similar effects across both measures. We find that men-owned labor hoarding firms are 9% to 10% more likely to survive than non-hoarding firms. Women-owned labor hoarding firms experience an additional survival advantage of about 0.3% to 0.5% compared to their male counterparts. Thus, women-owned labor hoarding firms experience a slightly larger benefit (9.5% to 10.3% more likely to survive compared to 9% to 10%) from labor hoarding than men-owned firms. Women-owned firms that did not hoard labor were about 1.5% less likely to survive than non-hoarding men-owned firms.

[5] The decrease in sample size in the employment and sales results is due to missing data on employment and sales for these firms.

These findings are consistent with prior evidence that women entrepreneurs often face tighter financial constraints and have less access to credit markets (Coleman & Robb, n.d.). At the same time, research suggests women leaders are more likely to adopt long-term, participatory decision-making styles and place greater emphasis on fairness and employee well-being (Croson & Gneezy, 2009; Mano-Negrin & Sheaffer, 2004). Together, these factors make women-owned businesses less likely to resort to layoffs, treating workforce preservation not only as a financial strategy to avoid costly turnover but also as a means of maintaining firm-specific human capital, loyalty, and reputation during challenging economic periods.

Columns 4 to 6 present the same analysis using nearest-neighbor propensity score matching to exclude non-labor hoarding firms that are not comparable to labor hoarding firms. The results remain largely consistent; there is a reduction in magnitude with men-owned labor hoarding firms 2% to 6% more likely to survive (compared to 9% to 10%), while the magnitude of the effect is slightly larger with women-owned hoarding firms experiencing an additional survival advantage of 0.9% to 4% (compared to 0.3% to 0.5%). Notably, despite the loss of over 2 million observations, the findings remain robust.

4.1.1 New firms

New firms have a higher propensity to close as they are more financially vulnerable and less established. The U.S. Bureau of Labor Statistics estimates that 45% of all businesses fail within their first 5 years, with approximately 20% failing after just 2 years (BLS Table 7). Since new firms are particularly at risk, we want to study survival rates for new firms (in 2007) that choose to keep more workers than expected and present the same analysis but for new firms in Table 3, with the exception that we can only add employment and sales controls for 2007. Column 1 shows the baseline survival rate of non-labor hoarding new businesses in 2007, which have lower survival rates (57.8%) compared to those of existing businesses (66.3%) and that new firms benefit similarly to labor hoarding, with an increase in survival 7 years later of 9.3%. Columns 2 and 3 present the effects of labor hoarding across genders. Men-owned/led firms that labor hoard are 8.7% to 9.8% more likely to survive, while women-owned/led firms survived an additional 2% compared to men-owned/led labor hoarding firms. New women-owned/led businesses that did not hoard labor are roughly 3% less likely to survive, which is twice as large as existing women-owned/led non-labor hoarding firms.

Table 3 The effect of labor hoarding during the 2009 Recession on the likelihood of survival in 2017

	OLS diff-in-diff			PSM diff-in-diff		
New firms in 2007	LH indicator	LH indicator	Top quartile LH	LH indicator	LH indicator	Top quartile LH
	(1)	(2)	(3)	(4)	(5)	(6)
Labor hoarding (LH)	0.0930***	0.0868***	0.0982***	−0.0174	−0.0119	0.0295**
	(0.00217)	(0.00258)	(0.00233)	(0.000717)	(0.0155)	(0.0138)
Women-owned and LH		0.0190***	0.0202***		−0.0126	−0.0407*
		(0.00459)	(0.00415)		(0.0258)	(0.0224)
Women-owned		−0.0271***	−0.0295***		−0.0347***	−0.0286**
		(0.00238)	(0.00253)		(0.0107)	(0.0111)
Constant	0.578***	0.586***	0.574***	0.641***	0.651***	0.646***
	(0.00104)	(0.00128)	(0.00136)	(0.00565)	(0.00643)	(0.00652)
Observations	291,376	291,376	291,376	13,472	13,472	13,472
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 07	Yes	Yes	Yes	Yes	Yes	Yes

Labor hoarding (LH) is a measure of employment in 2010 minus the expected employment in 2010 conditioned on the location (county), 2-digit SIC industry, and employment and sales in 2004, 2006, and 2007. Columns 1 and 2 use an indicator variable of labor hoarding while columns 3 and 4 use an indicator variable of whether they are in the top tercile or quartile of labor hoarding.

Including only non-labor hoarding firms that are similar to labor hoarding firms lowers the estimated effect of labor hoarding, with only the top quartile of new firms seeing an increased likelihood of survival of 3% and no additional advantage for women-owned new firms that labor hoard.

4.2 Employment

Tables 4 and 5 explore how employment changes from 2010 to 2017 in the post period of the recession for labor hoarders vs non-labor hoarders and comparing women-owned/led versus men-owned/led businesses. Results from Table 4 suggest that firms with more employment in 2010 than anticipated (our definition of labor hoarders) had a slower growth rate from 2010 to 2017 than those that had less employment than anticipated in 2010. Remember, Table 1 suggests that labor hoarders typically maintained (or grew) their employment during the recession while non-labor hoarders lowered their employment. Essentially, if a firm let go of a lot of employees during the recession, then they had to hire more people back after the recession, which makes intuitive sense. The breakdown by gender shows that women-owned/led business hoarders grew faster or they benefited more from having higher employment than anticipated of about half a percent (0.4% to 0.64% in OLS and 0% to 0.28% in PSM). The results from Table 4 suggest that overall labor hoarding is associated with slower employment growth (about 5.5%) during the recovery and about 5.7% for men and 5% for women-led businesses. This is likely due to businesses that did not hoard labor being forced to catch up on hiring after the recession, whereas businesses that kept their labor were already right-sized for the recovery. Columns 4 to 6 present results using propensity score matching to improve the comparison in the pre-period of non-labor hoarding businesses. We continue to find a similar pattern across all the results, with labor hoarding businesses owned/led by men with about 7% lower employment growth post-recession and 4% lower employment growth for women-owned firms (a 3% smaller effect for women-owned businesses).

4.2.1 New firm employment

For new firms, results from Table 5 find that labor hoarding had a smaller effect on employment in the period after the recession, with coefficients of 0.7% with no difference for women-owned businesses.

Table 4 The effect of labor hoarding during the 2009 Recession on employment growth from 2010 to 2017

	OLS diff-in-diff			PSM diff-in-diff		
Existing firms in 2007	LH indicator	LH indicator	Top quartile LH	LH indicator	LH indicator	Top quartile LH
	(1)	(2)	(3)	(4)	(5)	(6)
Labor hoarding (LH)	−0.0553***	−0.0570***	−0.0876***	−0.0686***	−0.0695***	−0.0704***
	(0.000389)	(0.000451)	(0.000581)	(0.000717)	(0.000835)	(0.000698)
Women-owned and LH		0.00652***	0.00403***		0.00279**	−0.000256
		(0.000843)	(0.00108)		(0.00137)	(0.00117)
Women-owned		−0.00287***	−0.00372***		−0.00206***	−0.00140**
		(0.000430)	(0.000661)		(0.000606)	(0.000637)
Constant	0.0103***	0.0103***	−0.00190***	0.0187***	0.0193***	0.0251***
	(0.000183)	(0.000183)	(0.000195)	(0.000287)	(0.000338)	(0.000350)
Observations	2,871,029	2,871,029	2,871,029	1,893,741	1,893,741	1,893,741
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 04, 06, 07	Yes	Yes	Yes	Yes	Yes	Yes

Labor hoarding (LH) is a measure of employment in 2010 minus the expected employment in 2010 conditioned on the location (county), 2-digit SIC industry, and employment and sales in 2004, 2006, and 2007. Columns 1 and 2 use an indicator variable of labor hoarding while columns 3 and 4 use an indicator variable of whether they are in the top tercile or quartile of labor hoarding. Dependent variable is the Δ ln(emp) in from 2010 to 2017.

Table 5 The effect of labor hoarding during the 2009 Recession on employment growth from 2010 to 2017

	OLS diff-in-diff			PSM diff-in-diff		
New firms in 2007	LH indicator	LH indicator	Top quartile LH	LH indicator	LH indicator	Top quartile LH
	(1)	(2)	(3)	(4)	(5)	(6)
Labor hoarding (LH)	−0.00138	−0.00681***	−0.0666***	−0.0836***	−0.0861***	−0.0987***
	(0.00168)	(0.00196)	(0.00175)	(0.0142)	(0.0168)	(0.0139)
Women-owned and LH		0.00305	0.00271		0.00778	0.0189
		(0.00347)	(0.00311)		(0.0283)	(0.0225)
Women-owned		−0.00652***	−0.00633***		−0.00447	−0.00731
		(0.00178)	(0.00191)		(0.00987)	(0.0102)
Constant	0.0250***	0.0270***	0.0336***	0.0436***	0.0448***	0.0480***
	(0.000775)	(0.000949)	(0.00102)	(0.00550)	(0.00611)	(0.00615)
Observations	209,880	209,880	209,880	8391	8391	8391
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 07	Yes	Yes	Yes	Yes	Yes	Yes

Labor hoarding (LH) is a measure of employment in 2010 minus the expected employment in 2010 conditioned on the location (county), 2-digit SIC industry, and employment and sales in 2004, 2006, and 2007. Columns 1 and 2 use an indicator variable of labor hoarding while columns 3 and 4 use an indicator variable of whether they are in the top tercile or quartile of labor hoarding. Dependent variable is the Δ ln(emp) in from 2010 to 2017.

Columns 4 to 6 show results with propensity score matching and find that new firms have more similar results to existing firms, with firms that kept their employees through the recession seeing about 9% lower employment growth post-recession (2010–2017). Results by gender did not find significant differences between men and women-owned/led businesses.

4.3 Sales

Our results for sales show a similar story. Table 6 shows sales at existing businesses grew slower for those who have higher employment than anticipated, and the propensity score matching suggests it is consistent across gender. Our results for the impact of labor hoarding on sales, similar to the effect on employment, show that labor hoarding during the recession is associated with lower sales growth during the recovery period, with OLS results suggesting a loss of 7%, while PSM results suggest a loss of 6%. This could be indicative of (1) the increased costs associated with labor hoarding affecting business performance during the recovery or (2) a disincentive effect associated with labor hoarding where employees who avoided layoffs during the recession when demand was low may not feel as motivated to maintain their productivity to maintain employment or got used to the lower productivity level required during a time of low demand. The result is similar for women-and men-owned firms, though slightly lower for women-owned firms in the top quartile. Table 7 shows that new firms had a similar effect with slightly larger magnitudes. Labor hoarding new firms grew their sales 7% slower than their non-hoarding counterparts, though it is 14% slower in the PSM results. Again, our PSM results suggest that this is true across genders, though smaller for women-owned businesses in the top quartile that hoard labor (7% slower growth in sales).

4.4 High-skilled vs. low-skilled impacts

Given that training costs and replacement costs can vary by high- versus low-skilled workers and in light of recent work highlighting that recessions tend to accelerate the replacement of low-skilled jobs with capital (Jaimovich and Siu,2020, Fedotenkov et al., 2024), we want to examine effects between firms that rely on high- and low-skilled workers. To do so, we follow Doms et al. (2010) and calculate the percent of a firm's industry's workforce that is college educated, calculated at the three-digit NAICS code using data from the Bureau of Labor and Statistics.

Table 6 The effect of labor hoarding during the 2009 Recession on sales growth from 2010 to 2017

	OLS diff-in-diff			PSM diff-in-diff		
Existing firms in 2007	LH indicator	LH indicator	Top quartile LH	LH indicator	LH indicator	Top quartile LH
	(1)	(2)	(3)	(4)	(5)	(6)
Labor hoarding (LH)	−0.0662***	−0.0734***	−0.0687***	−0.0558***	−0.0581***	−0.0517***
	(0.00106)	(0.00122)	(0.00111)	(0.00139)	(0.00161)	(0.00134)
Women-owned and LH		0.0259***	0.0248***		0.00834***	0.00991***
		(0.00229)	(0.00208)		(0.00264)	(0.00224)
Women-owned		−0.0296***	−0.0313***		−0.0264***	−0.0276***
		(0.00119)	(0.00126)		(0.00115)	(0.00121)
Constant	−0.105***	−0.0972***	−0.0921***	−0.118***	−0.110***	−0.115***
	(0.000506)	(0.000607)	(0.000644)	(0.000551)	(0.000645)	(0.000633)
Observations	2,333,308	2,333,308	2,333,308	1,833,357	1,833,357	1,833,357
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 04, 06, 07	Yes	Yes	Yes	Yes	Yes	Yes

Labor hoarding (LH) is a measure of employment in 2010 minus the expected employment in 2010 conditioned on the location (county), 2-digit SIC industry, and employment and sales in 2004, 2006, and 2007. Columns 1 and 2 use an indicator variable of labor hoarding while columns 3 and 4 use an indicator variable of whether they are in the top tercile or quartile of labor hoarding. Dependent variable is the Δ ln(sales) in from 2010 to 2017.

Table 7 The effect of labor hoarding during the 2009 Recession on sales growth from 2010-17

	OLS diff-in-diff			PSM diff-in-diff		
New firms in 2007	LH indicator	LH indicator	Top quartile LH	LH indicator	LH indicator	Top quartile LH
	(1)	(2)	(3)	(4)	(5)	(6)
Labor hoarding (LH)	−0.0624***	−0.0656***	−0.0643***	−0.121***	−0.142***	−0.144***
	(0.00338)	(0.00399)	(3.99e−05)	(0.0270)	(0.0320)	(0.0264)
Women-owned and LH		0.00911	0.0139**		0.0685	0.0741*
		(0.00713)	(0.00638)		(0.0540)	(0.0429)
Women-owned		−0.0330***	−0.0313***		−0.0628***	−0.0692***
		(0.00364)	(0.00326)		(0.0187)	(0.0194)
Constant	0.118***	0.128***	0.134***	−0.0695***	−0.0527***	−0.0481***
	(0.00157)	(0.00191)	(0.00205)	(0.0104)	(0.0115)	(0.0116)
Observations	201,806	201,806	201,806	8230	8230	8230
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 07	Yes	Yes	Yes	Yes	Yes	Yes

Labor hoarding (LH) is a measure of employment in 2010 minus the expected employment in 2010 conditioned on the location (county), 2-digit SIC industry, and employment and sales in 2004, 2006, and 2007. Columns 1 and 2 use an indicator variable of labor hoarding while columns 3 and 4 use an indicator variable of whether they are in the top tercile or quartile of labor hoarding. Dependent variable is the Δ ln(Sales) in from 2010 to 2017.

We define a high-skilled firm as a firm whose workforce is at least 50% college educated and a low-skilled firm as a firm whose workforce is less than 25% college educated. High-skilled three-digit NAICS industries include education services, professional scientific services, information services, and management of companies, while low-skilled three-digit industries include apparel manufacturing, repair and

maintenance, truck transportation, and food service, to name a few. Table 8 compares the effects of labor hoarding for firms in high-skill versus low-skill industries. Overall, the results are consistent across both groups, suggesting that the survival and employment effects of workforce preservation are not confined to one skill segment of the labor market. However, one small difference does emerge: for high-skill intensive firms, the negative effect on sales growth from labor hoarding is smaller for high-skill intensive firms. High-skilled workers may be harder to replace, carry more firm-specific knowledge, and may be more critical to maintaining productivity and innovation. Thus, preserving high-skilled labor may yield greater benefits for firm performance during recovery compared to retaining lower-skilled workers.

5 Alternative specification

Our measure of "labor hoarding," estimating the expected amount of labor conditional on location,

Table 8 Comparing the effect of labor hoarding between high-skilled reliant firms and low-skilled reliant firms on existing firm survival, and the growth rate of employment and sales from 2010 to 2017

	OLS diff-in-diff					
Existing firms in 2007	Survival in 2017		Employment Δ (2017–2010)		Sales Δ (2017–2010)	
	Low-skill	High-skill	Low-skill	High-skill	Low-skill	High-skill
	(1)	(2)	(3)	(4)	(5)	(6)
Labor hoarding (LH)	0.0849***	0.0852***	−0.0801***	−0.0950***	−0.0826***	−0.0728***
	(0.00144)	(0.00149)	(0.00119)	(0.00154)	(0.00218)	(0.00256)
Women-owned and LH	0.0405***	−0.0223***	0.0114***	0.0121***	0.0336***	−0.00918**
	(0.00274)	(0.00237)	(0.00225)	(0.00240)	(0.00409)	(0.00395)
Women-owned	−0.0219***	0.0263***	−0.00985***	0.00232*	−0.0227***	0.0339***
	(0.00163)	(0.00119)	(0.00136)	(0.00122)	(0.00248)	(0.00196)
Constant	0.684***	0.652***	0.0296***	0.0225***	0.0458***	−0.227***
	(0.000728)	(0.000697)	(0.000604)	(0.000726)	(0.00110)	(0.00116)
Observations	734,780	936,966	505,600	620,769	499,962	568,826
	PSM diff-in-diff					
Existing firms in 2007	Survival in 2017		Employment Δ (2017–2010)		Sales Δ (2017–2010)	
	Low-skill	High-skill	Low-skill	High-skill	Low-skill	High-skill
	(1)	(2)	(3)	(4)	(5)	(6)
Labor hoarding (LH)	0.0436***	0.0398***	−0.0772***	−0.0724***	−0.0866***	−0.0475***
	(0.00187)	(0.00199)	(0.00147)	(0.00191)	(0.00263)	(0.00321)
Women-owned and LH	0.0512***	−0.0116***	0.00805***	0.00963***	0.0359***	−0.00855*
	(0.00322)	(0.00300)	(0.00246)	(0.00281)	(0.00441)	(0.00463)
Women-owned	−0.0241***	0.0284***	−0.00703***	0.00409***	−0.0238***	0.0370***
	(0.00176)	(0.00127)	(0.00136)	(0.00116)	(0.00244)	(0.00188)
Constant	0.673***	0.631***	0.0213***	0.0190***	0.0381***	−0.233***
	(0.000818)	(0.000803)	(0.000628)	(0.000740)	(0.00112)	(0.00124)
Observations	602,915	774,793	409,625	504,144	406,200	470,201
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 04, 06, 07	Yes	Yes	Yes	Yes	Yes	Yes

Labor hoarding (LH) is a measure of employment in 2010 minus the expected employment in 2010 conditioned on the location (county), 2-digit SIC industry, and employment and sales in 2004, 2006, and 2007. A firm is considered a high-skilled reliant firm if their industry's workforce has at least 50% college educated, while a low-skilled reliant firm's industry workforce is less than 25% college educated.

industry, growth, and level of their employment and sales, is unique to the literature. To alleviate concerns that our results are driven by this uniqueness, we present estimates using whether or not a firm downsizes or not, which is similar to Matsa and Miller (2014). Now, the variable of interest is whether the firm had lower employment in 2010 at the end of the recession compared to 2007 before the recession. Tables 9 and 10 present the results for existing and new firms, respectively, examining survival rates, employment growth, and sales growth. Technically, an indicator of downsizing identifies a "negative" impact on employment, whereas our main measure of labor hoarding measures a positive impact on employment, so similar results would have opposite signs to our main results. Also, note that a firm that lowers its employment less than expected would be indicated as a "labor hoarder" in our main results, as more of its employment was maintained given its industry, size, etc.

Beginning with Table 9, we find the same exact pattern as our previous results. When firms downsize during the recession, it lowers the likelihood that they survive in the post-recession period of 2010 to 2017 (about 5% less likely for the PSM). For the growth rates of employment and sales, we continue to find

Table 9 The effect of downsizing during the 2009 Recession on existing firm survival, and the growth rate of employment and sales from 2010 to 2017

	OLS diff-in-diff					
Existing firms in 2007	Survival in 2017		Employment Δ (2017–2010)		Sales Δ (2017–2010)	
	(1)	(2)	(3)	(4)	(5)	(6)
Downsized	−0.0269***	−0.0261***	0.0749***	0.0780***	0.0650***	0.0622***
	(0.000701)	(0.000830)	(0.000725)	(0.000853)	(0.00138)	(0.00162)
Women-owned and downsized		−0.00257*		−0.0107***		0.0108***
		(0.00154)		(0.00161)		(0.00307)
Women-owned		−0.0146***		−0.000538		−0.0243***
		(0.000628)		(0.000587)		(0.00112)
Constant	0.688***	0.692***	−0.00509***	−0.00493***	−0.127***	−0.121***
	(0.000264)	(0.000319)	(0.000245)	(0.000296)	(0.000470)	(0.000564)
Observations	3,635,229	3,635,229	2,432,359	2,432,359	2,333,308	2,333,308
	PSM diff-in-diff					
Existing firms in 2007	Survival in 2017		Employment Δ (2017–2010)		Sales Δ (2017–2010)	
	(1)	(2)	(3)	(4)	(5)	(6)
Downsized	−0.0438***	−0.0447***	0.0528***	0.0525***	0.0521***	0.0491***
	(0.000820)	(0.000985)	(0.000776)	(0.000929)	(0.00148)	(0.00176)
Women-owned and downsized		0.00340*		0.00108		0.0109***
		(0.00175)		(0.00166)		(0.00316)
Women-owned		−0.0112***		−0.00259***		−0.0270***
		(0.000696)		(0.000589)		(0.00112)
Constant	0.649***	0.652***	0.0104***	0.0112***	−0.125***	−0.117***
	(0.000341)	(0.000400)	(0.000290)	(0.000339)	(0.000558)	(0.000648)
Observations	2,898,454	2,898,454	1,893,741	1,893,741	1,833,357	1,833,357
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-Digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 04, 06, 07	Yes	Yes	Yes	Yes	Yes	Yes

Downsized is an indicator that the firm had lower employment in 2010 compared to 2007.

the same pattern regardless of whether we use OLS or propensity score matching. Firms that downsized during the recession grew their employment post-recession more. Again, this could simply be these firms trying to rehire workers to get back to their optimal level of employment, and with the added workers, they can produce more and increase their sales. A comparison of results for our main labor hoarding measure with the downsizing measure shows an employment loss of −6% (OLS) and −7% (PSM) compared to a growth of 7% (OLS) and 5% (PSM), so similar in magnitude. A comparison of results for sales between the two measures finds our labor hoarding measure having a loss of −7% (OLS) and −6% (PSM) compared to a growth of 7% (OLS) and 5% (PSM) for the downsizing measure. Table 10 shows the analysis for downsizing on new firms, and the results are similar. The firms that labor hoard or do not downsize have higher survival rates but slower growth in employment and sales in the post-recession. Again, we expect the signs to reverse for the results to be similar.

Table 10 The effect of downsizing during the 2009 Recession on new firm survival, and the growth rate of employment and sales from 2010 to 2017

	OLS diff-in-diff					
New firms in 2007	Survival in 2017		Employment Δ (2017–2010)		Sales Δ (2017–2010)	
	(1)	(2)	(3)	(4)	(5)	(6)
Downsized	−0.0503***	−0.0549***	0.101***	0.108***	0.0917***	0.0892***
	(0.00192)	(0.00230)	(0.00255)	(0.00306)	(0.00437)	(0.00519)
Women-owned and downsized		0.0143***		−0.0206***		0.00816
		(0.00411)		(0.00546)		(0.00949)
Women-owned		−0.0258***		−0.00637**		−0.0372***
		(0.00220)		(0.00271)		(0.00469)
Constant	0.611***	0.619***	0.0211***	0.0230***	−0.0948***	−0.0838***
	(0.000956)	(0.00118)	(0.00116)	(0.00143)	(0.00198)	(0.00241)
Observations	348,605	348,605	201,904	201,904	182,435	182,435
	PSM diff-in-diff					
New firms in 2007	Survival in 2017		Employment Δ (2017–2010)		Sales Δ (2017–2010)	
	(1)	(2)	(3)	(4)	(5)	(6)
Downsized	−0.0812***	−0.0870***	0.0446***	0.0631***	0.0669**	0.0690*
	(0.0132)	(0.0163)	(0.0163)	(0.0205)	(0.0309)	(0.0388)
Women-owned and downsized		0.0199		−0.0497		−0.00140
		(0.0274)		(0.0337)		(0.0636)
Women-owned		−0.0352***		−0.00436		−0.0581***
		(0.0106)		(0.00976)		(0.0184)
Constant	0.672***	0.683***	0.0230***	0.0242***	−0.0915***	−0.0752***
	(0.00432)	(0.00533)	(0.00385)	(0.00473)	(0.00726)	(0.00889)
Observations	13,472	13,472	8391	8391	8230	8230
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 04, 06, 07	Yes	Yes	Yes	Yes	Yes	Yes

Downsized is an indicator that the firm had lower employment in 2010 compared to 2007.

6 Conclusion

This study examines the effects of labor hoarding during the Great Recession on firm performance (survival, employment, and sales) during the recovery to discover whether labor hoarding serves as a strategic advantage or an added cost, with a focus on the differential impact of labor hoarding for women-owned/led businesses (as women-owned businesses are more likely to hoard labor in a downturn).

Estimating the causal effects is challenging given concerns about endogeneity and omitted variable bias, but we mitigate these issues by using propensity score matching within counties and industries and controlling for pre-recession growth trajectories (2004–2007). It is important to note that firm-specific unobservables, such as managerial ability and access to informal credit, may still exist.

We find that firms engaging in labor hoarding, better described as "workforce preservation," were significantly more likely to survive in the wake of the recession. The cumulative effect is sizable: firms that preserved their workforce were 9–10% more likely to survive over the 2010–2017 period, with slightly stronger effects for women-owned and women-led businesses. This helps to explain why women-owned businesses are more likely to hoard labor or preserve their workforce during a recession. However, these survival benefits come with trade-offs: labor hoarding firms tended to grow more slowly in employment and sales during the recovery, while non-hoarding firms "caught up" by rehiring and expanding more aggressively.

Thus, programs like the Paycheck Protection Program (PPP) may have helped boost business survival rates post-COVID. Labor hoarding or really workforce preservation helps to reduce the volatility associated with the boom-and-bust cycle of a recession and recovery. Framing labor hoarding as workforce preservation highlights its role not as inefficiency but as a deliberate strategy for resilience and stability—especially valuable in the face of systemic shocks.

Data availability The paper uses proprietary data that can be purchased from Infogroup, a private company.

Declarations

Conflict of interest The authors have no interests that are directly or indirectly related to the work submitted for publication. This research is not sponsored or funded by anyone.

Appendix

Table 11 US national employment by industry, 2007–2015 (in yearly percent change)

Industry	2008	2009	2010	2011	2012	2013	2014	2015
Total nonfarm	−0.60%	−5.20%	−0.40%	1.70%	1.80%	2.00%	1.90%	2.00%
Construction	−4.20%	−21.50%	−1.80%	1.80%	1.80%	1.70%	5.10%	4.80%
Manufacturing	−2.20%	−11.90%	−1.70%	0.90%	0.90%	0.80%	1.70%	1.70%
Wholesale trade	−0.80%	−8.50%	0.00%	0.90%	0.90%	0.90%	0.90%	0.90%
Retail trade	−1.30%	−5.90%	0.70%	0.70%	0.70%	1.40%	1.30%	1.30%
Transportation and warehousing	1.10%	−4.30%	0.00%	1.10%	1.10%	1.10%	2.20%	2.10%
Information	−0.60%	−6.20%	−3.10%	0.00%	0.00%	−1.80%	−0.40%	0.40%
Financial activities	0.00%	−4.70%	−2.50%	0.00%	0.60%	0.60%	0.60%	0.60%
Professional and business services	−1.10%	−7.50%	−0.60%	3.10%	3.00%	3.50%	3.40%	3.80%
Education and health services	1.60%	0.50%	1.00%	2.00%	2.50%	2.90%	2.80%	2.80%
Leisure and hospitality	−0.80%	−4.60%	0.00%	2.40%	2.30%	1.50%	2.30%	2.20%
Other services	−0.90%	−3.60%	−0.90%	0.00%	0.90%	0.90%	0.90%	0.90%
Government	0.00%	−0.90%	0.00%	0.50%	0.00%	0.00%	0.00%	0.00%

Notes: Data comes from the Bureau of Labor Statistics

Table 12 The effect of labor hoarding during the 2009 Recession on the likelihood of survival in 2013

	OLS diff-in-diff			PSM diff-in-diff		
Existing firms in 2007	LH indicator	LH indicator	Top quartile LH	LH indicator	LH indicator	Top quartile LH
	(1)	(2)	(3)	(4)	(5)	(6)
Labor hoarding (LH)	0.0494***	0.0472***	0.0502***	0.0283***	0.0258***	0.0291***
	(0.000444)	(0.000516)	(0.000475)	(0.000843)	(0.000994)	(0.000877)
Women-owned and LH		0.00765***	0.00620***		0.00791***	0.00802***
		(0.000963)	(0.000880)		(0.00165)	(0.00144)
Women-owned		−0.00914***	−0.00937***		−0.00769***	−0.00840***
		(0.000501)	(0.000526)		(0.000717)	(0.000747)
Constant	0.843***	0.846***	0.841***	0.826***	0.829***	0.828***
	(0.000214)	(0.000258)	(0.000272)	(0.000388)	(0.000443)	(0.000449)
Observations	3,635,229	3,635,229	3,635,229	1,647,425	1,647,425	1,647,425
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 04, 06, 07	Yes	Yes	Yes	Yes	Yes	Yes

Labor hoarding (LH) is a measure of employment in 2010 minus the expected employment in 2010 conditioned on the location (county), 2-digit SIC industry, and employment and sales in 2004, 2006, and 2007. Columns 1 and 2 use an indicator variable of labor hoarding while columns 3 and 4 use an indicator variable of whether they are in the top tercile or quartile of labor hoarding.

Table 13 The effect of labor hoarding during the 2009 Recession on the likelihood of survival in 2013

	OLS diff-in-diff			PSM diff-in-diff		
New firms in 2007	LH indicator	LH indicator	Top quartile LH	LH indicator	LH indicator	Top quartile LH
	(1)	(2)	(3)	(4)	(5)	(6)
Labor hoarding (LH)	0.0683***	0.0607***	0.0622***	0.0222***	0.0214**	0.0312***
	(0.00180)	(0.00214)	(0.00194)	(0.00695)	(0.00846)	(0.00725)
Women-owned and LH		0.0242***	0.0229***		0.00326	0.0207*
		(0.00381)	(0.00345)		(0.0136)	(0.0114)
Women-owned		−0.0192***	−0.0213***		−0.0158***	−0.0108*
		(0.00198)	(0.00210)		(0.00555)	(0.00580)
Constant	0.778***	0.785***	0.778***	0.823***	0.827***	0.825***
	(0.000864)	(0.00107)	(0.00114)	(0.00312)	(0.00351)	(0.00354)
Observations	291,376	291,376	291,376	29,163	29,163	29,163
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 07	Yes	Yes	Yes	Yes	Yes	Yes

Labor hoarding (LH) is a measure of employment in 2010 minus the expected employment in 2010 conditioned on the location (county), 2-digit SIC industry, and employment and sales in 2004, 2006, and 2007. Columns 1 and 2 use an indicator variable of labor hoarding while columns 3 and 4 use an indicator variable of whether they are in the top tercile or quartile of labor hoarding.

Table 14 The effect of labor hoarding during the 2009 Recession on employment growth from 2010 to 2013

	OLS diff-in-diff			PSM diff-in-diff		
Existing firms in 2007	LH indicator	LH indicator	Top quartile LH	LH indicator	LH indicator	Top quartile LH
	(1)	(2)	(3)	(4)	(5)	(6)
Labor hoarding (LH)	−0.0546***	−0.00275***	−0.0553***	−0.0355***	−0.0364***	−0.0367***
	(0.000381)	(0.000419)	(0.000402)	(0.000655)	(0.000769)	(0.000648)
Women-owned and LH		0.00593***	0.00548***		0.00269**	0.00305***
		(0.000826)	(0.000747)		(0.00125)	(0.00104)
Women-owned		−0.00275***	−0.00292***		−0.000975**	−0.00114**
		(0.000419)	(0.000441)		(0.000493)	(0.000515)
Constant	0.00966***	0.0104***	0.0149***	0.00957***	0.00985***	0.0112***
	(0.000179)	(0.000215)	(0.000228)	(0.000272)	(0.000309)	(0.000312)
Observations	3,015,458	3,015,458	3,015,458	1,331,108	1,331,108	1,331,108
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 04, 06, 07	Yes	Yes	Yes	Yes	Yes	Yes

Labor Hoarding (LH) is a measure of employment in 2010 minus the expected employment in 2010 conditioned on the location (county), 2-digit SIC industry, and employment and sales in 2004, 2006, and 2007. Columns 1 and 2 use an indicator variable of labor hoarding, while columns 3 and 4 use an indicator variable of whether they are in the top tercile or quartile of labor hoarding. Dependent variable is the Δ ln(emp) from 2010 to 2013.

Table 15 The effect of labor hoarding during the 2009 Recession on employment growth from 2010 to 2013

	OLS diff-in-diff			PSM diff-in-diff		
New firms in 2007	LH indicator	LH indicator	Top quartile LH	LH indicator	LH indicator	Top quartile LH
	(1)	(2)	(3)	(4)	(5)	(6)
Labor hoarding (LH)	−0.00138	0.00588***	−0.0108***	−0.0478***	−0.0519***	−0.0566***
	(0.00168)	(0.00200)	(0.00192)	(0.00584)	(0.00712)	(0.00566)
Women-owned and LH		−0.0245***	−0.0195***		0.0116	0.00798
		(0.00348)	(0.00337)		(0.0111)	(0.00871)
Women-owned		−0.00693***	−0.00725***		−0.00710*	−0.00739*
		(0.00219)	(0.00234)		(0.00401)	(0.00419)
Constant	0.0255***	0.0279***	0.0348***	0.00851***	0.0105***	0.0117***
	(0.000968)	(0.00118)	(0.00127)	(0.00225)	(0.00252)	(0.00254)
Observations	264,472	264,472	264,472	23,504	23,504	23,504
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 07	Yes	Yes	Yes	Yes	Yes	Yes

Labor hoarding (LH) is a measure of employment in 2010 minus the expected employment in 2010 conditioned on the location (county), 2-digit SIC industry, and employment and sales in 2004, 2006, and 2007. Columns 1 and 2 use an indicator variable of labor hoarding, while columns 3 and 4 use an indicator variable of whether they are in the top tercile or quartile of labor hoarding. Dependent variable is the Δ ln(emp) from 2010 to 2013.

Table 16 The effect of labor hoarding during the 2009 Recession on sales growth from 2010 to 2013

	OLS diff-in-diff			PSM diff-in-diff		
Existing firms in 2007	LH indicator	LH indicator	Top quartile LH	LH indicator	LH indicator	Top quartile LH
	(1)	(2)	(3)	(4)	(5)	(6)
Labor hoarding (LH)	−0.0424***	−0.0513***	−0.0553***	−0.0305***	−0.0303***	−0.0272***
	(0.000781)	(0.000902)	(0.000402)	(0.00133)	(0.00155)	(0.00131)
Women-owned and LH		0.0320***	0.00548***		−0.000125	0.00149
		(0.00169)	(0.000747)		(0.00254)	(0.00211)
Women-owned		−0.0313***	−0.00292***		−0.0226***	−0.0229***
		(0.000851)	(0.000441)		(0.000995)	(0.00104)
Constant	0.0901***	0.0990***	0.0149***	0.0842***	0.00985***	0.0112***
	(0.000362)	(0.000435)	(0.000228)	(0.000547)	(0.000309)	(0.000312)
Observations	2,924,809	2,924,809	2,924,809	1,307,411	1,307,411	1,307,411
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 04, 06, 07	Yes	Yes	Yes	Yes	Yes	Yes

Labor hoarding (LH) is a measure of employment in 2010 minus the expected employment in 2010 conditioned on the location (county), 2-digit SIC industry, and employment and sales in 2004, 2006, and 2007. Columns 1 and 2 use an indicator variable of labor hoarding, while columns 3 and 4 use an indicator variable of whether they are in the top tercile or quartile of labor hoarding. Dependent variable is the Δ ln(sales) from 2010 to 2013.

Table 17 The effect of labor hoarding during the 2009 Recession on sales growth from 2010 to 2013

	OLS diff-in-diff			PSM diff-in-diff		
New firms in 2007	LH indicator	LH indicator	Top quartile LH	LH indicator	LH indicator	Top quartile LH
	(1)	(2)	(3)	(4)	(5)	(6)
Labor hoarding (LH)	−0.0169***	−0.0207***	−0.0309***	−0.0671***	−0.0770***	−0.0741***
	(0.00282)	(0.00334)	(0.00317)	(0.0140)	(0.0171)	(0.0135)
Women-owned and LH		0.0104*	0.0125**		0.0300	0.0162
		(0.00602)	(0.00572)		(0.0266)	(0.0208)
Women-owned		−0.0355***	−0.0374***		−0.0467***	−0.0467***
		(0.00359)	(0.00384)		(0.00957)	(0.0100)
Constant	0.116***	0.127***	0.133***	0.117***	0.130***	0.131***
	(0.00156)	(0.00190)	(0.00204)	(0.00536)	(0.00600)	(0.00605)
Observations	243,776	243,776	243,776	23,179	23,179	23,179
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 07	Yes	Yes	Yes	Yes	Yes	Yes

Labor hoarding (LH) is a measure of employment in 2010 minus the expected employment in 2010 conditioned on the location (county), 2-digit SIC industry, and employment and sales in 2004, 2006, and 2007. Columns 1 and 2 use an indicator variable of labor hoarding, while columns 3 and 4 use an indicator variable of whether they are in the top tercile or quartile of labor hoarding. Dependent variable is the Δ ln(Sales) from 2010 to 2013.

Table 18 The effect of downsizing during the 2009 Recession on existing firm survival, and the growth rate of employment and sales from 2010 to 2013

Existing firms in 2007	OLS diff-in-diff					
	Survival in 2013		Employment Δ (2013–2010)		Sales Δ (2013–2010)	
	(1)	(2)	(3)	(4)	(5)	(6)
Downsized	−0.00440***	−0.00468***	0.0534***	0.0566***	0.0452***	0.0444***
	(0.000533)	(0.000631)	(0.000493)	(0.000581)	(0.000999)	(0.00118)
Women-owned and downsized		0.00123		−0.0112***		0.00351
		(0.00117)		(0.00109)		(0.00221)
Women-owned		−0.00819***		0.000437		−0.0244***
		(0.000478)		(0.000397)		(0.000808)
Constant	0.855***	0.858***	−0.00835***	−0.00847***	0.0760***	0.0829***
	(0.000200)	(0.000232)	(0.000166)	(0.000201)	(0.000338)	(0.000407)
Observations	3,640,604	3,640,604	3,015,458	3,015,458	2,924,809	2,924,809
	PSM diff-in-diff					
Existing firms in 2007	Survival in 2013		Employment Δ (2013–2010)		Sales Δ (2013–2010)	
	(1)	(2)	(3)	(4)	(5)	(6)
Downsized	−0.0120***	−0.0136***	0.0319***	0.0325***	0.0286***	0.0303***
	(0.000847)	(0.00102)	(0.000689)	(0.000832)	(0.00139)	(0.00167)
Women-owned and downsized		0.00549***		−0.00194		-0.00431
		(0.00179)		(0.00144)		(0.00291)
Women-owned		−0.00688***		−0.000762		-0.0225***
		(0.000707)		(0.000485)		(0.000979)
Constant	0.829***	0.831***	0.00779***	0.00803***	0.0827***	0.0894***
	(0.000392)	(0.000446)	(0.000274)	(0.000310)	(0.000551)	(0.000623)
Observations	1,647,425	1,647,425	1,331,108	1,331,108	1,307,411	1,307,411
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 04, 06, 07	Yes	Yes	Yes	Yes	Yes	Yes

Downsized is an indicator that the firm had lower employment in 2010 compared to 2007.

Table 19 The effect of downsizing during the 2009 Recession on new firm survival, and the growth rate of employment and sales from 2010 to 2013

	OLS diff-in-diff					
New firms in 2007	Survival in 2013		Employment Δ (2013–2010)		Sales Δ (2013–2010)	
	(1)	(2)	(3)	(4)	(5)	(6)
Downsized	−0.0161***	−0.0198***	0.0666***	0.0711***	0.0590***	0.0580***
	(0.00159)	(0.00191)	(0.00187)	(0.00225)	(0.00313)	(0.00373)
Women-owned and downsized		0.0115***		−0.0145***		0.00288
		(0.00342)		(0.00400)		(0.00677)
Women-owned		−0.0152***		−0.0121***		−0.0322***
		(0.00183)		(0.00201)		(0.00338)
Constant	0.796***	0.801***	0.0104***	0.0142***	0.0980***	0.108***
	(0.000795)	(0.000981)	(0.000865)	(0.00107)	(0.00144)	(0.00176)
Observations	348,605	348,605	264,472	264,472	243,776	243,776
	PSM diff-in-diff					
New firms in 2007	Survival in 2013		Employment Δ (2013–2010)		Sales Δ (2013–2010)	
	(1)	(2)	(3)	(4)	(5)	(6)
Downsized	−0.00854	−0.00502	0.0315***	0.0310***	0.0114	0.0194
	(0.00667)	(0.00818)	(0.00566)	(0.00698)	(0.0135)	(0.0166)
Women-owned and downsized		−0.00948		0.00167		−0.0210
		(0.0140)		(0.0119)		(0.0283)
Women-owned		−0.0121**		−0.00714*		−0.0429***
		(0.00555)		(0.00399)		(0.00953)
Constant	0.844***	0.848***	0.00149	0.00357*	0.104***	0.116***
	(0.00227)	(0.00280)	(0.00162)	(0.00199)	(0.00386)	(0.00474)
Observations	29,163	29,163	23,504	23,504	23,179	23,179
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Emp. and sales controls in 04, 06, 07	Yes	Yes	Yes	Yes	Yes	Yes

Downsized is an indicator that the firm had lower employment in 2010 compared to 2007.

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