Labor Turnover, Firm Investment, and Stock Returns

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Abstract

This study examines the effect of labor turnover on firm investment decisions and stock returns. We set up a model that features negative effects of labor turnover on firms' productivity, heterogeneous job characteristics, and procyclicality of the overall labor turnover. The empirical analyses based on the model implications using the U.S. and Korean stock market data show that low labor turnover firms earn higher stock returns than high labor turnover firms. This negative relation between labor turnover and stock return is stronger among firms exposed to higher labor turnover costs. Our model implies that a decrease in labor turnover should be related to higher investment rates, and we confirm this empirically.

1. Introduction

A war for talent is starting. Clever, forward-thinking executives in large leading tech companies, such as Facebook, Amazon, and Google, have been buying office spaces, building fitness centers, and offering luxury amenities to make them attractive and appealing to workers. There was no exception for firms in Korea. In 2020, yearly wages of the largest three IT companies in Korea record an increase of 26% on average in response to a sharply increased demand for IT workers. Those phenomena indicate that labor becomes a crucial factor in a firm's production. Given the rapidly rising importance of labor in the economy, numerous research in the finance area has investigated the role of labor on firm values.

In this study, we focus on labor turnover among various features of labor. Labor turnover can substantially impact firms by inducing disruptions in production, significant losses in firms' outputs, loss of valuable skills, and recruiting and training expenses. For example, Brown and Medoff (1978) report that the elasticity of productivity to quit rates is about -0.1 at an industry level. Bliss (2004) estimates the average replacement costs for a salaried employee to 150% of his annual salary. Further, many studies in the organizational management literature consistently show the negative effect of labor turnover on firms' organizational performances (Hancock et al., 2011; Glebbeek and Bax, 2004). Under these adverse effects of turnover, firms would want to keep labor turnover at a low enough level. However, it is not easy for firms to fully control labor turnover because employees can quit against the firm's intention when they feel unsatisfied or get better outside offers. In this regard, firms' skill managing labor turnover can be a critical factor in a firm's performance and a valuable intangible asset. Eventually, a different level of labor turnover across firms may have important implications on firm values.

Motivated from this view, we examine the effects of labor turnover on firm decisions and stock returns. Specifically, we argue that labor turnover negatively affects stock returns, which we call a negative labor turnover premium. To analytically examine the mechanism of how labor turnover negatively affects firms' stock returns, we propose a simple one-period model that features three things: 1) labor turnover negatively affects a firm's productivity, 2) firms have heterogeneous job characteristics, and 3) the market-wide (overall) labor turnover is procyclical. These three features plausibly reflect phenomena in the real world.

Under the negative turnover-productivity relationship, firms have an incentive to lower mean labor turnover rates by raising wages for employees. Our model formalizes this idea by allowing firms to partially control labor turnover with a wage.[1] In the equilibrium, firms choose the wages at an optimal level in the trade-off between costs from high wages and benefits from low labor turnover induced by high wages. In this optimal wage policy, heterogeneous job characteristics generate a cross-sectional variation in firms' labor turnover rates, as we observe in the data. The turnover rate function in the model implicitly assumes that two non-pecuniary job characteristics affect the utilities of employees, and they are complementary to wage. Firms with more favorable job characteristics for employees can maintain lower turnover rates with the same level of wage than firms with less favorable job characteristics. Procyclicality of overall labor turnover swings the advantage of having favorable job characteristics with respect to the market state.

With the above three features, our model generates a negative relation between labor turnover and stock returns. The intuition behind this result is as follows. When the market is in a good state with high aggregate productivity, firms want to raise production efficiency by lowering labor turnover to maximize their profits. In such a good state, overall labor turnover increases, and firms need to pay higher wages than before to lower labor turnover. At this time, job characteristics play an important role in firm-level labor turnover because the average wage level is high, and the marginal effect of wage on turnover becomes low. Therefore, a firm with employee-favorable job characteristics is relatively easier to keep low labor turnover by wage than a firm with employee-unfavorable job characteristics, which means that better job characteristics have a large comparative advantage. This large advantage results in competitive low-turnover for the firm, and the low turnover firm earns more profits than a high turnover firm with unfavorable job characteristics in a good state.

On the other hand, when the market state is bad, overall labor turnover decreases, and the average wage level is low. In this state, the marginal effect of wage on turnover is more prominent, and the employee-favorable job characteristics become relatively unimportant, which means that better job characteristics become only a small comparative advantage. Thus, a firm with favorable job characteristics has relatively low turnover than a firm with

[1] In this respect, our model focuses on the expected (mean) labor turnover effects, rather than a realized (unexpected) labor turnover, on asset pricing. Unlike the realized labor turnover, the expected labor turnover is manageable by the firm to some extent.

unfavorable job characteristics, but the lower turnover does not make a significant difference in profits between the two firms. Put differently, both firms earn similarly low profits in such a bad state.

Consequently, a low turnover firm with favorable job characteristics generates much higher profits in a good state and similar profits in a bad state compared to a high turnover firm with unfavorable job characteristics. It means that a low turnover firm has a higher value than a high turnover firm, and the former will have a higher (lower) return in a good (bad) state than the latter. In other words, a low turnover firm is more exposed to aggregate risk. This higher risk of a low turnover firm leads to a higher expected return.

We emphasize that 'the riskier low turnover firms' does not mean that low turnover firms are poorly performing or inferior to high turnover firms. In our model, low turnover firms always generate larger cash flows than high turnover firms regardless of market states, which implies that those firms have a higher market value than high turnover firms. The point is, expected future cash flows to be generated in good states form a major part of the market value of low turnover firms, which requires higher discount rates for those firms because investors more discount future cash flows of good times than of bad times.

This study also empirically examines the link between labor turnover and stock returns using U.S. and Korean stock market data based on our model. Unfortunately, we do not have a direct measure for labor turnover rates at a firm-level in the U.S. Thus, we utilize the amount of cancelled, forfeited, or expired stock options out of total stock options outstanding as a proxy for turnover, following Carter and Lynch (2004), Phua et al. (2018), and Rouen (2020). By contrast, firms in the Korean stock market are required to report the average length of employee service (LS) since 2003, which is certainly negatively related to labor turnover rates. Furthermore, LS may be more appropriate for our study focusing on the mean turnover rates because LS is a slowly adjusted measure incorporating the historical average turnover rates, whereas the option-based turnover measure captures year-by-year turnover rates. In addition to the advantages of the Korean data, it is worth to analyze the Korean stock market as well as the U.S. stock market in the following aspects. First, labor turnover in Korea is more likely to be a voluntary turnover than in the U.S. The Korean labor-related laws are very protective of labor and make it very difficult for firms to fire their employees. As a result, turnover tends to result from voluntary decisions of employees rather than the decisions of firms. Because our model focuses on voluntary labor turnover that is not the result of optimal firm decisions, this characteristic of the Korean labor market fits our study well. Second, Korea is a country that has experienced fast growth with human capital. Thus, the impact of labor on firms' production is expected to be large, which is a desirable condition for our study focusing on labor turnover.

Using the U.S. and Korean stock market data, we first empirically document the negative labor turnover premium. We find that firms with low labor turnover earn higher mean returns than firms with high labor turnover in both the U.S. and Korean stock markets. The Fama-MacBeth regressions show that a one-standard-deviation increase in labor turnover lowers mean returns by 1.5% and 2.4% per year for the U.S. and Korean stock market, respectively. We further examine whether the CAPM and Fama-French five-factor (FF5) models can capture the negative labor turnover premium. The asset pricing tests confirm that the factor models cannot fully explain the negative labor turnover premium, which means that the labor turnover has additional information on stock returns over the prevalent asset pricing factors.

Secondly, we empirically test the model's implication that the negative link between labor turnover and stock returns becomes stronger among firms exposed to higher labor turnover costs. Our three measures of a turnover cost wedge (capturing the level of turnover costs) confirm that firms with a high turnover cost wedge generate a larger average return of the low-minus-high turnover portfolio than firms with a low turnover cost wedge, and the difference is significant in general.

Lastly, we observe that firms with relatively low turnover have a bigger size, higher profitability, and more physical (tangible) assets to total assets, all of which are consistent with our model. We find no empirical relation between turnover and operating leverage at a firm level, which excludes the possibility that the operating leverage hypothesis explains the negative relation between turnover and stock returns. We also empirically demonstrate that a decrease in labor turnover is positively linked to high investment rates, which is one of the implications of our model.

Our study contributes to a growing body of research investigating the role of labor with regard to stock returns and firms' decisions. In particular, our study is closely related to a series of papers examining the empirical relation between employee welfare and stock returns, which is a rising theme. Edmans (2011) documents that employee satisfaction is positively linked to stock returns. Faleye and Trahan (2011) find that positive abnormal stock returns follow announcements of labor-friendly policies, and labor-friendly firms outperform otherwise similar firms in long-term stock returns as well as operating results. Jiao (2010) shows that employee welfare forms crucial intangibles creating values for shareholders. Fauver et al. (2018) report that firms with a more employee-friendly culture are valued higher and perform better, using samples from 43 countries. Green et al. (2019) find that a better employee review for a firm is associated with the firm's positive future performance.

The variables these papers have shown to associate with firm values, i.e., employee satisfaction or welfare, are related to labor turnover. Moreover, our study reaches the results consistent with these papers: low labor turnover firms (likely to be high employee-satisfaction firms) earn higher stock returns than high labor turnover firms (likely to be low employee-satisfaction firms). However, our study is distinct from these papers as follows. First, across these papers the central idea explaining the positive association between employee satisfaction and stock returns is based on the behavioral explanation. Satisfied employees are more productive and make more money for their firms than unsatisfied employees, but the market participants underestimate the value of those firms. As market participants gradually incorporate the information about the firms' higher profitability due to employee satisfaction into the stock prices, the stock prices rise. We provide an alternative explanation based on a risk-based model to account for the existing relationship between employee satisfaction and stock returns through a labor turnover channel. To the best of our knowledge, our study is the first attempt to examine the relationship under a risk-based model. Second, labor turnover is an objective variable as the outcome of an employee's choice, whereas employee satisfaction is fairly subjective. It is hard to measure employees' satisfaction quantitively, which may result in significant estimation errors. Furthermore, it is still unclear that happier employees are significantly more productive than unhappier employees despite some arguments. In sharp contrast, turnover is relatively visible, and huge literature in labor economics and organizations confirm the adverse effect of labor turnover on production. Thus, labor turnover is more appropriate and convenient to analyze the impact of labor-related factors on firm values.

Our study is also related to a bundle of papers studying the impact of labor from the financial viewpoint. Donangelo (2014) shows that firms in higher labor mobility industries are exposed to higher operating leverage, leading to higher expected returns than firms in lower labor mobility industries. This result does not seem to be consistent with our main result, but Donangelo's industry-level labor mobility measure is different from our firm-level labor turnover measure.[2] Eisfeldt and Papanikolaou (2013) focus more on the mobility of high-skilled human capital, called the organization capital, and find that the threat of organization capitals to walk away from firms forms a systematic risk. Their results are extended to 20 OECD countries by Leung et al. (2018), who confirm the worldwide ability of the organization capital to explain cross-sectional stock returns. Chen et al. (2011) study whether constraints on firms' operations induced by labor unions raise costs of equity and reveal that labor union forms operating leverage generating the equity premium.[3] Belo et al. (2014) show that hiring rates have additional information on stock returns over investment rates. Kuehn et al. (2017) utilize the labor market tightness that inversely measures how quickly firms and labor are matched for a hiring contract. They reveal that the labor market tightness is functioning as a systematic risk affecting stock returns. We find that the negative labor turnover premium becomes larger (in absolute value) in states of high labor market tightness. Donangelo et al. (2019) document that labor expenses create leverage of firms, and thus it generates a cross-sectional variation in stock returns. Ghaly et al. (2015) report that firms committed to employees' well-being hold more cash, though our empirical result does not show the negative relation between labor turnover and cash-to-asset ratio.

The model suggested in our study stems from the production-based asset pricing literature, firstly introduced by Cochrane (1991). Following his work, Yashive (2016) argues the importance of labor to match the moments of the stock market data and the labor market data in the United States. Production-based asset pricing models feature an exogenously given stochastic discount factor (Zhang, 2005), and our model also adopts it.

Finally, our study is related to labor economics in the aspect that our model features labor turnover. The positive effect of wage on labor turnover (lowering turnover) is motivated by the spirit of Pencavel (1972) and the model of Salop (1979). In their models, labor turnover results in training costs for newly hired workers, and firms have incentives to increase wages to lower the costs associated with labor turnover. This idea is in line with the efficient wage theory

[2] The labor mobility measure in Donangelo (2014) is based on the distribution of occupations at an intra-industry level. According to his measure, an industry in which firms have a similar number of employees at each occupation is regarded as a high mobility industry. This measure is closely related to the industrial structure but may not be appropriate to proxy for labor turnover. For example, a few promising firms in a specific industry may attract many employees from the other firms in the industry, inducing higher labor turnover in the industry. In this case, the distribution of employees concentrated on a few firms in the industry (regarded as low mobility) is not linked to low labor turnover.

[3] Stoikov and Raimon (1968) show that labor union lowers labor turnover rates.

(Shapiro and Stiglitz, 1984; Summers, 1988) in which wage raises labor productivity by increasing efforts or decreasing shirking. Moreover, our model features hedonic wage theory (Rosen, 1974; Hwang et al., 1998; Dale-Olsen, 2006) in which non-pecuniary firm-specific amenities affect utilities of employees besides wages and eventually affect labor turnover rates. Dale-Olsen (2006) reports that fringe benefits are fairly effective for reducing turnover rates together with wage, although the average size of fringe benefits is much smaller than that of wage. The hedonic wage theory implicates that heterogeneity of non-pecuniary attributes of jobs is an important factor that generates cross-sectional variations in labor turnover rates, and we mainly exploit this fact in our model.

This study is organized as follows. In the next section, we propose a simple model and derive some implications from the model. In section 3, we describe the data and the proxy for labor turnover. We examine the implications of our model empirically in section 4. In section 5, we conclude.

2. The Model

In this section, we suggest a simple one-period model to describe the effect of labor turnover on firms' investment decision and asset prices.

2.1 The model set up

A. Technology

At t=0, a firm starts with one project that generates cash flow at t=1. The project is randomly drawn from a set of all the possible projects in the economy in which each project in the set is ex-ante distinguished only by its investment cost I. The project investment cost I is randomly drawn from the distribution F_I with its probability density function f_I where $I \in [I^L, I^U]$. A project's productivity at t=1 is defined as

$$X_1 = C_1 Z_1, \qquad (1)$$

where C_1 is the aggregate productivity (let us say, consumption) of the economy, and Z_1 is the project's idiosyncratic productivity. We assume that $c_1 = ln(C_1)$ follows a normal distribution with $E[c_1] = \mu_c$ and $Var(c_1) = \sigma_c^2$, and Z_1 is independent of C_1.

In this economy, the stochastic discount factor M_1 is exogenously given in the form of

$$M_1 = exp\left(-\gamma(c_1 - \mu_c) - \frac{\gamma^2}{2}\sigma_c^2 - r_f\right), \quad (2)$$

where γ is the representative investor's risk-aversion parameter and r_f is the risk-free rate.

A drawn project's investment cost I is known at t=0, and the firm can choose whether to invest in the project with a fixed investment cost I or not. Once the project is undertaken, it cannot be re-sold. The project's cash flow (or revenue) at t=1, Rev_1, is the project's productivity multiplied by outputs Y_1, all of which are defined as followings:

$$Rev_1 = X_1 Y_1 = X_1(L_1 - \delta L_1 p)^\alpha = X_1 L_1^\alpha (1 - \delta p)^\alpha \coloneqq X_1 L_1^\alpha S^\alpha, \quad (3)$$

where p is a mean turnover rate, $S \coloneqq 1 - \delta p$ is production efficiency that decreases with labor turnover rates, δ is a labor turnover cost wedge capturing the level of labor turnover costs, and α is the labor intensity. The functional form of revenue in (3) is similar to the one in the efficient wage theory model suggested by Summers (1988).

The revenue function above is a conventional form of a production function with one input of labor and decreasing return to scale. However, it takes account of the adverse effect of labor turnover on production as well. While all of the labor forces L_1 in a firm that undertakes a project are committed to production at t=1, each employee is allowed to leave the firm with a probability of p which is a (mean) labor turnover rate. The labor turnover results in loss in the final output. The magnitude of the loss increases with the number of leaving employees $L_1 p$ and a labor turnover cost wedge δ.

B. Labor turnover

Now, we introduce how a labor turnover rate is determined at a firm level. We first define a labor turnover rate p as a function of a firm-specific turnover rate p_o, wage per worker w, wage efficiency λ that captures the wage's effectiveness on turnover, and the aggregate productivity c. The two firm-specific job characteristics affecting firms' turnover, p_o and λ, are exogenously given at time 0, and firms endogenously choose wage at time t=1.

We explicitly define the labor turnover rate function $p(w; p_o, \lambda, c)$ as follows:

$$p(w; p_o, \lambda, c) = p_o + hc - (w^\rho + \lambda^\rho)^{k/\rho}, \quad (4)$$

where $h > 0$, $0 < k \leq 1$, $\rho < 0$, and $\lambda < w(-k/\rho)^{1/\rho}$.

The labor turnover function is set to satisfy the following conditions.

i) $p_w < 0,\ p_{ww} > 0$

ii) $wp_{ww} + p_w > 0$

iii) $p_\lambda < 0,\ p_{w\lambda} < 0$

iv) $p_c > 0$

The first condition formalizes the well-known facts that wage is one of the most useful tools for lowering labor turnover rates (See Pencavel, 1972) and the marginal effect of wage on turnover decreases. The second condition that $wp_{ww} + p_w > 0$ is to prevent the effect of wage on turnover rates from being immoderate.[4] The third condition implies that 1) higher wage efficiency λ lowers labor turnover and 2) increased wage lowers labor turnover rates more effectively for firms with higher λ. This condition is based on the presumption that wage and wage efficiency are complementary inputs to lower labor turnover. The last condition reflects the procyclicality of labor turnover that the overall (voluntary) labor turnover rises in good market states with high aggregate productivity, which is the main driving force of our model results. Firms want more labor forces in good states, and as a result, workers encounter more job opportunities and have more chances to get higher wages. Thus, workers will seek better job opportunities, which leads to higher labor turnover rates in good states. Although our model does not take account of and solve for the labor market equilibrium where the supply and demand for labor are met at a given market-wide wage, the term hc in equation (4) allows our model to nest the properties of the labor market equilibrium. The procyclicality of labor turnover can be confirmed in historical data. In Figure 1, we plot normalized and seasonally-adjusted turnover (quit) rates, hiring rates, and unemployment rates for both the United States and Korea. The U.S. and Korean data are obtained from the Job Openings and Labor Turnover Survey (JOLTS) and the Korean Statistical Information Service (KOSIS).

<Figure 1>

As we observe in the figure, labor turnover for both the United States and Korea is positively related to hiring and negatively related to unemployment, which shows that labor turnover is

[4] Without this condition, firms with a bad job environment have lower labor turnover in the equilibrium.

procyclical. Literature on the labor market, including Lazear and Spletzer (2012) and Mercan and Schoefer (2020), empirically confirms this procyclicality of labor turnover as well.

The firm-specific labor turnover rate, p_o, is motivated by the hedonic wage theory: jobs with a high probability of injury pay wage more than the average market level. This theory implies that jobs with characteristics that workers dislike are exposed to high labor turnover rates, and thus, workers require more complimentary wages for these jobs. In this sense, non-pecuniary factors such as job environment (including a likelihood of injury), a firm's location, fringe benefits, a firm's brand power, corporate culture, and organization systems (such as unions) determine the exogenous firm-specific turnover rates p_o.

The wage efficiency (λ) can be different across firms for various reasons. One of them is the credibility of wage streams. In a multi-period framework, wage per period engaged by firms with a high probability of default is less attractive to workers than the same wage per period proposed by financially healthier firms in terms of the present value of expected future wage streams. Though we are working in a single-period framework, we can embrace this property of the multi-period framework by allowing variations in λ. The number of competitors for a firm could be another important factor that affects λ, according to Summers (1988). In his model, the effect of wage on productivity (λ in our term) is more prominent when labor market conditions are bad for workers. In other words, a firm's λ is high if employees in the firm have less opportunity to move to other firms. Firms in more concentrated seller markets or firms with labor whose skills are firm-specific may have high λ. Because large firms are in relatively more concentrated markets and their employees have less incentive to move than those in small firms, λ is naturally expected to be higher among large firms than small firms.

The labor turnover cost wedge δ in equation (3) captures the degree of loss in output from labor turnover. The importance of turnover costs (and the turnover cost wedge) is introduced by Salop (1979), showing that heterogeneous turnover costs generate different equilibrium wages across firms based on the efficient wage theory framework. The range of δ is set between zero and one so that the production efficiency is always positive. By the construction of the output function, the loss in output is larger when the mean turnover rate p is higher and δ is higher. The labor turnover cost wedge δ can be interpreted as the degree of importance of firm-specific labor or the degree of difficulty replenishing labor. The higher value of δ

means that recruits to substitute for existing employees are hard, and therefore, the effect of labor turnover on a firm's production is larger.

C. Firm's problem

At the beginning of time t=1, aggregate productivity C_1 is observable, and a firm that invests in a project determines the number of labor L_1 and wage per worker w_1. At the end of t=1, cash flow (revenue) from the project is realized, the firm pays a wage and distributes all the remaining cash (a profit) as dividends liquidating the firm. If the firm does not invest, the firm does not hire and earns zero without paying wage at the end of t=1.

The profit of an investing firm at t=1 is

$$\Pi_1 = Rev_1 - w_1 L_1 = X_1 L_1^{\alpha} S^{\alpha} - w_1 L_1. \quad (5)$$

The firm chooses the optimal labor force L_1 and wage w_1 to maximize the profit Π_1 given C_1. Solving this maximization problem gives the following first order conditions:

$$S^* = w_1^* S_w^*, \qquad (6)$$

$$L^* = \alpha (L^* S^*)^{\alpha} X_1 \frac{S_w^*}{S^*}, \quad (7)$$

and the maximized profit is

$$\Pi_1^* = (1-\alpha)\alpha^{\frac{\alpha}{1-\alpha}} X_1^{\frac{1}{1-\alpha}} S_w^{*\frac{\alpha}{1-\alpha}}. \quad (8)$$

At time t=0, a firm determines whether to invest or not by comparing the optimal value of profits from the investment opportunity and its randomly drawn investment cost I. The optimal investment policy is that the firm invests if the project's net present value is positive, that is, $E_0[M_1 \Pi_1^*] - I \geq 0$.

The optimality condition in (6) indicates that the elasticity of the effective labor cost w_1/S with respect to wage is zero, which means that the firm minimizes the effective labor cost. From this condition along with equation (4) and $S = 1 - \delta p(w_1; p_o, \lambda, c)$, we can derive the below formula calculating for the optimal wage:

$$[(1-k)w^{\rho} + \lambda^{\rho}](w^{\rho} + \lambda^{\rho})^{\frac{k}{\rho}-1} = (p_0 + hc_1 - \delta^{-1}) := J > 0. \quad (9)$$

If we assume k=1 for tractability, we obtain the following form of the optimal wage and production efficiency which are a function of λ, p_0, and C_1:

$$w^* = \left[(J\lambda^{-\rho})^{\frac{\rho}{1-\rho}} - \lambda^{\rho}\right]^{\frac{1}{\rho}}, \qquad (10)$$

$$S^* = 1 - \delta p^* = \delta\left[(J\lambda^{-\rho})^{\frac{1}{1-\rho}} - J\right]. \qquad (11)$$

To keep the production efficiency S (and thus S^*) always positive, we assume $\lambda > J$.

Based on equation (10) and (11), we analyze the comparative statistics for the optimal wage and labor turnover with respect to the two job characteristics affecting labor turnover, λ and p_0. The following two properties summarize the analysis results.

Property 1. The optimal labor turnover rate p^* increases in firm-specific turnover rates p_0, and decreases in wage efficiency λ. Furthermore, the optimal wage w^* increases in p_0.

Property 2. S_w^* decreases in firm-specific turnover rates p_0, and increases in wage efficiency λ.

Proofs are given in Appendix A.

The relations among job characteristics, labor turnover, and wage described in *Property 1* are intuitive. Firms with high p_0 have relatively low production efficiency and thus, propose a higher wage to raise the efficiency by lowering turnover. Nevertheless, those firms' turnover resulting from their optimal decisions is still high because the positive effect of wage on turnover is limited. In contrast, firms with high λ are easier to keep low labor turnover because the wage proposed by those firms more effectively decreases employees' incentive to leave.

Given that $S_w^* = S^*/w^*$, *Property 2* implies that firms with a better environment for workers or higher wage efficiency enjoy relatively low turnover rates (high production efficiency) for their wage level. Furthermore, because *Property 2* holds for all the aggregate productivity level C_1, firms with high S_w^* always have larger profit (Π_1^* in equation (8)) than firms with low S_w^* regardless of C_1. This fact implies that the present value of the project's profit, $E[M_1\Pi_1^*]$, is larger for firms with high S_w^* than firms with low S_w^*. Thus, firms with lower turnover have larger market value from investment than those with high turnover.

2.2 Labor turnover and stock returns

In this subsection, we investigate the relation between labor turnover and stock returns. Because our model presumes only one aggregate productivity (risk) affecting investors' marginal utility, expected stock returns of firms are completely determined by the sensitivity of firms' project profit to the changes in the aggregate productivity. Equation (8) explicitly shows the profit of investing firms which is a function of the aggregate productivity and the two job characteristics. If firms have the same job characteristics so that they have the same S_w^*, then there would be no differences in expected stock returns across the firms. However, we allow job characteristics to exogenously vary over firms, which leads to a different optimal labor turnover rate for each firm and may result in a negative relation between labor turnover and stock returns.

We introduce the measure θ defined by $\theta = \partial ln(\Pi_1^*)/\partial ln(C_1)$ that captures the sensitivity of profit to changes in aggregate productivity. θ is defined so that a 1% increase in aggregate productivity raises a firm's profit by θ%. Thus, firms with higher θ are more exposed to aggregate risk and have higher expected returns.

Property 3. θ is negatively related to labor turnover p^*.

-Proof

$\theta = C_1 \frac{\partial ln(\Pi_1^*)}{\partial C_1} = C_1 \frac{\partial}{\partial C_1}\left[\ln(1-\alpha) + \frac{\alpha\ln(\alpha)}{1-\alpha} + \frac{\ln(C_1 Z_1)}{1-\alpha} + \frac{\alpha\ln(S_w^*)}{1-\alpha}\right] = \frac{1}{1-\alpha} + \frac{\alpha C_1}{1-\alpha}\frac{\partial\ln(S_w^*)}{\partial C_1}$, and

$\frac{\partial\ln(S_w^*)}{\partial C_1} = \frac{\partial\ln(S_w^*)}{\partial J}\frac{\partial J}{\partial C_1} = \frac{\partial\ln(S_w^*)}{\partial p_0}\frac{\partial p_0}{\partial J}\frac{\partial J}{\partial C_1} = -\frac{\delta}{S^*}\frac{h}{C_1}$. ($\frac{\partial\ln(S_w^*)}{\partial p_0} = -\frac{\delta}{S^*}$ is shown in Appendix A.)

$$\text{Thus, } \theta = \frac{1}{1-\alpha}\left(1 - \frac{\alpha\delta h}{S^*}\right) = \frac{1}{1-\alpha}\left(1 - \frac{\alpha\delta h}{1-\delta p^*}\right). \qquad (12)$$

Equation (12) reveals that p^* decreases θ.

(QED)

As we can see in equation (12), there is no relation between labor turnover and stock returns when $h = 0$. It is essential that h is positive to generate the negative relation between labor turnover and stock returns. The intuition behind this result is as follows. When the market is in a good state with a high level of aggregate productivity, firms want to hire more employees and raise production efficiency (decrease turnover) to exploit higher profit. It raises the overall labor turnover, as formalized by $h > 0$ in our model. Firms embedded with employee-favorable job characteristics (low p_0 and high λ) achieve low labor turnover more efficiently than firms with employee-unfavorable job characteristics in a good state because their marginal positive effect of wage on turnover becomes small and the difference in job characteristics makes larger comparative advantages.[5] Consequently, low turnover firms with low p_0 and high λ earn much larger profit in a good state compared to high turnover firms thanks to larger effective labor forces (the number of employees $\times$ production efficiency). On the other hand, when the market is in a bad state with low aggregate productivity, firms recognize that they need less labor and that labor turnover is less likely to occur. Thus, firms cut wages on average, and the marginal positive effect of wage on turnover becomes more prominent in a bad state, which means that the cross-sectional differences in job characteristics less affect firms' productivity. In this bad state, both low and high turnover firms similarly make low profits. Consequently, low turnover firms earn larger profits when the market is good and similar profits when the market is bad compared to high turnover firms. This asymmetry of profits due to the job characteristics makes the low turnover firms' profits per capital more sensitive to aggregate productivity. That is, low turnover firms are exposed to more aggregate risk.

Property 3 directly shows that low turnover firms have high θ, which means that their profit is more sensitive to aggregate productivity. To see why the stock return increases with θ, we consider the case where θ does not vary across the aggregate productivity C_1 for a moment, though θ is a function of C_1. In this case, Π_1^* is in proportion to C_1^{θ}. We can then explicitly derive the expected stock returns of investing firms by the followings:

$$\mathrm{E[R|Invest]} = \frac{\mathrm{E}[\Pi_1^*]}{\mathrm{E}[\mathrm{M}_1\Pi_1^*]} = \frac{E[(1-\alpha)\alpha^{\alpha/(1-\alpha)} Z_1^{1/(1-\alpha)} X_1^{1/(1-\alpha)} {S_W^*}^{\alpha/(1-\alpha)}]}{E[(1-\alpha)\alpha^{\alpha/(1-\alpha)} Z_1^{1/(1-\alpha)} X_1^{1/(1-\alpha)} {S_W^*}^{\alpha/(1-\alpha)} e^{-\gamma(c_1-\mu_c)-\frac{\gamma^2}{2}\sigma_c^2-r_f}]}$$

[5] In a high overall turnover state, it costs too much for firms with unfavorable job characteristics to retain the same level of labor turnover as firms with favorable job characteristics.

$$\frac{E[Z_1^{1/(1-\alpha)}]E[e^{\theta c_1}]}{E\left[Z_1^{1/(1-\alpha)}\right]E[e^{\theta c_1-\gamma c_1+\gamma\mu_c-\frac{\gamma^2}{2}\sigma_c^2-r_f}]} = \frac{e^{\theta\mu_c+\frac{\theta^2}{2}\sigma_c^2}}{e^{(\theta-\gamma)\mu_c+\frac{(\theta-\gamma)^2}{2}\sigma_c^2+\gamma\mu_c-\frac{\gamma^2}{2}\sigma_c^2-r_f}} = e^{r_f+\theta\gamma\sigma_c^2}, \tag{13}$$

noting that $X_1^{1/(1-\alpha)}{S_w^*}^{\alpha/(1-\alpha)} = C_1^{\theta}$.

As we can see in (13), the expected returns of investing firms are increasing with θ, which indicates the negative relation between labor turnover and stock returns. This result is consistent with the intuition that investors require higher discounts for future cash flows that are more correlated with aggregate productivity such as the firm's cash flows with high θ in our model. Moreover, looking at the expected return in (13) based on a conventional consumption-based asset pricing view, θ can be interpreted as a consumption beta that governs expected stock returns, which implies that low turnover firms with high θ are more exposed to aggregate consumption risk.

Because θ is a function of C_1, the expected return in equation (13) is not exactly the same as the true expected return of investing firms. However, the results remain qualitatively the same because a low turnover firm's θ is always larger than that of high turnover firms regardless of C_1.

The next property shows the effect of a labor turnover cost wedge on the negative relation between labor turnover and stock returns.

Property 4. The negative link between θ and p^* is stronger among firms with high δ.

The proof is given in Appendix A.

Property 4 states that firms with a higher cost wedge experience a larger decrease in θ than those with a lower cost wedge when turnover p^* increases. Thus, with the negative relationship between turnover and stock returns, we can infer that increased labor turnover more negatively affects the stock returns of firms with a higher cost wedge than those with a lower cost wedge. Intuitively, firms in which productions are hit harder by labor turnover have a stronger relationship between future stock returns and labor turnover.

2.3 Turnover, firm investment, and firm characteristics

In this subsection, we investigate the relations of labor turnover with firm investment and firm characteristics. First of all, we discuss the investment policy of firms. In our model, the benefit of investment in a project is $E[M_1 \Pi_1^*]$, and a firm invests if the investment cost I is lower than the investment benefit $E_0[M_1 \Pi_1^*]$. We know that $E_0[M_1 \Pi_1^*]$ increases in S_w^* from equation (8), and S_w^* is negatively related to the optimal labor turnover p^* by *property 1* and *2*. Thus, high (low) turnover firms have a low (high) investment benefit. This fact implies that low turnover firms proceed with larger investment on average than high turnover firms.

We now link firm characteristics to labor turnover, assuming that each firm is endowed with cash I^U. Our first interest is the relation between labor turnover and the market value of a firm. In our model, the conditional market value when investing in a project with a cost I is $E_0[M_1 \Pi_1^*] - I + I^U$, and a firm only invests when $E_0[M_1 \Pi_1^*] \geq I$. Thus, the unconditional expected market value is

$$\mathrm{E[MV]} = \int_{I^L}^{E_0[M_1 \Pi_1^*]} (E_0[M_1 \Pi_1^*] - I + I^U)\, f_I(I) dI + \int_{E_0[M_1 \Pi_1^*]}^{I^U} I^U\, f_I(I) dI,$$

$$= \int_{I^L}^{E_0[M_1 \Pi_1^*]} (E_0[M_1 \Pi_1^*] - I)\, f_I(I) dI + I^U. \qquad (14)$$

It is evident that the expected market value increases with the expected optimal profit, $E_0[M_1 \Pi_1^*]$, as

$$\partial \mathrm{E[MV]} / \partial E_0[M_1 \Pi_1^*] = \int_{I^L}^{E_0[M_1 \Pi_1^*]} f_I(I) dI > 0$$

by Leibnitz's theorem. Because $E_0[M_1 \Pi_1^*]$ is negatively related to labor turnover, high turnover firms have a lower market value. Labor turnover lowers the market value in two ways. On the one hand, high labor turnover directly deteriorates firms' production efficiency, resulting in lower future cash flows. On the other hand, high labor turnover restricts the investment opportunity of firms, which leads to fewer investments in projects that may enhance the market value of firms.

We note that firms with low labor turnover are more likely to invest in a project, and investments in projects generally accompany physical capital. Thus, we expect low turnover firms to have more physical assets compared to cash or other non-physical assets than high turnover firms. Because the physical capital is I if the firm invests and zero otherwise in our model, the unconditional expected value of tangibility (TG), which is a ratio of physical assets to total assets, is

$$\mathrm{E[TG]} = \frac{1}{I^U}\left[\int_{I^L}^{E_0[M_1\Pi_1^*]} I\, f_I(I)dI + \int_{E_0[M_1\Pi_1^*]}^{I^U} 0\, f_I(I)dI\right] = \frac{1}{I^U}\int_{I^L}^{E_0[M_1\Pi_1^*]} I\, f_I(I)dI. \qquad (15)$$

It can be easily shown that the unconditional expected tangibility is a decreasing function of the labor turnover, which is in accord with our intuition.

The lower labor turnover rate a firm retains, the higher productivity the firm achieves. This is a first-order effect of labor turnovers on firms' production, which our model underlies. Because lower labor turnover raises firms' realized cash flows given the amount of capital, we expect that profitability of firms such as ROE increases when labor turnover decreases.

To investigate the dynamics of asset growth rates (as a measure of investment rates) with regard to labor turnover, we allow firms to operate for multiple periods. We also add the following assumptions: 1) investments are financed by outside funds (equity or debt), 2) net incomes are immediately distributed as dividends each period, and 3) assets are depreciated by a rate of u. Then, the average capital is accumulated by the following process as

$$E[\mathrm{K_t}] = (1-u)E[K_{t-1}] + E[I_t],$$

where K_t is the total asset (capital) and $E[I_t]$ is the average investment, which is calculated by $\int_{I^L}^{E_{t-1}[M_t\Pi_t^*]} I\, f_I(I)dI$ and is a decreasing function of the labor turnover rate. If the labor turnover rate is constant until at time t-1, the total asset at time t-1 is calculated as $\mathrm{K_{t-1}} = E[I_{t-1}](1-(1-u)^{t-1})/u$. Then, the average asset growth rate (AG) at time t can be written as,

$$\mathrm{E[AG_t]} = \frac{E[I_t]-uK_{t-1}}{K_{t-1}} = \frac{E[I_t]}{E[I_{t-1}]}\cdot\frac{u}{(1-(1-u)^{t-1})} - u. \qquad (16)$$

As we can see in equation (16), if there is no change in the labor turnover rate so that $E[I_t]$ is the same as $E(I_{t-1})$, the average asset growth rate is constant across labor turnover rates. It is because low turnover firms take a larger amount of investments than high turnover firms, but their assets are already bigger than high turnover firms. By contrast, the average asset growth rate becomes higher among firms that experience an increase in the average investment induced by a decrease in the labor turnover rate. Intuitively, firms with decreased labor turnover are faced with more investable projects than before and proceed larger amounts of investments than the prior average amount of investments, which leads to high asset growth rates. Consequently, our model based on the multi-period framework shows little relation between labor turnover and asset growth rates but a significant inverse relation between changes in labor turnover and asset growth rates.

In summary, lower turnover firms have larger investments, bigger market value, more physical assets and tangible assets, and higher profitability than higher turnover firms. In addition, when a firm's labor turnover increases, its asset growth rate decreases. We put forth empirically testable hypotheses in Section 4 based on model implications developed in this section and test these predictions using the U.S. and Korean stock market data.

3. The Data

3.1 Data description

For the U.S. data, monthly stock return data are from the Center for Research in Security Prices (CRSP), and accounting data are from the Compustat-CRSP-merged data set. The sample we use is from 2004 to 2020 and includes stocks with common shares (share codes 10 and 11) and firms listed in the New York Stock Exchange (exchange code 1), the American Stock Exchange (exchange code 2), and NASDAQ (exchange code 3). We exclude firms whose primary standard industrial classification is between 4900 and 4999 (regulated firms) or between 6000 and 6999 (financial firms). We also exclude a firm if one of its recent 12-month returns is missing, its stock price is below 1 dollar, its book value is negative, or the number of its employees is less than 20. We correct for the delisting return bias with the approach as suggested by Shumway (1997). To adjust risk on U.S. stock returns, we utilize Fama-French's five factors provided on Kenneth French's website.

For the Korean data, we obtain firm-level stock market and accounting data from FnGuide (Data Guide 5.0) for 2003 to 2019 for all common stocks listed in KOSPI or KOSDAQ. We exclude financial firms whose two-digit KSIC code is between 64 and 66 and exclude observations with missing 12-month returns, negative book value, or the number of employees less than 20. We add a restriction that the price of stocks at the end of each month should be at least 1000 Korean Won, roughly one dollar. We construct the market factor (MKT) by calculating value-weighted excess returns on all firms in our universe and other Fama-French three factors (the size factor [SMB] and value factor [HML]) by the same way as in Fama and French (1993). To construct the profitability factor and investment factor ([RMW] and [CMA]), we use ROE and asset growth rates following Fama and French (2015). The risk-free rate used in this study is CD91 rates from FnGuide.

Throughout this study, we keep track of the following ten firm characteristics: the firm age (AGE); the market value (MV); the ratio of book value to the market value (BM); the asset growth rates (AG); the return on equity (ROE); the operating leverage (OL); the R&D intensity (RDM); the cash holdings (CH); the capital intensity (K/L), and tangibility (TG). All details for the firm characteristics are described in Appendix B.

3.2 A proxy for labor turnover rates

3.2.1 U.S. proxy

We utilize the rate of stock options cancelled, forfeited, or expired to proxy for labor turnover rates in the U.S. data. The cancelled, forfeited, or expired stock options can be a proxy for the labor turnover because these usually occur when employees leave the firm. Several papers, such as Carter and Lynch (2004), Phua et al. (2018), and Rouen (2020), use the option-based measure for a labor turnover proxy. We construct labor turnover (TO) as a ratio of option cancellations (Compustat: optca) to the number of stock options outstanding at the beginning of the year (Compustat: optosby). Both of the information regarding stock options are available from the year 2004 onwards. We control the industry effects in labor turnover by subtracting industry-mean TO from individual firms' TO where industries are identified by Fama and French's 17-industry classification. Industry adjustment prevents latent industry factors that our model does not consider from distorting the empirical turnover-return relation. We use (industry-adjusted) TO as a main variable for the empirical analyses and non-industry-adjusted TO (denoted by TO_NIA) as a robustness check.

Using the option-based labor turnover measure TO for empirical works has a concern that the measure largely captures realized labor turnovers rather than mean turnover rates. Our model establishes a negative link between mean turnover rates and expected stock returns. Although realized turnover rates are closely related to the mean turnover rates, the former might have different implications from the latter on the negative turnover premium. The Korean labor turnover proxy that we introduce in the following section can address this issue regarding the U.S. turnover proxy.

3.2.2 Korean proxy for labor turnover

We construct a proxy for labor turnover rates using the length of service (LS) data from 2003 onwards in the Korean stock market. The length of service is negatively related to turnover rates and is widely used instead of turnover in the management literature.[6] Moreover, the length of service can be a better proxy for this study in the sense that it focuses on mean (or expected) labor turnover because it captures the average of historical realized labor turnover rates, whereas the U.S. turnover proxy primarily reflects one year's realized turnover. Thus, we expect the turnover measure based on LS to show more reliable empirical results for the negative labor turnover premium that our model demonstrates.

The length of service is affected by firm age and hiring workers as well as labor turnover rates due to its calculation mechanism. Each employee's length of service is averaged to calculate the length of service for the firm. Thus, length of service naturally increases as the firm gets older as long as the labor turnover evenly takes place regardless of employees' length of service. In addition, the length of service decreases if the firm hires employees because the length of service for recruits is zero.

We extract the information for turnover rates at a firm level from the length of service by removing the effect of firm age and hiring on the length of service. To do so, we run cross-sectional regressions of the length of service on firm age and firms' positive hiring rates for every year *t*, and use the negative signed residuals, $-\epsilon_{i,t}$, from the cross-sectional regressions as a proxy for the labor turnover rate (TO) of firm *i* at time *t*. The positive hiring rate (PHL) is defined as the larger value between the hiring rate (HL) and zero, i.e., $PHL_{i,t} = max(HL_{i,t}, 0)$. Because past positive hiring affects firms' length of service as well as the current positive hiring, we add one- and two-year lagged positive hiring rates into the cross-sectional regressions as explanatory variables. Finally, we control the industry effects in labor turnover by adding 17 industry dummies in accordance with Fama and French's industry classification.[7] As a result, we run the regression at time *t* with the following form:

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[6] In an unreported table, we find that LS is negatively linked to the realized industry-level turnover rates announced by the Ministry of Employment and Labors.

[7] We exclude in our regressions three industries whose number of firms is less than five.

$$\ln(LS_{i,t}+1) = k_{0,t} + k_{1,t}\ln\left(AGE_{\mathrm{i},t}\right) + k_{2,t}PHL_{\mathrm{i},t} + k_{3,t}PHL_{\mathrm{i},t-1} + k_{4,t}PHL_{\mathrm{i},t-2}$$

$$+Industry\ \ dummies + \epsilon_{i,t}(=-TO_{i,t}), \qquad (15)$$

where $LS_{i,t}$ is the length of service of firm *i* at time *t* and $PHL_{\mathrm{i},t}$ is a positive hiring rate. From the construction, $-\epsilon_{i,t}$ captures an average (or implied) labor turnover rate for firm *i* at time *t*, which is distinct from a realized turnover rate at time *t*. We exclude firms with less than 20 employees and firms under the age of 10 due to the concern of measurement accuracy of the length of service data. Though not reported here, we check the estimation results that firm age is positively related to the length of service, and hiring rates are negatively related to the length of service. The adjusted-R^2 of the regressions is 0.4 on average, indicating that firm age and positive hiring largely affect the length of services besides labor turnover rates.

3.3 Summary statistics

Table 1 shows the summary statistics for main variables based on the U.S. data (panel A) and Korean data (panel B).

<Table 1>

For the U.S. data, the mean of non-industry-adjusted turnover (TO_NIA) is 0.09, which indicates that the average labor turnover rate is 9% per year across U.S. firms. The standard deviations of TO and TO_NIA are 0.14 and 0.13, respectively, showing a larger spread in turnover rates across firms. Surprisingly, the mean and cross-sectional standard deviations of the firm characteristics between the U.S. and Korea are comparable. AG's mean and standard deviation is 0.08 and 0.23 for the U.S. data and 0.08 and 0.22 for the Korean data. Capital intensity (K/L) has a mean and standard deviation of 5.72 and 0.94 for the U.S. data and 6.59 and 1.01 for the Korean data. Both countries' standard deviations of BM are similar as well. Though not reported in the table, the autocorrelations of TO in U.S. and Korean data are 0.31 and 0.83, respectively. The high autocorrelation of Korean TO indicates that the LS-based TO is a good proxy for expected turnover rather than unexpected turnover.

4. Empirical Tests

This section aims to investigate the relation between stock returns and labor turnover rates empirically. We first establish a set of testable empirical predictions following our model implications. Then, we conduct empirical tests for the predictions using the U.S. and Korean stock market data and discuss the results.

4.1 Empirical predictions

The main results of the model described in Section 2 are summarized as follows. First, stock returns are negatively related to labor turnover. Second, this negative relation is stronger among firms with a higher labor turnover cost wedge. Third, firms with low labor turnover are bigger, more profitable, and have a higher share of physical assets (tangibility) than firms with high labor turnovers. Fourth, a decrease in labor turnover accompanies a higher investment rate. From these, we put forth the following empirical predictions.

Prediction 1*: Firms with a low turnover measure (TO) have higher future stock returns than those with a high turnover measure.*

Prediction 2*: The negative relation between stock returns and labor turnover is more pronounced among firms with a higher turnover cost wedge.*

We measure the turnover cost wedge using a sum of two years' ROE (2YROE) and capital intensity (K/L).[8] The high capital-intensity firms have a high capital-labor ratio. If a firm is more capital-intensive, then workers in the firm produce more per capital and play more important roles in production, implying that the firm's turnover cost will be higher. Arai (2003) also suggests the possibility that high capital intensity is related to high labor turnover costs as a driving force for the positive relationship between wages and capital-labor ratio. Thus, we expect the turnover cost wedge to increase when the firm has a higher capital intensity.

2YROE is the sum of the recent two years' ROE. Firms that have experienced a negative profitability shock may have fewer resource to retain or recruit employees. Ghaly et al. (2017)

[8] Someone may wonder that a labor skill level employed by firms is another candidate for a proxy of the turnover cost wedge. However, as Hancock et al. (2013) document, a certain amount of turnover on skilled workers (rather than unskilled workers) may improve innovation by reducing stagnation or the development of employee homogeneity. Moreover, Almeida and Kogut (1999) show the positive effect of labor turnover on innovations. Thus, the effect of labor skill levels on turnover costs can be positive, negative, or insignificant.

point out that firms with a higher share of skilled workers and thus less flexibility to adjust to labor demand shocks have a stronger incentive to hold precautionary cash. It may imply that a firm's available cash can play a vital role in minimizing the loss of production caused by labor turnover. Eriksen (2012) also finds that firms absorb productivity losses due to labor turnovers by retaining more slack resources such as cash. In this context, we expect the labor turnover cost wedge to be high among firms with low 2YROE.[9]

In addition to 2YROE and K/L, we construct a proxy for the turnover cost wedge by using a worker-shortage rate only available in Korea (not in the U.S.). The worker-shortage rate in year *t* is defined as the number of shortage workers scaled by the total employees in the same year. The worker-shortage rates are at an industry level identified by two digits of the 9th KSIC. With a higher worker-shortage rate, firms will have more difficulty replacing employees who have voluntarily left, making the loss in productions due to the turnover larger.

The first two predictions are about the relation between labor turnover and stock returns. The following two predictions are about the relation between labor turnover and firm characteristics, which are shown in the model provided in the previous section.

Prediction 3*: The firms with lower turnover have larger market value, higher ROE, and higher tangibility.*

Prediction 4*: A decrease in labor turnover is positively correlated with high asset growth rates.*

4.2 Empirical results for the predictions

4.2.1 Relation between turnover and returns

We utilize a portfolio-based approach to examine our empirical predictions for the relation between labor turnover rates and stock returns. Specifically for the U.S. data, at the end of June of each year t, we divide firms into decile groups sorted on TO calculated at the end of the calendar year t-1. We keep track of each decile portfolio's equal- and value-weighted monthly returns until the end of June of year t+1. By repeating this process, we obtain monthly returns of the decile TO portfolios from July 2005 to June 2020. For the Korean data, we construct

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9 We do not use cash holdings because a firm's manager endogenously chooses it.

quintile TO portfolios instead of decile portfolios due to the small number of firms compared to the U.S. case.

We first report the mean and risk-adjusted returns of the TO decile portfolios for the U.S. case in Table 2. We find that the lowest TO portfolio comprising firms with low labor turnover rates generate a higher average return than the highest TO portfolio comprising firms with high labor turnover rates, consistent with Prediction 1. The average monthly return of the lowest-minus-highest (L-H) TO portfolio is 0.34% (t=1.38) and 0.52% (t=2.00) for the equal- and value-weighted cases, respectively. The positive mean return of the equal-weighted L-H TO portfolio is not statistically significant, mainly due to the short sample period including large market crashes. When excluding the last three months (April 2020 to June 2020) on the sample period, for which the unemployment level was soaring with COVID-19, we find that the equal-weighted L-H TO portfolio's mean return becomes statistically significant.[10] Those results confirm the negative labor turnover premium in the U.S. stock market.

We also note that the highest TO portfolio's mean return is much lower than the other decile portfolios' mean returns. This non-linearity that the average return of the decile TO portfolios decreases concavely in TO may result from the non-linear effect of labor turnover on firms' production, as Glebbeek and Bax (2004) document.[11]

We conduct an asset pricing test for the L-H TO portfolio with the CAPM. The estimated CAPM alpha of the portfolio is 0.49% for the equal-weighted case and 0.70% for the value-weighted case, and both values are statistically significant at a 5% level. The CAPM beta of the L-H TO portfolio is statistically significantly negative, which means that the CAPM reinforces the negative turnover premium. The bottom side of Table 2 shows that the Fama-French five factors cannot account for the negative turnover premium. The alpha from the FF5 model for the L-H TO portfolios is statistically significantly positive for the equal- and value-weighted cases.

These results with the TO decile portfolios empirically confirm the model implication for the negative labor turnover premium in the U.S. stock market. As a robustness check, we form

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[10] The average L-H TO portfolio return for these three months is -8% per month. It is consistent with our model that the TO premium weakens when the unemployment level is high, as discussed in Section 4.3.2.

[11] Several papers document the non-linear turnover effect: a relation between turnover and firms' performance is flat or weakly positive up to some low level of turnover and becomes significantly negative beyond the turnover level.

decile portfolios sorted by TO_NIA and conduct the same analyses with the decile TO portfolios. We present the results with TO_NIA decile portfolios in the right panel of Table 2. We find that the overall results are the same: the L-H TO_NIA portfolio earns a significantly positive CAPM or FF5 alpha. It means that industry effects are less likely to affect the negative labor turnover premium.

We then investigate the role of labor turnover on the stock returns in the Korean stock market. We report the mean and risk-adjusted returns of the quintile TO portfolios based on the Korean stock market data. For the equal-weighted case (panel A), we observe a significant negative link between TO and stock returns. The mean return of the L-H TO quintile portfolio is 0.51%, with a t-value of 2.67. However, we find weak evidence for the value-weighted case (panel B). The mean return of the low minus high (L-H) TO portfolio is 0.25%, which is positive but statistically insignificant. It may arise from the fact that firm size is negatively correlated with turnover, which implies that firms with low turnover rates are more likely to have low stock returns due to the size effect. Because large firms' returns mostly govern value-weighted returns, the size effect can distort the relation between turnover and value-weighted returns. In this respect, we consider the alternative TO-quintile portfolios constructed based on all firms excluding the largest 10 firms.[12] Panel C of Table 3 confirms the substantial influence of large firms (by the size effect) on the turnover-return relation. When we form the value-weighted quintile TO portfolios by only excluding the largest 10 firms, the L-H TO portfolios earn significantly positive mean returns of 0.51% (t=2.12). These outcomes imply that the negative relation between labor turnover and stock returns generally holds for all firms in the Korean stock market when controlling firm size (especially for very large firms).

<Table 3>

We examine whether the prevalent risk factors can explain the negative turnover premium in the Korean stock market using the CAPM and FF5. Kang et al. (2019) document that FF5 reasonably explains stock returns in the Korean stock market. Table 3 shows that the well-known factor models cannot account for the negative turnover premium. Regardless of the asset pricing models considered, alphas from the CAPM and FF5 models for the L-H TO portfolios

[12] The market value of the largest 10 firms is approximately 40% of the total market value in the Korean stock market.

are statistically significantly positive in general for all the portfolio cases (EW, VW, and VW excluding the largest 10 firms).

In sum, we confirm the negative labor turnover premium in both the U.S. and Korean stock markets based on a portfolio approach. Furthermore, the existing asset pricing models such as the CAPM and FF5 models cannot explain the turnover premium. This result implies that labor turnover seems to have additional information on firms' systematic risk that the prevalent asset pricing factors cannot capture.

<Table 4>

To check whether the negative relation between turnover and stock returns is due to firm characteristics that are known to affect stock returns in the literature, we conduct Fama-MacBeth (1973) regressions. We provide the regression results for the U.S. and Korean data in panels A and B of Table 4, respectively. When controlling the reversal and momentum effects, the effect of TO on stock returns is statistically significant with the estimated coefficient by -1.40 (t=-3.04) and -0.45 (t=-2.15) for the U.S. and Korean cases, respectively. Furthermore, when controlling other firm characteristics, the estimated coefficient of TO is -0.88 and -0.59 for the U.S. and Korean cases, and both values are statistically significant at a 1% level. These coefficients indicate that an increase in labor turnover by its one-standard deviation (0.14 for the U.S. and 0.34 for Korea, reported in Table 1) lowers mean returns by 1.5% and 2.4% per year for the U.S. and Korean stock market, respectively. As a robustness check, we substitute TO with TO_NIA in the Fama-MacBeth regressions, and the regression results are shown in the third raw in each panel of Table 4. We find that TO_NIA, the turnover measure that is not industry-adjusted, also has negative return predictability in both the U.S. and Korean stock markets, consistent with our model's implication. The overall results show a substantial negative turnover premium even after controlling for the characteristics known to affect stock returns in the literature.

The turnover measure TO obtained from stock options or LS reflects the time-varying mean turnover that is of our interest, but is also closely related to realized turnover that contains the unexpected part of turnover. In this respect, the negative relation between TO and stock returns documented thus far may result from the unexpected turnover rather than the expected turnover. To address this concern, we utilize one-year lagged TO in the Fama-MacBeth regression in place of the latest TO and report the regression results in the last raw in each panel of Table 4.

If realized turnover is not the main driving force of the negative relation between TO and stock returns, then past TO that is not affected by the unexpected turnover should be negatively related to future stock returns. The estimated coefficient of the one-year lagged TO is -0.55 and -0.37 for the U.S. and Korean cases, and both coefficients are statistically significant. It confirms that the main driver of the negative turnover premium is the expected turnover. Moreover, this long-term return predictability of TO makes the negative labor turnover premium hard to reconcile with Agrawal et al. (2020)'s argument that investors underestimate the bad signals on high labor turnover rates, which leads to a lower stock return in the following month.

4.2.2. Turnover cost wedge and labor turnover premium

We examine Prediction 2 that the relation between TO and stock returns is more prominent when a labor turnover cost wedge (δ) is larger. In Table 5, we compare the two mean returns of the L-H TO portfolios between firms with high and low turnover cost wedges. Measures for the labor turnover cost wedge are constructed from recent two years' ROE (2YROE), capital intensity (K/L), and the worker-shortage rates at an industry level (WS). The low 2YROE and high K/L and WS capture a high labor turnover cost wedge. At the end of June every year, we first divide firms into two groups by each turnover cost wedge measure with its median breakpoint. We then subdivide firms for each δ group into decile (U.S.) or quintile (Korea) groups sorted on TO. As a result, the L-H TO portfolio is constructed for each turnover cost wedge measure. Table 5 shows the equal- and value-weighted returns of the L-H TO portfolio for each measure and their differences between the low and high turnover cost wedge groups.

#<Table 5>

We first note that the mean returns of the L-H TO portfolios are positively significant in general for the high δ group, whereas those are not statistically significant for the low δ group. Furthermore, their differences in the L-H TO portfolio's return are significant. When we use 2YROE, the difference in the L-H TO portfolio's return between the high and low δ groups is 0.67 (t=2.23) and 0.75 (t=1.68) for the EW and VW cases in the U.S. stock market, and 0.47 (t=1.70) and 0.93 (t=2.10) for the EW and VW cases in the Korean stock market. The case of using K/L as a turnover cost wedge measure provides weak but similar results with the case of 2YROE. We find that WS generates a large spread in the L-H TO portfolio's mean returns between the high and low δ firms in the Korean stock market. The L-H portfolio's mean return is 0.64% for firms with high δ and 0.13% for firms with low δ in the equal-weighted case. The difference between the two returns is 0.51% and statistically significant.

In sum, our empirical evidence supports Predictions 1 and 2; there is a negative turnover premium in the stock market, and the turnover premium for high turnover wedge firms is larger than the one for low turnover wedge firms.

4.2.3 Firm characteristics and turnover

We examine firm characteristics of low and high turnover firms at a portfolio level and report the results in Table 6.

<Table 6>

Our model shows that low turnover firms are more productive and generate larger cash flows than high turnover firms, which leads to Prediction 3 that low turnover firms have a higher market value, profitability, and tangibility due to larger investments. We confirm this prediction empirically by examining firm characteristics of low and high turnover firms at a portfolio level. Table 6 presents the averages of time-series median firm characteristics of the TO decile portfolios (the U.S, in panel A) or quintile portfolios (Korea, in panel B). For both countries, firms with low TO have a larger market value, higher profitability, and tangibility than high TO firms. These differences in characteristics are statistically significant, which is direct evidence for Prediction 3.

There are also substantial differences in other characteristics between low and high TO firms. In the Korean stock market, low TO firms have higher K/L than high TO firms, implying that low TO firms are inclined to be higher capital intensity firms whose marginal capital value is more affected by labor turnover. However, we do not observe the relation in the U.S. stock market. We find that R&D intensity is positively associated with labor turnover in the U.S. stock market, which is consistent with the arguments that labor mobility is an important source of R&D activities (Almeida and Kogut, 1999; Balsvik, 2011), but we do not find the positive R&D-TO link in the Korean stock market. While our model does not predict anything about book-to-market values, our data show that TO and BM are positively associated in the U.S. stock market and negatively associated in the Korean stock market.

Our model predicts that the asset growth rates are similar between the low and high TO firms. We find consistent evidence that the difference in AGs between the low and high TO firms is statistically negligible for the Korean case. However, we observe that TO is negatively related to AG in the U.S. case. This discrepancy probably arises from the fact that the option-based U.S. measure for turnover is largely affected by realized turnover rates changing year by year, whereas the LS-based Korean measure for turnover is slowly adjusted over several years.

Firms with high operating leverage are riskier than those with low operating leverage. Thus, if firms with low turnover tend to have higher operating leverage, we may observe the negative turnover premium due to the difference in operating leverages. However, both panels of Table 6 show no significantly negative relation between turnover and operating leverage, which refutes the possibility that operating leverage explains the negative labor turnover premium.

Finally, we test Prediction 4 that a decrease in turnover is positively correlated to high investment rates. We measure firms' investment rates by asset growth rates (AG) or capital investment rates (IK). IK is defined as the capital expenditures (CAPX) minus sale of property, plant, and equipment (SPPE) scaled by the average of recent two years' net property, plant, equipment (PPENT). We run firm-level pooled-regressions of AG or IK on changes in TO, BM, OL, ROE, and CH where all the independent variables are winsorized at a 1% level. We also run the same regressions based on the sample excluding microcaps to address the potential concern that investment rates of microcaps tend to be highly volatile. Microcaps are defined as firms with a market value below the NYSE- or KOSPI-size 20% breakpoints. The regression results are shown in Table 7.

#<Table 7>

Table 7 provides evidence supporting Prediction 4. Whether we exclude microcaps or not, the coefficients of TO change are significantly negative for all the AG and IK regressions for both countries. Those estimation results indicate that lower labor turnover raises investment rates, consistent with our model implication.

4.3 Inspecting the model mechanism.

4.3.1 Aggregate risk and the negative labor turnover premium

Our model predicts that the cash flow of a low turnover firm is more co-varying with aggregate productivity, which leads to a higher exposure of the firm's stock return to the aggregate risk. This subsection empirically examines whether stock returns of low turnover firms are more exposed to the aggregate productivity shocks than firms with high turnover.

We measure aggregate productivity as the aggregate consumption per capita, the total GDP, and labor share (labor income per consumption). Donangelo et al. (2018) show the countercyclicality of labor share due to stickiness of wages. We use seasonally-adjusted real consumption, GDP, and labor income data at a quarterly frequency, obtained from the Bureau of Economic Analysis (BEA) and the Bank of Korea. Unfortunately, labor income data are not available at a quarterly frequency in Korea: we only report the U.S. analysis results for labor share. The consumption (GDP, labor share) growth rate at quarter t is defined by the logarithm of consumption per capita (GDP, labor share) at quarter t minus logarithm of consumption per capita (GDP, labor share) at quarter t-1. To investigate the difference in risk exposures to aggregate productivity between high and low labor turnover, we focus on the exposure of the quarterly L-H TO portfolio return. If the L-H TO portfolio return turns out to have a positive loading to the consumption and GPD growths and a negative loading to labor share growths, then it is consistent with our model's mechanism. To examine it, we run time-series regressions of the L-H turnover portfolio returns on consumption, GDP, or labor share growth rates in the following form,

$$r_t^L - r_t^H = a + bX_{t-K} + \epsilon_t, \text{ where K= 0, 1.} \qquad (18)$$

r_t^L and r_t^H are the quarterly returns of the lowest and the highest decile (quintile) TO portfolios, respectively, X_t is the quarterly consumption, GDP, or labor share growth, and K is the number of the time lag. Portfolio returns are equal- or value-weighted. The K=0 case reveals the contemporary co-movement of portfolio returns and the aggregate shocks. The K=1 case captures the co-movement of returns and the one-quarter lagged aggregate shocks, which consider that consumption and GDP data become publicly available roughly after one quarter. As a robustness check, we run the same regression in (18) using the L-H TO_NIA portfolio instead of the L-H TO portfolio for the U.S. case.

Table 8 reports the regression results of using L-H TO portfolio returns for the U.S. case (panel A), L-H TO_NIA portfolio returns for the U.S. case (panel B), and L-H TO portfolio returns for the Korean case (panel C).

#<Table 8>

The regression results are generally consistent with our argument. For the U.S. results, the loadings of the equal-weighted L-H TO portfolio on the contemporary consumption or GDP growths (*b* in the above regression) are 1.29 and 1.65, respectively, and both values are significant. The coefficient of 1.29 for the consumption growth means that the low turnover firms earn higher stock returns by 1.29% per quarter on average than the high turnover firms for a 1% increase in consumption. Furthermore, the loading of the equal-weighted L-H TO portfolio on the contemporary labor share growth is estimated at -1.09 (t=-12.80), which is in line with the fact that the stock returns of low turnover firms are higher when the aggregate productivity raises. When using the L-H TO_NIA portfolio, we observe similar patterns with the results of using TO. The L-H TO_NIA portfolio returns are positively exposed to the consumption and GDP growths and negatively exposed to the labor share growths. However, we do not find supportive evidence for our argument in the value-weighted case.

For the Korean results, the estimated loadings of the L-H TO portfolio on the contemporary consumption growth are positive but statistically insignificant for both the equal- and value-weighted cases. By contrast, the loadings of the L-H TO portfolio on the one-quarter lagged consumption growth are 1.83 and 3.75 for the equal- and value-weighted cases, respectively, and both values are statistically significant. The coefficient of 1.83 for the equal-weighted case means that the low turnover firms earn higher stock returns by 1.83% per quarter than the high turnover firms when there is a 1% increase in consumption. The loadings on the lagged GDP growth are 1.47 and 2.19 for the equal- and value-weighted cases, respectively, and they are statistically significant at a 5% level.

The empirical result shown in Table 8 supports our model's mechanism. Low turnover firms have higher (lower) returns than high turnover firms when there is a positive (negative) aggregate shock, which requires the negative turnover premium as compensation for the systematic risk from the exposure of the aggregate shock.

4.3.2 The labor market tightness and the negative labor turnover premium

The labor market tightness, defined as the ratio of job vacancies to unemployed labor forces, is one of the important indexes showing the labor market condition (Kuehn et al., 2017). The labor market tightness indicates the degree of difficulty in firms' hiring employees. A high (low) value of market tightness implies that workers are relatively easy (hard) to find jobs, which may result in high (low) labor turnover. Thus, the labor market tightness affects the overall level of labor turnover rates, and an increase in the labor market tightness is likely to broaden the spread in cross-sectional labor turnover. That is, high turnover firms with bad job characteristics suffer a relatively harder time keeping their employees when the labor market tightness is high. Considering that an expected stock return is a monotonic decreasing function of labor turnover rates, the higher labor market tightness will also broaden the spread in mean returns between low and high turnover firms.[13] To empirically test this relation between labor market tightness and labor turnover premium, we measure the labor market tightness by the log of the ratio of job vacancies to the unemployment level from June 2005 to June 2020 using the monthly data obtained from FRED.

<Figure 2>

We examine the effect of the labor market tightness on the negative turnover premium by running the following regression,

$$\sum_{j=0}^{2}\left[r_{t-j}^{L} - r_{t-j}^{H}\right] = a + b\sum_{j=0}^{2}\theta_{t-j} + \epsilon_t. \qquad (19)$$

r_t^L and r_t^H are the returns of the lowest and highest decile TO portfolios, respectively, and θ_t is the labor market tightness in month *t*. We use the sum of the recent three months' returns and labor market tightness in the regressions to consider delayed information issues or measurement errors in macro variables.

In an unreported table, we find that the coefficient b in equation (19) is positively estimated for the equal- and value-weighted cases, and the former is statistically significant. Figure 2 also shows the positive relation between the negative labor turnover premium (the dependent variable in the regressions) and the labor market tightness (the independent variable in the regressions). These results reveal that the higher labor market tightness leads to the larger negative labor turnover premium, that is, the larger spread of expected returns between low and high turnover firms.

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[13] From the viewpoint of our model, δ in equation (3) can play a role in the labor market tightness. In a high (low) labor market tightness state where δ is high (low), employees' turnover has a larger (smaller) negative impact on a firm's production because firms are harder (easier) to hire employees to make up for the turnover. In this case, Property 4 in Section 2 can be applied to explain the relation between the labor market tightness and the negative labor turnover premium.

4.4 Effects of p_o and λ on labor turnover.

As defined in Section 2, the turnover rate is a function of two exogenous variables, the firm-specific turnover rate (p_o) and the wage efficiency (λ), and one endogenous variable, wage. Because the optimal wage is a function of the two exogenous variables in the equilibrium, turnover rates observed in data can be represented as a function of unobservable p_o and λ. We decompose the labor turnover rate into two parts capturing p_o and λ, respectively, and examine the effects of each part on stock returns.

To decompose labor turnover rates into the two parts attributed to p_o and λ, we run a cross-sectional regression of TO on log wages. Considering the fact that firms with high p_o set a higher wage but still have a high turnover rate p^* than firms with low p_o, those firms would have relatively high observed turnover rates TO compared to their wage level. Thus, the residual from the cross-sectional regression of TO on log wages can capture firm-specific turnover rates p_o. We use the remaining part in the regressions, the explained labor turnover (by wage), as a proxy of λ. Because the firm-level wage data are only available for Korea, the empirical tests on this subsection are based on the Korean stock market.

In panel A of Table 9, we report the results of cross-sectional regressions of TO on log wage. The panel shows that wage is negatively related to labor turnover, which means that firms paying high wages have low labor turnover rates. This negative estimated slope of TO has an important implication for wage efficiency λ. If λ is a redundant variable, we should observe a positive link between TO and wage in the data because firms with high p_o have high turnover rates and wages. Consequently, the empirical result implies that wage efficiency λ certainly affects employees' turnover, and firms with high λ pay a high wage as more effective tools to lower turnover.

From the cross-sectional regressions of TO on log wages for every year, we obtain the two decomposed parts of TO. One is the regression residuals as labor turnover due to $\mathrm{p_o}$ (TO_{p_o}), and the other is the explained part in the regressions, which is regarded as labor turnover due to wage efficiency λ (TO_{λ}). Panel B of Table 9 examines how the two components of TO affect stock returns by forming quintile portfolios sorted on TO_{p_o} and TO_{λ}, respectively. Because firm size is one of the most important variables affecting p_o and λ, we control the firm size by 5×5 size-TO dependent double sorting. We first divide all firms into five groups using the market value KOSPI breakpoints and then sub-divide each group into quintile portfolios sorted on TO_{p_o} or TO_{λ}, respectively. The portfolio return of each of the 25 portfolios is calculated using the equal-weighted average of its constituents.

#<Table 9>

The results show that the negative relation between turnover and stock returns holds in general even when we use TO_{p_o} or TO_{λ} as the turnover measure: All of the L-H TO_{p_o} or TO_{λ} portfolios are positive and statistically significant in general. However, the average return of the L-H TO_{p_o} is not significant for the biggest size quintile portfolio, while that of the L-H TO_{λ} is not significant for the smallest size quintile portfolio. These results demonstrate that both of the two sources generating cross-sectional variations in labor turnover rates, p_o and λ, are essential determinates of the expected stock returns. However, they may affect firms in a different manner. Wage becomes a more critical determinant in labor turnover for large firms because they may provide a relatively comfortable working environment to their employees so that non-pecuniary benefits become less distinguishing. On the other hand, non-pecuniary benefits are a more important determinant for small firms that are likely to be constrained by their reliability for wage scheming, as documented by Barth and Dale-Olsen (1999).

6. Conclusion

This study investigates the effect of labor turnover on firms' investment decisions and stock returns. We first set up a model based on three facts: i) high labor turnover deteriorates a firm's productivity, ii) firms have different job characteristics, and iii) labor turnover is procyclical. Our model shows that firms with lower labor turnover are more exposed to aggregate productivity, which leads to higher expected returns of those firms. We also find that this negative relation between labor turnover and stock returns, which we refer to as a negative labor turnover premium, is stronger for firms exposed to higher labor turnover costs. The model reveals several relations of labor turnover to firm characteristics: low turnover firms have a higher market value, tangibility, and profitability. Finally, our model implies that an increase in labor turnover negatively links to investment rates.

We empirically test the model-based implications on the relations among labor turnover, stock returns, and firm characteristics. We utilize the number of cancelled stock options and a length of service orthogonalized to firm age and the past three years' positive hiring rates to proxy labor turnover rates. Our empirical analyses using the U.S. and Korean stock market data reveal results consistent with the model-based implications, especially confirming the negative labor turnover premium.

Effects of labor on firms have not been actively studied in the finance area, whereas numerous research has focused on the effects of capital, CEO, and shareholders. Our study contributes to the literature in finance by documenting that labor turnover largely affects firms. On the one hand, it is meaningful to show how employees, representative stakeholders, can influence firms' investment decisions with labor turnover. On the other hand, our study sheds light on the relation between labor turnover and stock returns with risk-based explanations, which may help to understand the existing empirical relations between employee welfare and stock returns and to justify the Social Responsibility Investment that considers employees' satisfaction. Consequently, the evident effect of labor turnover on firms, as an outcome of firms' rational decisions, shows the necessity of more follow-up research on labor-related factors in the finance area.

Appendix A.

-Property 1

To examine the effects of the two job characteristics (wage efficiency λ and firm-specific turnover p_o) on the optimal labor turnover, we analyze a partial derivative of the optimal production efficiency S^* with respect to the two job characteristics.

Recalling that $S^* = 1 - \delta p^* = \delta\left[(J\lambda^{-\rho})^{1/(1-\rho)} - J\right]$, then

$$\frac{\partial S^*}{\partial \lambda} = \delta\left[\frac{-\rho}{1-\rho} J^{\frac{1}{1-\rho}} \lambda^{\frac{-\rho}{1-\rho}-1}\right] = \frac{-\delta\rho}{1-\rho}\left(\frac{J}{\lambda}\right)^{\frac{1}{1-\rho}} > 0. \qquad \text{(A1)}$$

$$\frac{\partial S^*}{\partial p_o} = \delta\left[\frac{1}{1-\rho} J^{\frac{1}{1-\rho}-1} \lambda^{\frac{-\rho}{1-\rho}} - 1\right]\frac{\partial J}{\partial p_o} = \delta\left[\frac{1}{1-\rho}\left(\frac{\lambda}{J}\right)^{\frac{-\rho}{1-\rho}} - 1\right]. \qquad \text{(A2)}$$

Equation (A1) indicates that the wage efficiency raises S^*, and thus, it lowers the optimal labor turnover p^*.

From the condition for the labor turnover function that $wp_{ww} + p_w > 0$, we obtain the following inequality: $wp_{ww} + p_w = -w^{\rho-1}(w^\rho + \lambda^\rho)^{1/\rho-2}(w^\rho + \rho\lambda^\rho) > 0$,

which implies $w^{*\rho} < -\rho\lambda^\rho$. This inequality along with the optimal wage formula (10) eventually implies that

$$w^{*\rho} = (J\lambda^{-\rho})^{\frac{\rho}{1-\rho}} - \lambda^\rho < -\rho\lambda^\rho \;\Leftrightarrow J^{\frac{\rho}{1-\rho}} < (1-\rho)\lambda^{\frac{\rho}{1-\rho}} \;\Leftrightarrow \left(\frac{\lambda}{J}\right)^{\frac{-\rho}{1-\rho}} < (1-\rho). \qquad \text{(A3)}$$

Thus, $\partial S^*/\partial p_o < 0$ as equation (A2) and it indicates that p_o raises p^*.

To show that the optimal wage decreases in p_o, we calculate a partial derivative of w^* with respect to p_o, (recalling that $w^* = \left[(J\lambda^{-\rho})^{\rho/(1-\rho)} - \lambda^\rho\right]^{1/\rho}$)

$$\frac{\partial w^*}{\partial p_o} = \frac{1}{\rho}\frac{\rho}{1-\rho} J^{\frac{\rho}{1-\rho}-1} \lambda^{-\frac{\rho^2}{1-\rho}} \left[(J\lambda^{-\rho})^{\frac{\rho}{1-\rho}} - \lambda^\rho\right]^{\frac{1}{\rho}-1} \frac{\partial J}{\partial p_o} > 0. \qquad \text{(A4)}$$

-Property 2

Using the fact that $w^{*}S_{w}^{*} = S^{*}$, S_{w}^{*} can be expressed by

$$S_{w}^{*} = \frac{\delta[(J\lambda^{-\rho})^{1/(1-\rho)} - J]}{[(J\lambda^{-\rho})^{\rho/(1-\rho)} - \lambda^{\rho}]^{1/\rho}} = \delta\frac{J}{\lambda}\left[\left(\frac{J}{\lambda}\right)^{\rho/(1-\rho)} - 1\right]^{1-\frac{1}{\rho}}. \qquad \text{(A5)}$$

A partial derivative of $ln(S_{w}^{*})$ with respect to the two job characteristics is as follows:

$$\frac{\partial \ln(S_{w}^{*})}{\partial\lambda} = -\frac{1}{\lambda} - \left(1 - \frac{1}{\rho}\right)\frac{\rho}{(1-\rho)}\left(\left(\frac{J}{\lambda}\right)^{\frac{\rho}{1-\rho}} - 1\right)^{-1}\lambda^{-\frac{\rho}{1-\rho}-1}J^{\frac{\rho}{1-\rho}}$$

$$= -\frac{1}{\lambda} + \frac{1}{\lambda}\left(\frac{J}{\lambda}\right)^{\frac{\rho}{1-\rho}}\left(\left(\frac{J}{\lambda}\right)^{\frac{\rho}{1-\rho}} - 1\right)^{-1} = \frac{1}{\lambda}\left(\left(\frac{J}{\lambda}\right)^{\frac{\rho}{1-\rho}} - 1\right)^{-1} = \frac{\delta J}{\lambda S^{*}}. \qquad \text{(A6)}$$

$$\frac{\partial \ln(S_{w}^{*})}{\partial p_{0}} = \frac{1}{J} + \left(1 - \frac{1}{\rho}\right)\frac{\rho}{(1-\rho)}\left(\left(\frac{J}{\lambda}\right)^{\frac{\rho}{1-\rho}} - 1\right)^{-1}\lambda^{-\frac{\rho}{1-\rho}}J^{\frac{\rho}{1-\rho}-1}$$

$$= \frac{1}{J} - \frac{1}{J}\left(\frac{J}{\lambda}\right)^{\frac{\rho}{1-\rho}}\left(\left(\frac{J}{\lambda}\right)^{\frac{\rho}{1-\rho}} - 1\right)^{-1} = -\frac{1}{J}\left(\left(\frac{J}{\lambda}\right)^{\frac{\rho}{1-\rho}} - 1\right)^{-1} = -\frac{\delta}{S^{*}}. \qquad \text{(A7)}$$

At the end of the above two equations, we exploit the fact that $S^{*} = \delta\left[(J\lambda^{-\rho})^{1/(1-\rho)} - J\right] = \delta J\left((J/\lambda)^{\rho/(1-\rho)} - 1\right)$. With $\lambda > J$, it is derived that $\ln(S_{w}^{*})/\partial\lambda > 0$ and $\ln(S_{w}^{*})/\partial p_{0} < 0$, which implies that S_{w}^{*} is positively related with λ and negatively related with p_{0}.

-Property 4

The statement that the negative link between θ and p^{*} is stronger for firms with high δ is equivalent to $\frac{\partial}{\partial\delta}\left(\frac{\partial\theta}{\partial p^{*}}\right) < 0$. Considering that p^{*} is a function of λ and p_{0} along with *property 1*, we only need to show that $\frac{\partial}{\partial\delta}\left(\frac{\partial\theta}{\partial\lambda}\right) > 0$, and $\frac{\partial}{\partial\delta}\left(\frac{\partial\theta}{\partial p_{0}}\right) < 0$ to prove *property 4*.

We first calculate $\partial\theta/\partial\delta$ as followings:

$$\frac{\partial\theta}{\partial\delta} = \frac{\partial}{\partial\delta}\left(\frac{1}{1-\alpha}\left(1 - \frac{\alpha\delta h}{S^{*}}\right)\right) = -\frac{\alpha h}{1-\alpha}\left(\frac{S^{*} - \delta\frac{\partial S^{*}}{\partial\delta}}{{S^{*}}^{2}}\right). \qquad \text{(A8)}$$

Using that $\frac{\partial S^{*}}{\partial\delta} = \left(J^{\frac{1}{1-\rho}}\lambda^{\frac{-\rho}{1-\rho}} - J\right) + \delta\left(\frac{1}{1-\rho}J^{\frac{\rho}{1-\rho}}\lambda^{\frac{-\rho}{1-\rho}} - 1\right) = \frac{S^{*}}{\delta} + \delta\left(\frac{1}{1-\rho}J^{\frac{\rho}{1-\rho}}\lambda^{\frac{-\rho}{1-\rho}} - 1\right)$, then

$$\frac{\partial\theta}{\partial\delta} = -\frac{\alpha C_1 h}{1-\alpha}\left(\frac{S^* - \delta\frac{\partial S^*}{\partial\delta}}{S^{*2}}\right) = \frac{\alpha C_1 h}{1-\alpha}\frac{\delta^2\left(\frac{1}{1-\rho}J^{\frac{\rho}{1-\rho}}\lambda^{\frac{-\rho}{1-\rho}}-1\right)}{S^{*2}} := v\frac{\left(\frac{1}{1-\rho}J^{\frac{\rho}{1-\rho}}\lambda^{\frac{-\rho}{1-\rho}}-1\right)}{S^{*2}}, \qquad \text{(A9)}$$

where $v = \alpha h\delta^2/(1-\alpha) > 0$.

Then, we can calculate $\frac{\partial}{\partial\delta}\left(\frac{\partial\theta}{\partial p_0}\right)$ and $\frac{\partial}{\partial\delta}\left(\frac{\partial\theta}{\partial\lambda}\right)$ as follows.

$$\frac{\partial}{\partial\delta}\left(\frac{\partial\theta}{\partial p_0}\right) = \frac{\partial}{\partial p_0}\left(\frac{\partial\theta}{\partial\delta}\right) = \frac{v}{\mathrm{S}^{*3}}\left[\frac{\rho}{(1-\rho)^2}J^{\frac{\rho}{1-\rho}-1}\lambda^{\frac{-\rho}{1-\rho}}S^* - 2\delta\left(\frac{1}{1-\rho}J^{\frac{\rho}{1-\rho}}\lambda^{\frac{-\rho}{1-\rho}} - 1\right)\left(\frac{1}{1-\rho}J^{\frac{\rho}{1-\rho}}\lambda^{\frac{-\rho}{1-\rho}} - 1\right)\right]$$

$$= \frac{v}{\mathrm{S}^{*3}}\left[\frac{\rho}{(1-\rho)^2}J^{\frac{\rho}{1-\rho}-1}\lambda^{\frac{-\rho}{1-\rho}}\left(J^{\frac{\rho}{1-\rho}}\lambda^{\frac{-\rho}{1-\rho}} - 1\right)\delta J - 2\delta\left(\frac{1}{1-\rho}J^{\frac{\rho}{1-\rho}}\lambda^{\frac{-\rho}{1-\rho}} - 1\right)\left(\frac{1}{1-\rho}J^{\frac{\rho}{1-\rho}}\lambda^{\frac{-\rho}{1-\rho}} - 1\right)\right]$$

$$= \frac{v}{\mathrm{S}^{*3}}\frac{\delta}{(1-\rho)^2}\left[\rho\left(\frac{J}{\lambda}\right)^{\frac{\rho}{1-\rho}}\left(\left(\frac{J}{\lambda}\right)^{\frac{\rho}{1-\rho}} - 1\right) - 2\left(\left(\frac{J}{\lambda}\right)^{\frac{\rho}{1-\rho}} - 1 + \rho\right)^2\right]. \qquad \text{(A10)}$$

$$\frac{\partial}{\partial\delta}\left(\frac{\partial\theta}{\partial\lambda}\right) = \frac{\partial}{\partial\lambda}\left(\frac{\partial\theta}{\partial\delta}\right) = \frac{v}{\mathrm{S}^{*3}}\left[\frac{-\rho}{(1-\rho)^2}J^{\frac{\rho}{1-\rho}}\lambda^{\frac{-1}{1-\rho}}S^* + 2\delta\frac{\rho}{1-\rho}J^{\frac{1}{1-\rho}}\lambda^{\frac{-1}{1-\rho}}\left(\frac{1}{1-\rho}J^{\frac{\rho}{1-\rho}}\lambda^{\frac{-\rho}{1-\rho}} - 1\right)\right]$$

$$= \frac{v}{\mathrm{S}^{*3}}\left[\frac{-\rho\delta}{(1-\rho)^2}J^{\frac{1}{1-\rho}}\lambda^{\frac{-1}{1-\rho}}\left(J^{\frac{\rho}{1-\rho}}\lambda^{\frac{-\rho}{1-\rho}} - 1\right) + 2\frac{\rho\delta}{(1-\rho)^2}J^{\frac{1}{1-\rho}}\lambda^{\frac{-1}{1-\rho}}\left(J^{\frac{\rho}{1-\rho}}\lambda^{\frac{-\rho}{1-\rho}} - 1 + \rho\right)\right]$$

$$= \frac{v}{\mathrm{S}^{*3}}\frac{\rho\delta}{(1-\rho)^2}\left(\frac{J}{\lambda}\right)^{\frac{1}{1-\rho}}\left[\left(\frac{J}{\lambda}\right)^{\frac{\rho}{1-\rho}} - 1 + 2\rho\right]. \qquad \text{(A11)}$$

Using the facts that $\rho < 0$, $\lambda > \mathrm{J}$, and $(J/\lambda)^{\frac{\rho}{1-\rho}} < (1-\rho)$, we can show that both $\frac{\partial}{\partial\delta}\left(\frac{\partial\theta}{\partial p_0}\right) < 0$ and $\frac{\partial}{\partial\delta}\left(\frac{\partial\theta}{\partial\lambda}\right) > 0$ hold.

Appendix B.

Main firm characteristics

Firm age (**AGE**) at time *t* is the year of time *t* minus the year of establishment of firms. Market value of equity or Size (**MV**) at the end of June every year *t* is a log of price times shares outstanding. Book-to-market (**BM**) at the end of June in year *t* is a log of the ratio of the firm's book value to the market value of equity at the end of December in year *t*-1. The asset growth rate (**AG**) at the end of June every year *t* is the difference in total assets at the end of year *t*-1 and *t*-2 divided by total assets at the end of year *t*-2. The returns on equity (**ROE**) at the end of June in year *t* is net incomes divided by total assets at the end of year *t*-1. Operating leverage (**OL**) at the end of each June year *t* is defined as operating costs scaled by total assets for the fiscal year ending in *t*-1. R&D intensity (**RDM**) at the end of June in year *t* is the ratio of expenses on R&D to the market value at the end of year *t-1*. Cash holdings (**CH**) at the end of June in year *t* is the ratio of cash and short-term investments to the total assets. The capital intensity (**K/L**) at the end of June in year *t* is the ratio of the total assets to the number of employees (scaled by 10^{-3}) in log at the end of the year *t*-1. Finally, the asset tangibility (**TG**) at the end of June every year t is the tangible assets at the end of year t-1 divided by total assets at the same time.

Other variables

EMP at time *t* is the number of employees at the end of December in year *t*-1. Hiring rate (**HL**) at the end of June every year *t* is the difference in the number of employees at the end of year *t*-1 (EMP_{t-1}) and *t*-2 (EMP_{t-2}) divided by the number of employees at the end of year *t*-2 (EMP_{t-2}). **LS** at the end of every June year *t* is the average years of length of service for employees at the end of December in year *t*-1. Momentum (**MOM**) in month *t* is the sum of the past *t-12* to *t-2* months' returns.

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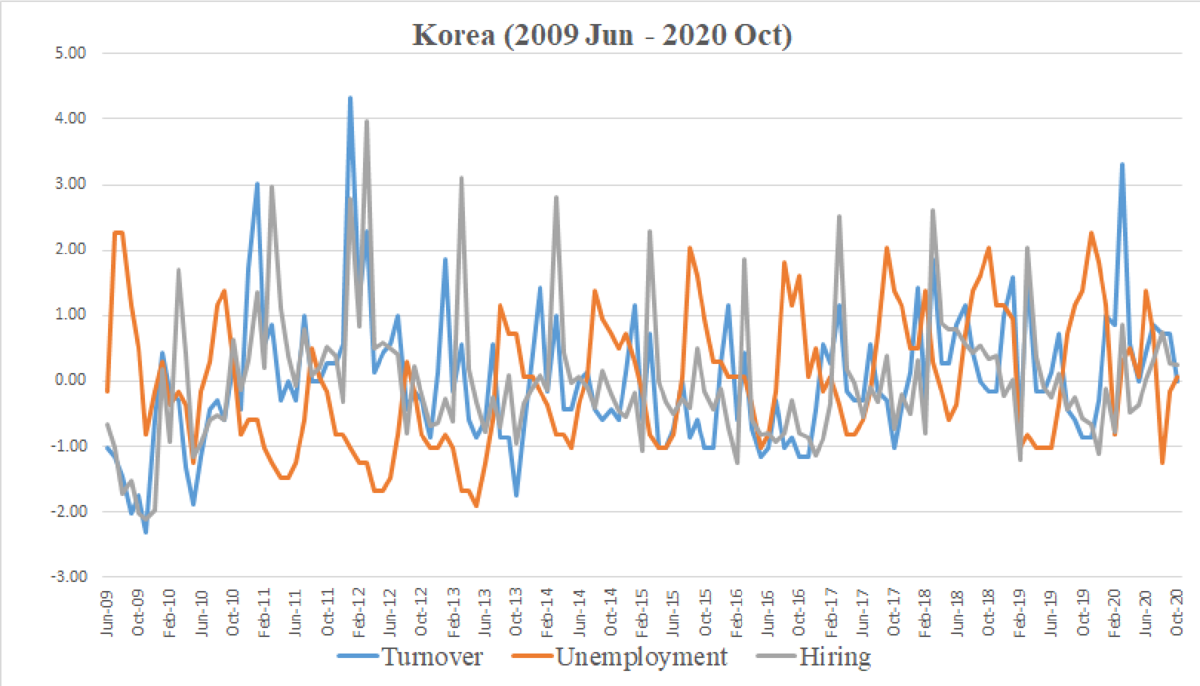
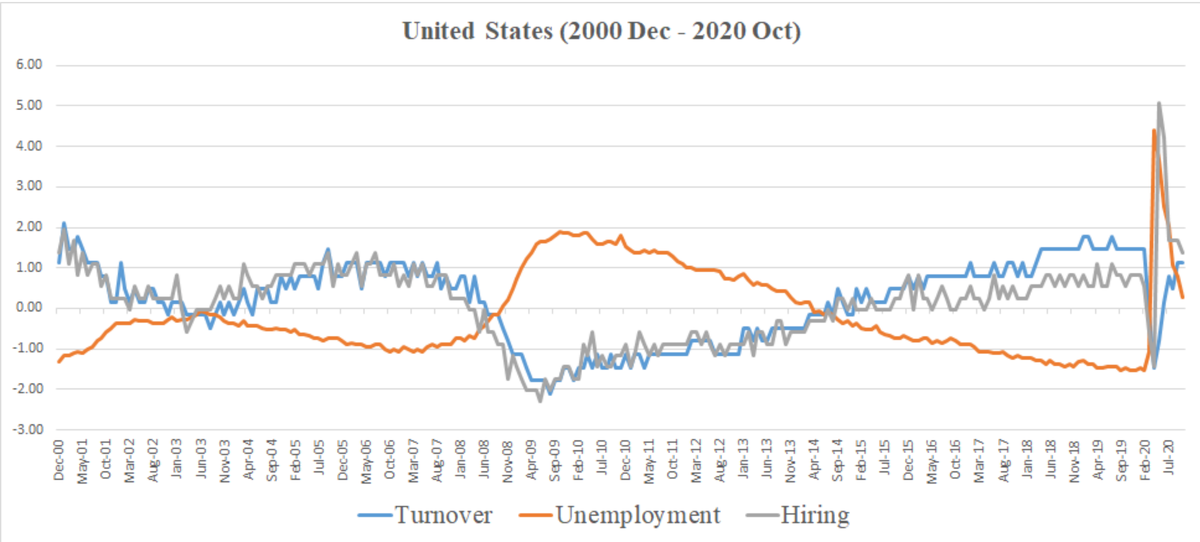
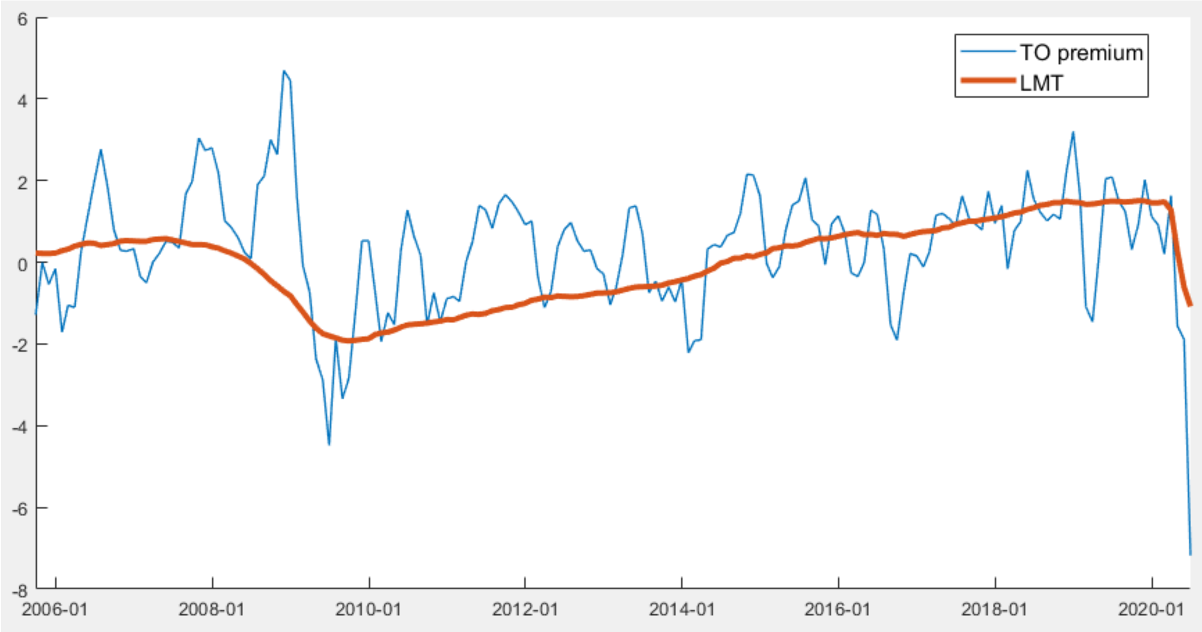
<Figure 1>





Turnover, hiring, and unemployment rates from 2009 June to 2020 October for Korea and from 2000 December to 2020 October for the United States. The time-series data are seasonally adjusted and normalized.

<Figure 2>



This figure plots the time series of the negative labor turnover premium (TO premium, blue line) and the labor market tightness (LMT, red line) from August 2005 to June 2020. TO premium is defined as the sum of the recent three-month returns of the equal-weighted L-H TO portfolio, multiplied by 30. LMT is the normalized value of the sum of the recent three months' labor market tightness.

Table 1

Summary statistics

	TO	TO_NIA	AGE	ln(MV)	ln(BM)	AG	ROE	OL	RDM	CH	K/L	TG
Panel A: U.S. data												
Mean	-0.01	0.09	22.14	13.63	-0.97	0.08	0.03	0.97	0.05	0.23	5.72	0.19
Std.	0.14	0.13	14.18	2.10	0.80	0.23	0.58	0.66	0.08	0.21	0.94	0.17
10^{th}	-0.03	0.00	1.67	2.99	-0.54	-0.04	-0.09	0.10	0.00	0.01	1.24	0.01
Median	-0.01	0.01	5.10	3.77	-0.25	0.01	0.02	0.22	0.01	0.05	1.59	0.04
90^{th}	0.04	0.07	12.83	4.51	-0.01	0.09	0.08	0.49	0.03	0.15	1.89	0.11
Panel B: Korean data												
Mean	0.00	0.00	31.80	11.54	0.02	0.08	-0.04	0.92	0.03	0.16	6.59	0.32
Std.	0.34	0.37	14.99	1.41	0.79	0.22	0.48	0.51	0.05	0.14	1.01	0.19
10^{th}	-0.42	-0.48	14.31	10.07	-1.04	-0.11	-0.23	0.39	0.00	0.03	5.52	0.07
Median	0.01	0.01	29.63	11.25	0.09	0.06	0.05	0.82	0.01	0.12	6.44	0.31
90^{th}	0.41	0.45	53.07	13.41	0.97	0.29	0.17	1.53	0.08	0.36	7.73	0.58

This table represents summary statistics for the main variables. TO is the labor turnover; TO_NIA is the non-industry-adjusted TO; AGE is the firm age; MV is the market value; BM is the ratio of book value to the market value; AG is the asset growth rates; ROE is the return on equity; OL is the operating leverage; RDM is the R&D intensity; CH is the cash holdings; K/L is the capital intensity, and TG is tangibility. The sample period is from June 2005 to June 2020 for the U.S data and from June 2004 to June 2019 for the Korean data.

Table 2

Labor turnover decile portfolio returns - U.S.

	TO				TO_NIA			
Decile	EW		VW		EW		VW	
	E[re]	[t]	E[re]	[t]	E[re]	[t]	E[re]	[t]
L	0.78	1.83	0.97	3.03	0.77	1.73	0.83	2.60
2	0.92	1.96	0.78	2.13	0.94	2.06	0.76	2.24
3	0.89	1.98	0.78	2.56	0.94	2.03	0.74	2.33
4	0.85	1.82	0.87	2.55	0.89	1.81	0.75	2.14
5	0.82	1.69	0.63	1.88	0.82	1.73	0.86	2.51
6	0.79	1.51	0.71	1.86	0.79	1.54	0.56	1.29
7	0.73	1.39	0.73	1.89	0.72	1.31	0.76	2.00
8	0.71	1.29	0.75	2.07	0.86	1.57	0.80	2.34
9	0.64	1.15	0.87	2.11	0.65	1.17	0.94	2.41
H	0.44	0.72	0.45	1.04	0.36	0.59	0.45	1.03
L-H	0.34	1.38	0.52	2.00	0.41	1.73	0.38	1.50
CAPM α	0.49	2.42	0.70	2.77	0.51	2.37	0.59	2.33
MKT	-0.21	-5.06	-0.26	-3.63	-0.13	-2.74	-0.29	-3.82
FF5 α	0.49	2.42	0.69	2.62	0.51	2.53	0.51	2.04
MKT	-0.16	-3.09	-0.18	-2.49	-0.09	-1.61	-0.18	-3.02
SMB	-0.33	-3.71	-0.39	-3.47	-0.32	-3.33	-0.48	-4.18
HML	0.14	1.26	-0.04	-0.37	0.19	1.99	0.04	0.25
RMW	0.02	0.14	-0.24	-1.42	0.13	0.83	0.05	0.23
CMA	-0.29	-1.84	-0.01	-0.05	-0.44	-3.32	-0.29	-1.22

This table reports the mean excess returns of the TO and TO_NIA decile portfolios. TO is labor turnover and TO_NIA is non-industry-adjusted labor turnover. Portfolio returns are equal- (EW) or value-weighted (VW) returns; they are in percentage and at a monthly frequency. This table further provides the risk-adjusted returns of the lowest-minus-highest (L-H) decile TO or TO_NIA portfolios with CAPM and FF5; factor loadings of the L-H TO or TO_NIA portfolio returns are denoted by MKT, SMB, HML, RMW, and CMA. All *t*-statistics are consistent with Newey-West corrections. The sample is from July 2005 to June 2020.

Table 3

TO quintile portfolio returns - Korea

TO quintile	L	2	3	4	H	L-H	L	2	3	4	H	L-H	L	2	3	4	H	L-H
	Panel A: EW						Pane B: VW						Panel C: VW - Excluding the largest 10 firms					
E[re]	1.43	1.40	1.45	1.49	0.92	0.51	0.61	0.81	0.84	0.63	0.36	0.25	0.87	0.69	0.92	0.73	0.35	0.51
[t]	2.87	2.58	2.66	2.60	1.61	2.67	1.58	1.91	1.75	1.24	0.75	0.89	2.10	1.41	1.88	1.42	0.74	2.12
CAPM α	1.00	0.97	1.02	1.05	0.49	0.51	0.21	0.41	0.37	0.19	-0.08	0.30	0.46	0.21	0.45	0.28	-0.09	0.54
[t]	4.14	3.21	3.23	3.04	1.39	2.61	1.52	1.81	1.82	0.66	-0.38	1.07	3.21	1.35	2.35	1.01	-0.39	2.21
MKT	1.01	1.02	1.03	1.05	1.01	0.00	0.93	0.95	1.12	1.06	1.05	-0.11	0.98	1.13	1.12	1.08	1.05	-0.07
[t]	16.24	14.06	15.48	13.67	11.87	0.00	31.20	14.90	24.61	15.36	20.10	-2.29	23.84	30.56	25.27	16.21	20.06	-1.50
FF5 α	0.40	0.46	0.51	0.52	0.09	0.31	0.26	0.54	0.24	0.35	-0.30	0.55	0.46	0.10	0.34	0.39	-0.30	0.76
[t]	3.66	4.14	3.88	4.39	0.60	2.09	1.81	2.88	1.37	1.03	-1.43	2.04	3.40	0.56	2.16	1.23	-1.45	3.09
MKT	0.96	0.97	1.00	1.02	0.96	0.00	0.90	1.09	1.06	1.04	0.99	-0.09	0.89	1.06	1.05	1.04	0.99	-0.10
SMB	0.66	0.84	0.85	0.92	0.86	-0.21	-0.06	0.05	0.22	0.17	0.30	-0.36	0.01	0.15	0.23	0.18	0.30	-0.29
HML	0.30	0.18	0.13	0.11	0.06	0.24	0.08	-0.32	0.07	-0.15	0.12	-0.03	0.16	0.14	0.09	-0.10	0.11	0.04
RMW	-0.10	-0.19	-0.19	-0.16	-0.31	0.21	-0.09	0.47	-0.27	-0.24	-0.29	0.20	-0.32	-0.25	-0.32	-0.28	-0.28	-0.04
CMA	-0.01	-0.13	-0.06	-0.05	-0.08	0.07	-0.17	0.08	0.03	-0.10	0.03	-0.20	-0.19	-0.10	-0.08	-0.11	0.03	-0.22

This table shows the mean excess return and risk-adjusted return of five portfolios one-way sorted by labor turnover rates (TO). The five portfolio returns are calculated by equal-weighing (panel A) or value-weighting (panel B) individual stock returns in a given portfolio. Panel C reports the value-weighted returns of TO quintile portfolios constructed based on all firms but excluding the largest 10 firms. In each panel, raw mean excess returns (E[re]), CAPM α, and Fama-French five-factor model's α for quintile TO portfolios are tabulated as well as the market, SMB, HML, RMW, and CMA betas. L-H stands for the low-minus-high hiring portfolios. The returns are in percentage and at a monthly frequency. All *t*-statistics are consistent with Newey-West corrections. The sample is from July 2004 to June 2019.

Table 4

Fama-MacBeth regressions

	Const.	TO	Ret(-1)	MOM	AGE	ln(MV)	ln(BM)	AG	ROE	OL	RDM	TO_NIA	TO(-1)
Panel A: U.S.													
Coef.	0.51	-1.40	-0.75	3.50									
[t]	1.15	-3.04	-1.66	1.06									
Coef.	-0.12	-0.88	-1.68	1.79	0.00	0.06	0.01	0.05	0.34	-0.07	0.40		
[t]	-0.15	-3.08	-4.21	0.56	-0.79	2.34	0.12	0.28	4.03	-0.79	0.54		
Coef.	-0.14		-1.57	2.18	0.00	0.07	0.02	0.02	0.33	-0.09	0.72	-1.01	
[t]	-0.19		-3.91	0.69	-0.77	2.75	0.28	0.14	4.01	-1.02	1.02	-3.90	
Coef.	-0.33		-1.60	1.59	0.00	0.07	0.00	0.11	0.28	-0.05	-0.08		-0.55
[t]	-0.40		-3.52	0.47	-0.78	2.65	-0.05	0.58	3.79	-0.55	-0.11		-2.08
Panel B: Korea													
Coef.	1.57	-0.45	-2.24	0.32									
[t]	2.75	-2.15	-2.91	1.52									
Coef.	5.82	-0.59	-2.86	0.37	0.00	-0.39	0.53	-0.70	0.29	0.16	0.36		
[t]	3.72	-4.35	-3.75	1.85	0.84	-3.76	2.88	-2.68	2.90	1.44	0.22		
Coef.	5.81		-2.87	0.36	0.00	-0.39	0.51	-0.71	0.29	0.16	0.54	-0.52	
[t]	3.81		-3.77	1.82	0.88	-3.91	2.98	-2.72	2.87	1.40	0.34	-2.67	
Coef.	5.43		-3.03	0.37	0.00	-0.36	0.53	-0.85	0.30	0.16	0.15		-0.37
[t]	3.47		-3.93	1.67	0.14	-3.41	2.96	-3.88	2.73	1.34	0.09		-2.33

This table reports the estimation results from several specifications of Fama-MacBeth regressions at time *t* of the form

$$r_{i,t+1} = \gamma_{0,t} + \gamma_{1,t} \times TO_{i,t} + \gamma_{2,t} \times r_{i,t} + \gamma_{3,t} \times MOM_{i,t} + \gamma_{4,t} \times AGE_{i,t} + \gamma_{5,t} \times \ln(MV_{i,t}) + \gamma_{6,t} \times \ln(BM_{i,t}) + \gamma_{7,t} \times AG_{i,t}$$
$$+\gamma_{8,t} \times ROA_{i,t} + \gamma_{9,t} \times OL_{i,t} + \gamma_{10,t} \times RDM_{i,t} + \epsilon_{i,t},$$

where $r_{i,t+1}$ is firm i's return at *t*+1 month; Ret(-1) is firm i's return at *t* month; MOM is the 12-2 momentum; TO is the labor turnover; AGE is the firm age; MV is the market value; BM is the ratio of book value to the market value; AG is the asset growth rate; ROE is the return on equity; OL is the operating leverage; RDM is R&D intensity for firm i at time *t*. TO_NIA is the non-industry-adjusted TO and TO(-1) is the one-year lagged TO. We report the time-series averages of each estimator and their t-statistics that are corrected by Newey-West estimation.

Table 5

The labor turnover costs and TO portfolio returns

Measure		High δ	Low δ	H-L	High δ	Low δ	H-L
			EW			VW	
			Panel A: U.S.				
2YROE	E[re]	0.64	-0.03	0.67	0.87	0.11	0.75
	[t]	2.69	-0.11	2.23	2.12	0.46	1.68
K/L	E[re]	0.31	0.46	-0.16	0.69	0.04	0.65
	[t]	0.94	1.65	-0.43	2.24	0.14	1.65
			Panel B: Korea				
2YROE	E[re]	0.73	0.26	0.47	0.87	-0.06	0.93
	[t]	2.93	1.28	1.70	2.19	-0.20	2.10
K/L	E[re]	0.80	0.21	0.59	0.34	0.24	0.09
	[t]	3.12	1.16	2.11	1.12	0.84	0.24
WS	E[re]	0.64	0.13	0.51	0.73	-0.33	1.06
	[t]	2.80	0.54	2.11	2.03	-0.73	1.87

This table presents the equal-weighted and value-weighted mean returns of the L-H TO portfolios among high or low turnover cost (δ) firms, and their difference between the two groups of δ. High δ firms and low δ firms are classified by the cross-sectional median breakpoints of each measure of δ at the end of June every year. In each δ group, decile or quintile TO portfolios are constructed at the end of June every year and the average returns of the L-H TO portfolio are presented. As a measure of δ, 2YROE is the sum of the recent two years' ROE, K/L is the capital intensity, and WS is worker-shortage rates at an industry-level. H-L stands for the differences in mean returns between the L-H TO portfolio among high δ firms and the L-H TO portfolio among low δ firms. All *t*-statistics are corrected by Newey-West estimation. The sample period is from July 2005 to June 2020 for the U.S. results and from July 2004 to June 2019 for the Korean results.

Table 6

Firm characteristics

TO	AGE	ln(MV)	ln(BM)	AG	ROE	OL	RDM	CH	K/L	TG
Deciles					Panel A: U.S.					
L	19.78	13.93	-1.09	0.08	0.14	0.75	0.01	0.14	5.70	0.14
2	19.16	14.08	-1.07	0.08	0.13	0.73	0.02	0.16	5.74	0.14
3	19.88	14.23	-1.08	0.08	0.13	0.76	0.02	0.16	5.77	0.15
4	19.13	14.16	-1.04	0.07	0.12	0.77	0.02	0.15	5.80	0.15
5	19.38	14.18	-1.02	0.06	0.12	0.79	0.02	0.13	5.78	0.15
6	19.38	14.07	-0.97	0.05	0.11	0.78	0.02	0.15	5.79	0.14
7	18.09	13.73	-0.91	0.04	0.08	0.77	0.03	0.17	5.82	0.14
8	17.88	13.16	-0.73	0.02	0.03	0.82	0.04	0.19	5.81	0.12
9	16.88	12.68	-0.65	0.00	-0.02	0.86	0.05	0.22	5.73	0.11
H	16.34	12.01	-0.47	-0.03	-0.06	0.96	0.05	0.20	5.63	0.11
L-H	3.44	1.93	-0.62	0.11	0.20	-0.20	-0.04	-0.07	0.07	0.03
[t]	5.39	5.13	-12.91	11.62	12.59	-3.56	-11.48	-2.80	0.65	2.57
Quintiles					Panel B: Korea					
L	33.13	11.70	0.24	0.06	0.06	0.84	0.01	0.10	6.74	0.36
2	30.90	11.29	0.15	0.06	0.06	0.84	0.01	0.13	6.46	0.32
3	28.03	11.18	0.09	0.06	0.06	0.82	0.01	0.13	6.31	0.30
4	27.43	11.11	0.04	0.07	0.05	0.85	0.01	0.12	6.25	0.31
H	28.27	10.95	-0.01	0.06	0.03	0.81	0.01	0.11	6.40	0.29
L-H	4.87	0.75	0.25	-0.01	0.03	0.03	0.00	-0.01	0.34	0.07
[t]	6.54	19.28	6.84	-1.46	9.41	1.77	1.10	-2.95	13.79	10.14

This table reports the ten time-series averaged firm characteristics at a portfolio level for the U.S. data (panel A) and the Korean data (panel B). Ten characteristics for decile or quintile portfolios univariate-sorted on TO at the end of June of year *t* are provided. L-H stands for the lowest minus highest turnover portfolios. The portfolio-level characteristics are calculated as the median value of each characteristic across all firms in the portfolio in any given year *t*. All the t-statistic is calculated considering Newey-West corrections. The sample period is from June 2005 to June 2020 for the U.S. results and from June 2004 to June 2019 for the Korean results.

Table 7

The effect of changes in TO on investments

		U.S.				Korea			
		AG		IK		AG		IK	
Ind.Var		All firms	All-but-Micro	All firms	All-but-Micro	All firms	All-but-Micro	All firms	All-but-Micro
ΔTO	Coef.	-0.04	-0.02	-0.03	-0.02	-0.03	-0.04	-0.10	-0.11
	[t]	-7.45	-2.99	-1.40	-3.00	-3.01	-3.39	-6.16	-5.56
Δln(BM)	Coef.	0.05	0.08	0.03	0.04	0.06	0.04	0.09	0.07
	[t]	19.85	22.82	3.61	9.54	15.55	10.09	13.40	9.96
ΔOL	Coef.	-0.52	-0.56	-0.03	-0.02	-0.28	-0.31	-0.21	-0.22
	[t]	-102.21	-68.69	-2.17	-1.75	-43.18	-36.25	-17.72	-14.73
ΔROE	Coef.	0.01	0.00	-0.01	0.00	0.04	0.04	-0.02	-0.01
	[t]	6.01	-0.17	-1.36	-1.09	14.04	9.20	-3.31	-1.65
ΔCH	Coef.	-0.26	-0.29	-0.38	-0.27	0.02	0.06	-1.03	-1.05
	[t]	-19.40	-15.50	-8.95	-13.54	1.00	2.57	-29.15	-24.97
Indst.		Y	Y	Y	Y	Y	Y	Y	Y
Year		Y	Y	Y	Y	Y	Y	Y	Y

This table shows the results of the pooled-regressions of investments on changes in TO and other control variables, which is in the following form:

$$Investment_{i,t} = \gamma_{1,t}\Delta TO_{i.t} + \gamma_{2,t}\Delta \ln(BM)_{i.t} + \gamma_{3,t}\Delta OL_{i.t} + \gamma_{4,t}\Delta ROE_{i.t} + \gamma_{5,t}\Delta CH_{i.t} + Industry\ \ Dummies + Year\ \ Dummies + \epsilon_{i,t},$$

where $Investment_{i,t}$ is firm i's asset growth (AG) or capital investment (IK) at time t, and $\epsilon_{i,t}$ captures errors. Control variables are changes in the following variables: BM is the ratio of book value to the market value; OL is the operating leverage; ROE is the return on equity; CH is the cash holdings. Changes in variable, ΔX_t is defined by $X_t - X_{t-1}$. The above pooled-regression is conducted on the sample of all firms or all firms excluding Micro-caps (All-but-Micro). Micro-caps are defined as firms with market value (MV) less than the bottom 20% NYSE or KOSPI breakpoints. All independent variables are winsorized at a 1% level. The sample period is from June 2005 to June 2020 for the U.S. results and from June 2004 to June 2019 for the Korean results.

Table 8

Time-series regressions of TO portfolios to macro variables

			EW		VW		EW		VW		EW		VW	
	lag		*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*
			Panel A: TO - U.S.				Panel B: TO_NIA - U.S.				Panel C: TO - Korea			
Consumption growth	K=0	Coef.	0.01	1.29	0.02	-0.06	0.01	1.38	0.01	0.44	1.48	0.26	1.35	1.35
		[t]	1.27	1.97	2.34	-0.18	1.61	2.45	1.45	1.40	1.74	0.30	1.08	1.08
Consumption growth	K=1	Coef.	0.01	1.77	0.02	-0.48	0.01	2.34	0.01	0.17	0.83	1.83	3.75	3.75
		[t]	0.46	1.01	2.29	-0.58	0.56	1.44	1.30	0.18	1.18	2.48	3.32	3.32
GDP growth	K=0	Coef.	0.00	1.65	0.02	-0.05	0.00	1.81	0.01	0.50	1.04	0.64	0.38	0.37
		[t]	0.28	2.93	2.30	-0.14	0.50	4.24	1.16	1.58	0.94	0.73	0.28	0.33
GDP growth	K=1	Coef.	-0.01	3.36	0.01	0.71	-0.01	3.46	0.00	1.01	0.34	1.47	-1.17	2.19
		[t]	-0.86	2.41	1.59	0.88	-0.85	2.56	0.43	0.92	0.43	2.99	-1.03	2.17
Labor share growth	K=0	Coef.	0.01	-1.09	0.02	-0.22	0.02	-1.01	0.01	-0.22				
		[t]	1.94	-12.80	2.31	-1.88	2.15	-6.92	1.57	-0.95				
Labor share growth	K=1	Coef.	0.01	-0.57	0.02	-0.25	0.01	-0.76	0.01	-1.22				
		[t]	1.34	-0.70	2.28	-0.58	1.68	-0.94	1.44	-2.14				

This table presents the estimates for time-series regressions of the low-minus-high turnover portfolio returns to a set of three macro variables. Consumption growth, GDP, and labor share growth are used as an independent variable in the following regression in the form of

$$r_t^L - r_t^H = a + bX_{t-K} + \epsilon_t, \text{ where K= 0, 1,}$$

where r_t^L and r_t^H are the quarterly returns of the lowest and the highest decile or quintile labor turnover portfolio, respectively, X_t is the quarterly consumption, GDP, or labor share growth, and K is the number of a time lag. The lowest-minus-highest TO portfolio is based on TO of U.S. data (panel A), TO_NIA of U.S. data (panel B), and TO of Korean data (panel C). TO is labor turnover and TO_NIA is non-industry-adjusted labor turnover. All regression results include estimated coefficients and their t-statistics. All t-statistics are corrected for heteroscedasticity and autocorrelation by Newey-West estimator.

Table 9

Decomposing labor turnover

Panel A

	Const	ln(WAGE)	$\overline{R^2}$
Coef.	1.51	-0.41	0.14
[t]	11.60	-11.71	

Panel B

Size		TO_{p_o} L	2	3	4	H	L-H	TO_{λ} L	2	3	4	H	L-H
S	re	2.35	2.41	2.47	2.23	1.64	0.71	2.14	2.33	2.17	2.38	2.07	0.07
	[t]	3.80	3.85	3.94	3.54	2.56	3.02	3.51	3.60	3.80	3.56	3.23	0.28
2	re	1.46	1.20	1.08	1.27	0.52	0.95	1.39	1.32	1.08	0.97	0.61	0.79
	[t]	2.58	1.95	1.85	2.12	0.85	3.82	2.54	2.19	1.91	1.62	0.94	2.69
3	re	1.04	0.41	0.93	0.92	0.35	0.69	1.15	0.99	1.08	0.75	-0.35	1.49
	[t]	1.85	0.74	1.53	1.69	0.57	2.66	2.14	1.76	1.96	1.20	-0.57	4.49
4	re	0.97	0.84	0.90	0.69	0.37	0.60	0.92	1.11	0.68	0.64	0.18	0.74
	[t]	1.93	1.64	1.46	1.24	0.69	2.25	1.74	1.90	1.24	1.12	0.33	2.24
B	re	0.75	0.90	0.62	0.73	0.63	0.12	0.99	0.53	0.95	0.85	0.20	0.79
	[t]	1.68	1.94	1.36	1.46	1.27	0.53	2.07	1.17	1.88	1.65	0.42	2.42

This table reports the regression results for decomposing labor turnover rates into the firm-specific turnover TO_{p_o} and turnover due to the wage efficiency TO_{λ} in panel A and the relations between decomposed turnovers and stock returns in panel B. The average value of the estimated coefficient, its time-series t-statistics, and the mean of adjusted R square of the cross-sectional regressions are also reported in panel A. In panel B, we present that the mean equal- and value-weighted excess returns of 25 portfolios two-way sorted by size and TO. At the end of June in every year *t*, we first divide firms into five groups by the market values. The market value breakpoints are 20^{th}, 40^{th}, 60^{th}, and 80^{th} percentile of the cross-sectional distribution of market values on KOSPI-listed firms. Then, we dependently sort firms into five groups by TO within each size group. The TO breakpoints are 20^{th}, 40^{th}, 60^{th}, and 80^{th} percentile of the cross-sectional distribution of TO on all firms in each size group. All returns are at a monthly frequency and in percentage; all t-statistics are corrected for heteroscedasticity and autocorrelation by the Newey-West estimator. The sample period is from July 2004 to June 2019.