Firms' Liquidity Assets and Workers' Claims*

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Abstract

Primary stakeholders for a firm include shareholders, banks, other creditors, and employees (workers). This study pays special attention to the role of employees, which has rarely been analyzed in an explicit form in the field of corporate finance. We show that the presence of workers' claims can have great influence on firms' financial operations, particularly on accumulation of liquidity assets. In general, workers' claims tend to be paid before other claims even when firms face with liquidity shortages. Thus, in an economy where workers' claims are given priority, companies may fail to raise sufficient funds due to their excessive burden to pay workers' claims. To forestall such fund shortages, firms may accumulate liquidity assets in advance. Liquidity assets, though far less profitable, can help cover unexpected fund shortages. This study finds that firms tend to accumulate more liquidity assets preemptively in line with growth in workers' claims. This finding indicates that the presence of workers' claims is an important factor behind an increase in liquidity assets of firms and that labor-intensive firms with greater workers' claims tend to accumulate more liquidity assets.

Keywords: Liquidity shock, control right, workers' claims
JEL Classification: A12, B34, C56

I. Introduction

Primary stakeholders for a firm include shareholders, banks, other creditors, and employees (workers). Among them, shareholders generally have control during normal times. Banks have control when a firm facing a liquidity shock is unable to repay its debt. Reflecting this phenomenon, previous research in the field of corporate finance has analyzed the role of shareholders during normal times and banks during crises.

In contrast, the role of employees (workers) has not been explicitly analyzed in the context of corporate finance. When a firm's financial condition is good, the control of employees is relatively weak compared to that of shareholders and creditors. However, when a firm's financial condition is bad, employees often play a critical role in corporate decision making. For example, Chang (1992) showed that under the optimal contract between a risk averse employee and a risk neutral investor, wages should be paid before the investor's claim, which affects the firm's restructuring and fundraising operations.

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In Japan, the long-term relationship between firms and employees has been tighter than that in other major countries. For example, Hashimoto and Raisian (1985) and Itami et al. (1988) pointed out that Japanese employees had invested in firms via the seniority wage system and lifetime employment in an implicit manner. Iwai (1988) showed that a firm whose utility includes the employees' utility tends to adopt the seniority wage system for higher growth of the firm. Thus, it is more likely that companies in Japan face excessive burden to pay workers' claims when their financial condition becomes bad.

Excessive burden to pay workers' claims can arise not only for current workers but also for retired workers. As recent cases of restructuring highlighted, not only workers' claims but also the payment of pension of retired employees sometimes restricted corporate operations. Hence, focusing on the case where an unexpected negative liquidity shock occurs, this paper investigates the impact of employee's control over corporate financing operations and considers the role of employees in corporate governance[1].

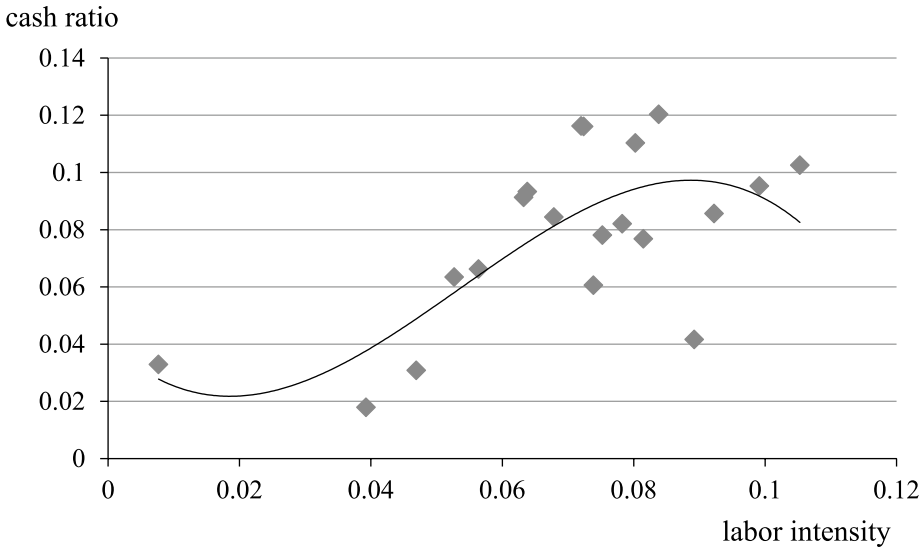
A key result of this paper is that workers' claims can be one of the most important factors involved in increasing a firm's liquidity assets. This result is consistent with the phenomenon that the cash/deposit ratio has increased for labor-intensive Japanese firms. For example, Figure 1 shows the relation between labor intensity of each manufacturing industry (horizontal axis) and its cash/deposit ratio (vertical axis) in 2015 using data from Financial Statements Statistics of Corporations by Industry (equity capital of 1 billion yen or over). The labor intensity is calculated as the ratio of employees' salary to sales, while the cash/deposit ratio is calculated as the ratio of cash and deposit (liquidity assets) to total assets. The figure shows that the cash/deposit ratio is higher in an industry with higher labor intensity.

Note that labor intensity and the cash/deposit ratio do not show a monotonically positive correlation. Interestingly, when the labor intensity is sufficiently low, there is hardly any correlation. Furthermore, when labor intensity is sufficiently high, there is a negative correlation with the cash/deposit ratio. Nonlinearity suggests that various factors affect the relationship between the two statistics.

A similar positive correlation is also observed in 1995 and 2005. Figure 2 shows the relationship between labor intensity of each manufacturing industry (horizontal axis) and its cash/deposit ratio (vertical axis) in 1995 and 2005 using data from Financial Statements Statistics of Corporations by Industry (for corporations of all sizes). The figure shows that the cash/deposit ratio is higher in an industry with higher labor intensity. Note that the slope of the approximate curves in 1995 and 2005 is smaller than that in 2015. Furthermore, the nonlinearity observed in 2015 is not necessarily apparent in 1995 and 2005. The degree of positive correlation between labor intensity and the cash/deposit ratio is increased, and nonlinearity between them only emerged after the Lehman shock. This suggests that many firms began to accumulate more liquidity assets than before to support workers' claims in case of

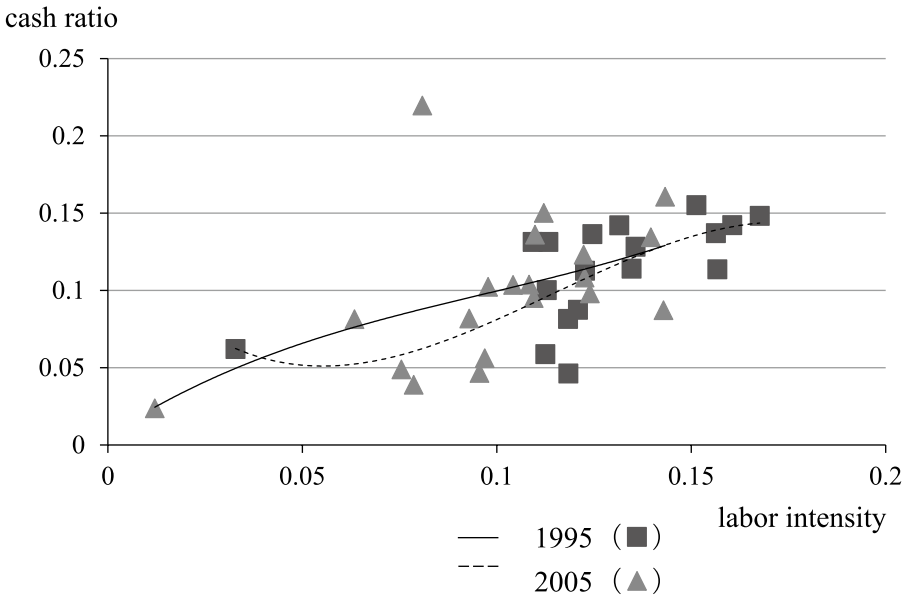
[1] Ghaly et al. (2015) is one of the few studies that analyzed the role of employees in corporate finance. They created an indicator regarding employees' evaluation on their firms, called EWI, and showed that firms that put more weight on the welfare levels of employees tend to hold money. This paper analyzes a mechanism by which a firm whose weight of workers' claims is relatively high tends to hold money.

Figure 1. Relationship between labor intensity and cash/deposit ratio (2015)



Data: Financial Statements Statistics of Corporations by Industry (for corporations with at least 1 billion yen)

Figure 2. Relationship between labor intensity and cash ratio (1995 and 2005)



Data: Financial Statements Statistics of Corporations by Industry (for corporations of all sizes)

liquidity shock.

It should be noted that workers' claims are not the only factor that restricts firms' fund-raising. In particular, since there are many preferential claims other than workers' claims, workers' claims are not always protected even when firms are faced with liquidity shortages. The order of priority is different, depending on a law and timing of procedure. For example, bankruptcy laws in Japan[2] state that "workers' claims for the three months preceding the commencement of bankruptcy proceedings" take priority second to "secured claims" such as mortgage, which is most privileged as claims on the estate. Wages other than secured claims such as mortgage take priority after claims on the estate as a preferred bankruptcy claim. In addition, the Civil Rehabilitation Act states that workers' claims take priority second to "secured claims" including mortgage. The Corporate Reorganization Act also states that workers' claims take priority second to common benefit claims and secured claims including mortgage. Hence, we should consider other privileged claims when investigating the accumulation of a firm's liquidity assets.

However, as Article 11 of ILO Convention No. 95 Concerning the Protection of Wages states, workers' claims take priority over other claims in labor law from an international standpoint. This principle comes from workers' weak position in that the wages are paid after they work (Bronstein, 1987). The Japanese labor law also establishes the Act on Securing the Payment of Wages to properly pay the wages when a firm is in distress. Article 24 of the Labor Standards Act states that the total amount of wages should be paid without reservation[3]. Thus, it is important to consider the effect of workers' claims on corporate financing when workers' claims take high priority.

Several previous studies pointed out that privileged payment of workers' claims causes some abuse. For example, Yamazaki and Seshimo (2013) suggested that protection of regular workers by the Employment Dismissal Regulations tends to be a hindrance to corporate vitalization. In particular, they pointed out that all four requirements (i.e. the necessity of curtailing of employment, an attempt to avoid a job cut, reasonable selection of the personnel, and validity of the procedure) should be satisfied prior to the termination of employment. During the revitalization of JAL (Japan Airlines), validity of the termination of employment was a critical issue in the trial. They concluded that protection of regular workers may not only lead to more irregular employees, but also curtail the levels of subordination.

As described above, workers' claims are one of the factors that restrict firms' funding operations when firms face liquidity shortages. Firms that hold larger workers' claims tend to face borrowing constraints when a negative liquidity shock occurs. In other words, workers' claims are one of the potential reasons for the precautionary savings of liquidity assets.

In literature, Wakita (2017) is a related study showing that firms increase savings in

[2] See HP of Tokyo Labor Bureau of the Ministry of Health, Labour and Welfare (2017) (http://tokyo-roudoukyoku.jsite.mhlw.go.jp/hourei_seido_tetsuzuki/roudoukijun_keiyaku/roudousaiken3.html) The order of priority for the payment of workers' claims is left to each country (Bronstein, 1987).

[3] Note that a deduction is allowed in the case of income tax and social insurance fees; otherwise, the firm establishes a labor-management agreement with the labor union comprising a majority of the workers or the person who represents a majority of the workers (the Article 24 of the Labor Standards Act).

preparation for a potential stochastic productivity shock. He constructed a model in which the wage rate is determined by negotiations between the labor union and the firm and showed that an increase in negotiation power of the labor union increases corporate savings. This paper also studies the relationship between wages and corporate savings, but it analyzes the effects of privileged payment of workers' claims on accumulation of corporate liquidity assets when a liquidity shock happens.

Section II introduces cases concerning privileged payment of workers' claims. Section III describes the basic settings of the model in which firms, banks and workers choose their actions given that workers' claims take priority when a negative liquidity shock happens[4]. Section IV investigates the role of workers' claims by analyzing the impact of the size of workers' claims on continuation of production process. Section V examines the role of liquidity assets on the possibility of continuing production even when a firm faces a liquidity shock by borrowing money. Finally, Section VI summarizes the results and concludes.

II. Cases concerning privileged payment of workers' claims

Since workers' claims take priority, firms with larger workers' claims tend to face delays in revitalization. When the burden of workers' claims potentially suspends the production process, firms may accumulate liquidity assets from a precautionary perspective. This section examines the extent to which the burden of workers' claims has an impact on the continuation of the production process by examining several specific cases for Japanese firms.

II-1. JAL

During JAL revitalization, pension claims restricted borrowing from the bank. This subsection introduces the process of JAL revitalization according to Hatakeyama (2010). In the 2000s, JAL faced operating losses due to external factors such as terrorist attacks in the U.S., SARS and the Iraq War. Since JAL was the biggest airline in Japan at the time, suspension of JAL's operations was likely to cause huge damage to the network of airlines. JAL managed to avoid fund shortages using emergency loans from the DBJ (Development Bank of Japan), public offerings, and third-party share issuance. However, after the Lehman shock in 2009, vitalization of JAL became impossible without debt waivers from banks. In June 2009, a ministerial conference required JAL to submit a reorganization plan and approved DBJ to lend 100 billion yen in June 2009 and 100 billion yen in December 2009. When the Hatoyama's Cabinet started at the end of August, the reorganization plan was dismissed, and after the newly created "JAL reorganization taskforce" submitted a report to recommend revitalization of JAL, it applied to the ETIC for support. Finally, JAL filed for application of the Corporate Reorganization Act on January 19th, 2010, and revitalization by the ETIC was determined.

[4] Chang (1992) endogenously derives the privileged payment of workers' claims from workers' risk averse property.

One of the biggest problems during the procedure of the Corporate Reorganization Act is the payment of pension to employees and retired employees. The pension for the retired workers is different from workers' claims. However, one-third of the retirement pension took priority over common benefit claims, and the rest also took priority if it was regarded as workers' claims. Pension and retirement benefits of JAL amounted to 800 billion yen, and there was a 330 billion yen shortage in reserves. It was therefore impossible to revitalize JAL without solving the problem of pension and retirement benefits.

In the end, over two-thirds of the members of the JAL corporate pension system agreed that 53% of pension for the present workers and 30% of pension for the retired workers were waived on January 12, 2010, which promoted revitalization of JAL. However, JAL faced opposition to the waiver of the pension by one-third of the pensioners. This case clearly shows how the burden of workers' claims restricted revitalization by limiting additional funding.

II-2. Sharp

Besides JAL, there are many other cases in which workers' claims were a big issue in revitalization during the process of voluntary liquidation via voluntary waiving by banks. For example, Sharp, which eventually became a subordinate of Hon Hai Precision Industry Co., Ltd. in 2016, faced job cuts when it fell into deficits for the fiscal years ending in March 2011 and 2012.

According to Bloomberg (September 26th, 2012), Sharp considered cutting over 10,000 employees, which is about 18% of its total employees, as part of the restructuring plan. In September 2012, Sharp needed 1,500 billion yen to repay the funds (360 billion yen of CP and 200 billion yen of convertible bonds). However, since the credit rating of Sharp was downgraded to speculative bonds, Sharp was unable to raise funds without voluntary waiving by banks. The Mizuho Corporate Bank and the Bank of Tokyo-Mitsubishi UFJ urged Sharp to submit their restructuring plan for additional funding. In the restructuring plan, it was indispensable for Sharp to reorganize the firm without cutting the workers' claims.

On April 2nd, 2016, Sharp signed an acquisition contract with Hon Hai Precision Industry Co., Ltd. According to several newspapers, Sharp wanted to maintain both employment and projects (the Asahi Shimbun, 2016a and 2016b), while Hon Hai Precision Industry Co., Ltd. announced that it would maintain employment for employees 40 years of age or younger (Nihon Keizai Shimbun, 2016). However, Sharp needed to make a concession in employment. Even after the acquisition, Hon Hai Precision Industry Co., Ltd. announced that they would reduce employment due to poor performance from the perspectives of global optimization of staff assignment. This implies that it is difficult to reorganize a firm without radically reducing workers' claims.

The above cases show that the principle of the Labor Law under which workers' claims should take priority may deter reconstruction of the insolvent firms under the Bankruptcy Law, the Civil Rehabilitation Law, and the Corporate Rehabilitation Law. It is likely that the

burden of workers' claims potentially restricts firm fundraising after a negative liquidity shock. To avoid such credit constraints, firms may accumulate liquidity assets in advance. The following theoretical model investigates such a possibility where large workers' claims may promote accumulation of liquidity assets by firms from precautionary motives.

III. Basic Model

Holmström and Tirole (1998) is a seminal paper that studies funding operations when an anticipated liquidity shock happens. As in Holmström and Tirole (1998), we construct a three-period model in which a liquidity shock happens during the middle of the production process. Unlike Holmström and Tirole, we do not assume a moral hazard based on the entrepreneur's private benefit. Instead, we assume that workers' claims take priority even when a liquidity shock happens and analyze whether the priority of workers' claims increases corporate liquidity assets.

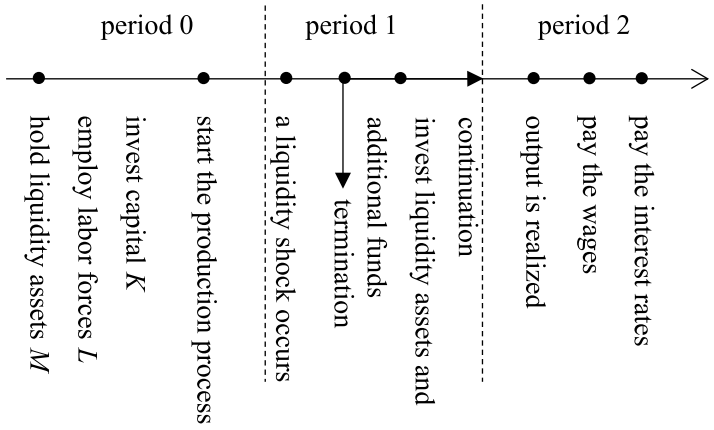
In this economy, there are three types of risk neutral agents: firms, workers, and banks. Figure 3 describes the behavior of each agent. We first consider their decisions one by one.

III-1. Firms

Firms produce from period 0 to period 2. Firms prepare the capital K from their own capital X during period 0, and save liquidity assets M in case of a liquidity shock. Since a liquidity asset does not generate profits, i.e. the interest rate is zero, liquidity assets incur an opportunity cost. However, when a firm needs additional funding in case of a liquidity shock, firms can utilize their liquidity assets. The rest of their own money, i.e. $X-(K+M)$, is paid as dividend. Firms also employ the labor forces L during period 0. For simplicity, K and L are constant. On the other hand, M is an endogenous variable.

When a firm uses K and L as inputs, output is realized during period 2. However, during

Figure 3. Timeline of firms' decision making



period 1, a liquidity shock occurs with probability $p \in (0, 1)$. If a liquidity shock does not happen, the production process is completed in period 2 and $Y=AF(K, L)$ is realized. On the other hand, if a liquidity shock happens during period 1, firms cannot continue production unless they raise additional funding ρK. If firms accumulate enough liquidity assets, the assets can cover the total additional funding. If not, firms need external funds to continue their production. Thus, the output becomes zero if the firms cannot neither utilize liquidity assets M nor borrow from banks $\rho K - M$.

III-2. Workers

Each worker can freely choose the firm that he works for, and each worker supplies labor from period 0 to period 2. If a liquidity shock does not happen, or if a liquidity shock happens and production continues, the firm pays wages for two periods after the output is realized during period 2. On the other hand, if a liquidity shock happens and the firms cannot continue production, output becomes zero and the wages are not paid[5]. We assume that the wage rate is determined during period 0. Since workers can freely choose the firms, the expected wage rates in period 0 are equal to the market wage rates under the assumptions that the labor market is competitive and workers are risk neutral. In the following analysis, we denote the market wage rate w when the workers work for two periods at the same firm.

The wage rate of firms that may terminate their production during period 1 increases by the risk premium, since those firms cannot pay wages in period 1. In other words, by denoting the wage rate for such firms as $\overline{w}$, the relation between the market rate for two periods, w, and $\overline{w}$ is written as follows:

$$w=(1-q)\overline{w} \tag{1}$$

Note that $q \in \{0, p\}$ denotes the probability of termination during period 1. Hence, $\overline{w}$ is given as follows:

$$\overline{w} = \frac{w}{1-q} \tag{2}$$

This equation means that as the probability of termination increases, the workers' claims increase, following which it becomes difficult for such firms to raise additional funds for continuation of production. Hence, as in the following analysis, accumulating liquidity assets during period 0 reduces the risk premium of the wage and promotes production by decreasing the workers' claims.

[5] The results do not fundamentally change if workers whose firms terminate production in period 1 move to another company in period 1 and receive wages for one period in period 2. In this case, for w, the following arbitrage condition holds: $\frac{w_1}{1+r_K} + \frac{w_1}{(1+r_K)^2} = \frac{w}{(1+r_K)^2}$, where the risk-free discount rate is r_K, and the wage is for two periods.

III-3. Banks

We assume that banks hold enough personal funds and always have opportunities to invest the funds at the interest rates r_K. The capital market is competitive, and the risk-free discount rate r_K is exogenous. This means that when a firm faces a liquidity shock and needs additional funds ρK, the risk neutral banks lend $\rho K - M$ to the firm during period 1 if they can receive $(\rho K - M)(1+r_K)$ during period 2.

When the workers' claims take priority, the firms that continue production can repay $AF(K, L) - wL$ at most during period 2. Hence, firms provide additional funds if the following condition holds:

$$AF(K, L) - wL \geq (\rho K - M)(1+r_K) \tag{3}$$

If the above inequality does not hold, the source of repayment cannot cover the principal and interest. In this case, the firm cannot borrow funds and needs to terminate the production process during period 1.

VI. The Role of Workers' claims

This section analyzes whether firms accumulate liquidity assets when workers' claims take priority over other claims. As a benchmark, we first describe the case in which firms accumulate no liquidity asset, i.e. M=0, and whereby the existence of privileged payment of workers' claims can terminate production.

If firms accumulate no liquidity assets, they have to borrow funds from banks when a liquidity shock happens during period 1. Since banks lend the money as long as its rate of returns is r_K, only in cases where the source of repayment during period 2 can cover the principal and interest do firms continue production.

If the workers' claims do not take priority, the wage is determined by negotiation power between workers and banks. Then, the source of repayment is at most $AF(K, L)$, and as long as $AF(K, L) \geq \rho K(1+r_K)$, firms can borrow from banks. On the other hand, if the workers' claims take priority, the source of repayment becomes $AF(K, L) - wL$. This means that workers' claims decrease the source of repayment and make it difficult for firms to borrow from banks.

To analyze the effects of privileged payment of workers' claims on liquidity assets, we impose the following assumption:

Assumption 1. $$AF(K, L) - wL < \rho K(1+r_K) < AF(K, L) \tag{4}$$

Assumption 1 indicates that if the workers' claims do not take priority, principal and interest are less than the source of repayment, whereas if the workers' claims take priority, principal and interest exceed the source of repayment. Under Assumption 1, even when the liquidity shock happens in period 1, if the workers' claims do not take priority, firms can

borrow from banks and continue production. On the other hand, if the workers' claims take priority, firms cannot repay the debt and need to terminate production. Assumption 1 does not hold if the workers' claims wL are sufficiently small. However, the workers' claims exceed the critical level, the assumption holds. Hence, Assumption 1 implies that the size of workers' claims is one of the factors that most affects continuation of a project when a liquidity shock happens.

V. The Role of Liquidity Assets

The previous section analyzed the case in which firms accumulate no liquidity asset. This section analyzes the case where firms accumulate enough liquidity assets. In this case, firms can borrow from the bank and continue production even if workers' claims take priority. An advantage of accumulating liquidity assets is that firms can directly utilize liquidity assets and reduce their debt to banks, which enables them to reduce repayment and increase the possibility of continuing production. On the other hand, holding one unit of liquidity assets for one period incurs opportunity cost r_K. Firms choose the optimal amount of liquidity assets to balance the merit and demerit of accumulating liquidity assets. In the following analysis, we analyze how the optimal level of liquidity assets is related to workers' claims.

V-1. The Level of Liquidity Assets

Firms have to accumulate liquidity assets M to satisfy the inequality (3), since banks will lend the money only when (3) holds. However, firms have to pay an opportunity cost for holding liquidity assets. Hence, firms hold the minimum level of liquidity assets. As a result, (3) holds with equality and the optimal liquidity asset M^* is given as follows:

$$M^* = \rho K - \frac{AF(K,L) - wL}{1 + r_K} \tag{5}$$

This equation shows that M^* is increasing in wL given the other conditions. In other words, firms with larger workers' claims accumulate more liquidity assets. From Assumption 1, any value for M^* that satisfies (5) is always positive. However, it is undesirable for firms to accumulate large amount of liquidity assets due to their opportunity cost. Thus, the next section analyzes the conditions for accumulating liquidity assets.

V-2. Conditions for Accumulating Liquidity Assets

Firms accumulate liquidity assets if the expected profits in the case where firms accumulate liquidity assets and continue production exceeds those in the case where firms do not hold liquidity assets and terminate production. In the following analysis, we describe the expected profits for each case and examine whether to accumulate liquidity assets by comparing the expected profits.

V-2-1. Expected profits in the case where firms accumulate liquidity assets

In this model, when a liquidity shock does not happen during period 1, the wage rates determined during period 0 are paid during period 2. To the extent that they hold liquidity assets, the profit of firms in period 2 is thus calculated by subtracting the wage wL, the principal and interest $(1+r_K)^2K$, and opportunity cost of holding liquidity assets from the output $AF(K, L)$. Since the opportunity cost evaluated during period 2 by holding liquidity assets M from period 0 to period 1 is r_KM, the profit of firms during period 2 is written as follows:

$$AF(K, L) - wL - (1+r_K)^2K - (1+r_K)r_KM \tag{6}$$

On the other hand, when a liquidity shock happens during period 1, firms need additional funds ρK and can continue production only when they borrow enough funds from banks. When production continues, firms need to pay wages to workers with priority and then repay the principal and interest to the bank. Hence, firms' revenue is the output $AF(K, L)$ net of wage wL and repayment $(\rho K - M)(1+r_K)$ when a liquidity shock happens. However, to calculate the profits during period 2, we need to take into account the principal and interest payments to their own funds and the opportunity cost of holding liquidity assets. Thus, given $M=M^*$, profits of firms during period 2 when a liquidity shock happens are calculated by substituting $AF(K, L) - wL=(\rho K - M^*)(1+r_K)$ into $AF(K, L) - wL - (\rho K - M^*)(1+r_K) - (1+r_K)^2K - (1+r_K)^2M^*$ as follows:

$$-(1+r_K)^2(K+M^*) \tag{7}$$

Equations (6) and (7) lead to the expected profits of firms during period 2 by holding liquidity assets M^* as follows:

$$(1-p)\{AF(K, L) - wL - (1+r_K)^2K - (1+r_K)r_KM^*\} + p\{-(1+r_K)^2(K+M^*)\} \tag{8}$$

V-2-2. Expected profits in the case where firms do not accumulate liquidity assets

Even when firms do not hold liquidity assets, if a liquidity shock does not happen during period 1, the wage determined during period 0 is paid during period 2. However, when firms do not hold liquidity assets, firms facing a liquidity shock have to terminate production and cannot pay the wage in period 2. Hence, the wage rate determined during period 0 is not w, but $\overline{w} = \frac{w}{1-q}$, reflecting the risk premium.

The firms' profits during period 2 in the case where a liquidity shock does not happen is calculated by subtracting the wage $\overline{w}L$ and the principal and interest $(1+r_K)^2K$ as follows:

$$AF(K,L) - \overline{w}L - (1+r_K)^2K = AF(K,L) - \frac{w}{1-p}L - (1+r_K)^2K \tag{9}$$

Since there are no liquidity assets, this equation no longer contains $-(1+r_K)r_KM$. However, when comparing this with equation (6), the wage is higher because $\overline{w} = \frac{w}{1-q} > w$.

In addition, when a liquidity shock happens, firms cannot borrow from banks due to lack of liquidity assets and need to terminate production. In this case, the output is zero and K becomes lost. Hence, the firms' profit is given as follows:

$$-(1+r_K)^2K \tag{10}$$

Equations (9) and (10) lead to the expected profits without liquidity assets as follows:

$$(1-p)\left\{AF(K,L)-\frac{1}{1-p}\,wL\right\}-(1+r_K)^2K \tag{11}$$

V-2-3. Condition under which firms accumulate liquidity assets

Firms accumulate liquidity assets if the expected profit in the case in which firms hold liquidity assets exceeds that in the case in which firms do not hold liquidity assets, i.e. (8) exceeds (11). Hence, the condition that firms accumulate liquidity assets is given as follows:

$$pwL \geq (1+r_K)(r_K+p)M^* \tag{12}$$

Utilizing (5), this condition is rewritten as follows:

$$\left\{\frac{AF(K,L)}{1+r_K}-\rho K\right\}(1+r_K)\,(r_K+p)\geq r_K wL \tag{13}$$

If this condition is satisfied, firms hold liquidity assets M^* (>0). Note that the left side of (13) is always positive under Assumption 1. Thus, the condition is satisfied when $r_K wL$ is small enough.

V-3. Level of Liquidity Assets Chosen by Firms

This section analyzes the effects of various exogenous variables on corporate liquidity assets. We first consider the effect of the size of workers' claims on corporate liquidity assets. Subsection V-1 showed that the optimal liquidity asset is given by $M^*=\rho K-\dfrac{AF(K,L)-wL}{1+r_K}$. On the other hand, subsection V-2-3 showed that the condition under which firms hold liquidity assets is given by (13). However, we need to note that the inequality in (13) does not necessarily hold. If inequality in (13) does not hold, Assumption 1 implies that firms which do not hold liquidity assets cannot borrow from banks when a liquidity shock happens during period 1. We thus obtain the following proposition:

Proposition Under Assumption 1. As long as (13) is satisfied, the optimal level of liquidity assets is given by $\rho K-\dfrac{AF(K,L)-wL}{1+r_K}$. This means that an increase in workers' claims wL increases liquidity assets. However, given the other conditions, (13) is not satisfied when the workers' claims wL are sufficiently large. Thus, liquidity assets become zero when the workers' claims wL are sufficiently large.

This proposition shows that there is no monotonic correlation between the workers' claims and corporate liquidity assets since (13) does not always hold when the interest rate r_K is high and the probability of a liquidity shock p is low. In other words, when the workers' claims are not sufficiently large, (13) is satisfied, and there is a positive correlation between the size of workers' claims and the level of liquidity assets. On the other hand, when the workers' claims are sufficiently large, (13) is not satisfied, and the level of liquidity assets become zero.

Such nonlinearity between the workers' claims and liquidity assets is observed in the relationship between labor intensity and cash ratio, as showed in Figure 1 of Section 1. It is not clear whether (13) is satisfied or not, but since the probability of a liquidity shock p, which affects validity of (13), varies depending on an industry, there is the possibility that labor intensity and cash ratio have a nonlinear relationship.

Note that such nonlinearity holds not only for workers' claims wL, but also for the probability of a liquidity shock p and interest rate of safe assets r_K. In particular, an increase in p does not affect the optimal level of liquidity assets according to (5), but an increase in p makes (13) easier to hold, since it increases the left side of (13). Hence, the following Lemma 1 holds:

Lemma 1. An increase in the probability of a liquidity shock, p, increases an incentive of firms to accumulate liquidity assets. However, it does not affect the optimal level of liquidity assets M^*.

On the other hand, an increase in the interest rate r_K, i.e. opportunity cost, affects the optimal level of liquidity assets according to (5). However, an increase in r_K makes (13) more difficult to hold, since it decreases the left side of (13). Hence, the following Lemma 2 holds:

Lemma 2. An increase in the interest rate r_K increases the amount of repayment, which makes it more difficult for firms to borrow from banks and reduces an incentive to hold liquidity assets. However, an increase in r_K increases the level of liquidity assets M^* when firms hold liquidity assets.

VI. Conclusion

In an economy where the workers' claims take priority, firms may face fund shortages due to large workers' claims when a liquidity shock happens. This research shows that as workers' claims increase, firms tend to accumulate more liquidity assets in advance. Since the role of employees as a stakeholder of firms is relatively large in Japan, this result has an important implication for Japanese liquidity asset holdings. As Figure 1 shows, the cash/deposit ratio tends to be high in a more labor-intensive industry. Reflecting the characteristics of Japanese firms, the results of this paper suggest that the size of workers' claims is one of the most important factors for promoting accumulation of liquidity assets.

For analytical simplicity, this paper considers the case where only current workers' claims take priority. But in general, firms face obligations to pay health care costs and pensions not only for current employees but also for retirees, and such legacy costs are also likely to worsen firms' fund shortages. As the negotiation power of retired workers increases, firms face more serious borrowing constraints and are obliged to reduce current employment for restructuring. For example, in the cases of bankruptcy for GM and Chrysler, due to the strong labor unions in the U.S. automobile industry, the legacy costs for corporate pension and health benefits insurance became a serious obstacle for their restructuring (Lowenstein, 2008). Even in Japan, there are many cases where the labor costs for retirees became a big issue in restructuring. The legacy cost is another critical problem which restricts corporate finance in that it affects accumulation of liquidity assets.

In literature, Monk (2008) did not focus on fund shortages and instead analyzed the effects of legacy costs on corporate decision making. The paper pointed out that Delphi went into bankruptcy partly because legacy costs, including defined benefit pension, hinder growth and innovation and lead to a decline in international competitiveness. In other words, without legacy costs, funds may be put into investment, R&D, innovative production lines, and so on. However, when the benefits for retired workers are generous, funds typically available for investing in improving the corporate value are diverted to the payment of the legacy costs. Hence, if the negotiation power of retired workers is strong, the funds for the present investors are utilized to pay the pensions for the retired workers, which may worsen fund shortages. As a result, liquidity assets may accumulate much more.

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