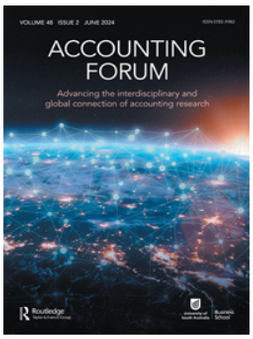

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An analysis of the effect of employee tenure on WACC

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ABSTRACT

No international accounting policy exists to mandate that firms must report employee/workforce-level human capital information on a structured basis. Thus, the link between employee/workforce human capital and firm risk is not demonstrated in the literature. South Korea is a rare instance where human capital information, such as employee tenure is disclosed on Annual Reports as a rule. Therefore, we invoke resource-based theory, a human resource policy assertion, and a business ethics/sustainability inference to show whether capital providers differentiate between firms that are able/unable to retain employees, thus adjusting WACC accordingly. Using OLS regression analysis, from 2011-2020, empirical results show that firms with the ability to retain employees enjoy economically significantly lower levels of WACC. The results infer that equity/debt providers associate workforce tenure and firm risk/returns expectations. Empirical results also show that capital providers are nuanced when impounding employment information into risk/return assessments, based on incrementally different associations for investment-grade/non-investment-grade firms. The study contributes to the literature by providing evidence that management should develop strategies to retain employees to enjoy economic advantages. Because structured employee/workforce human capital information is rare internationally, the study has important practical implications for legislators, management, employees and the public.

KEYWORDS
Human capital; employee tenure; WACC; financial reporting transparency

ACCEPTED BY
Byron Song

1. Introduction

Weighted Average Cost of Capital (WACC), a firm's aggregated cost of debt (COD) and equity (COE), represents the returns borrowers and shareholders would expect based on investment risk. The literature shows that equity stakeholders use all forms of available information when making investment decisions (Carhart, 1997; Fama & French, 1992, 2016). Moreover, debt providers are considered to be effective monitors of risk (Bharath et al., 2008; Dhaliwal et al., 2011; Francis et al., 2005). However, there is no accounting policy that mandates workforce/employee level human capital information

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must be disclosed on financial reports on a structured year-on-year basis. Therefore, whether capital providers would impound employee-level information into WACC if made publicly available on a firm-level basis, is a question left unanswered.

The literature shows that human capital information quality varies internationally (Abeysekera & Guthrie, 2004; Fincham & Roslender, 2003; Roslender & Stevenson, 2009; Steen et al., 2011; Striukova et al., 2008; Vandemaele et al., 2005). However, in South Korea, due to a combination of; (i) legislators' propensity for early adoption of regulatory policies; (ii) labour union power and (iii) a lack of natural resources, investment in human capital has been considered a national productivity strategy following the Korean War (Kim et al., 2010; Lee, 2005). Thus, in South Korea, workforce-level human capital information must be reported on a structured, annual, numerical basis, in a similar format to revenue, assets or equity values. As a result, Korean market participants may utilise comparative human capital information for investment decision-making purposes. Thus, to the best of our knowledge, the Korean institutional setting is most suitable to explore the effect of employee tenure on WACC, because it provides us with reliable, structured data on employee-level human capital. Taken together, by providing insights into whether investors incorporate human capital-related information into their investment decisions, this study can speak to the potential benefits of disclosing numerical human capital-related information, on a mandatory basis.

This study's main research question is: *whether the average years of service (AYS) of a firm's workforce, reduces borrowing costs (WACC)*? We have several motivations to conduct this study. Firstly, human capital is one of three components of intellectual capital, in addition to structural and relational capital (Bamel et al., 2022; Edvinsson, 1997). However, many argue that human capital can be considered a firm's most valuable asset (Curado et al., 2011; Guthrie et al., 2012). Human capital reputational advantages are associated with lower borrowing costs (Cao et al., 2015). Moreover, based on a legitimacy assertion, firms with a higher propensity to disclose human capital information can enjoy lower borrowing costs (Cormier et al., 2009; García-Sánchez & Noguera-Gámez, 2017; Mangena et al., 2010; Salvi et al., 2020). However, to the best of our knowledge, there is limited empirical evidence demonstrating that capital providers use numerical human capital information to make risk/reward assessments, on a comparative firm-level basis. In this study, we envision that because of the availability of numerical AYS data in South Korea, based on (i) resource-based theory, (ii) an effective human resource policy assertion, and (iii) AYS representing business ethics and sustainability, a firm that is (un)able to retain employees will be expected to pay lower (higher) WACC, relative to peers. By answering the above research question, the study can provide evidence that adopting strategies to retain employees provides firms with economic benefits.

Second, non-financial reporting (NFR) studies have gained traction by providing evidence that information that is excluded from the mainstream accounting framework can be useful for stakeholders (Jackson et al., 2020; La Torre et al., 2018; Stolowy & Paugam, 2018). However, Stubbs and Higgins (2018) report that few studies provide empirical evidence of the explicit benefits of reporting NFR information to market participants. This study is motivated to extend the NFR literature by demonstrating the economic effect that AYS (an NFR variable) can have on WACC (£). By demonstrating this effect, the study can be informative to stakeholders, management, as well as extend the NFR literature. Third, it is accepted that the default risk of investment grade (IG) firms is lower

compared to non-investment grade (NIG) firms (Alissa et al., 2013; Ashbaugh-Skaife et al., 2006; Kisgen, 2006; Mali & Lim, 2019). Thus, we are motivated to demonstrate whether increasing levels of AYS have a different/equal effect on WACC for IG/NIG firms. Evidence of a different association between IG/NIG firms can extend the literature by demonstrating that capital providers are nuanced when making business risk assessments.

Fourth, Bharath et al. (2008) and Dhaliwal et al. (2011) report that debt providers are more effective monitors of risk. Moreover, the efficiency-risk hypothesis infers that efficient firms with high levels of organisational effectiveness are more likely to have the capability to secure higher levels of debt, relative to equity in their capital structure (Margaritis & Psillaki, 2010). Thus, we are motivated to discover whether there is an incremental difference between COD and COE based on AYS, to extend the efficiency-risk hypothesis literature. Finally, we are motivated to show how limitations in the mainstream accounting framework can negatively influence society. There is no requirement for firms to report human capital information on a relative firm-year basis. As a result, studies use aggregated (Office of National Statistics) questionnaire data to show that zero-hour and non-standard contracts are becoming the norm in the UK (Farina et al., 2020; Koumenta & Williams, 2019). Thus, in section 6, a normative perspective is introduced to explain how mainstream accounting framework limitations can negatively impact society. Policymaking suggestions are also introduced.

Using a sample of Korean-listed firms from 2011 to 2020, empirical results show a negative relationship between AYS and WACC. After dividing the sample into IG (large, complex, less risky firms) and NIG firms (smaller, less complex, inherently risker), NIG firms are shown to have lower levels of WACC. Moreover, as AYS increases, its effect in reducing WACC is higher for IG firms, relative to NIG firms. We also find that the effect of male/female AYS on WACC is qualitatively indifferent. Next, WACC is divided into COD and COE. Empirical results show that AYS has a negative effect on both COD and COE. However, the effect of AYS is more pronounced for COD. Finally, to demonstrate model robustness, additional analysis is conducted using Fama and MacBeth (1973) yearly regressions, 3 Stage least square, replacing beta with stock price volatility, endogeneity tests, amongst others.

Empirical results provide several important insights and make numerous contributions. For brevity, a full discussion and contributions are provided in section 6 to avoid repetition. The manuscript proceeds as follows. In the next section, relevant literature is reviewed, and the hypothesis is developed. In Section 3, research design details are provided. Section 4 provides the results of the main analysis. Section 5 provides the results of additional analysis and robustness checks. Finally, the conclusion section offers a discussion of the empirical results, contributions, and avenues for future research.

2. Literature review and hypothesis development

2.1. Literature review

Ceteris paribus, securing the lowest possible WACC is the strategic priority of a firm's finance department. WACC is the aggregated combination of a firm's cost of debt and cost of equity. COD is the interest required by debt stakeholders including bond holders, insurance companies and banks, based on a risk assessment of lenders. Despite infamous financial defaults, the

literature shows that banks (Bharath et al., 2008; Francis et al., 2005), credit rating agencies and public bondholders (Dhaliwal et al., 2011) are effective monitors of risk. COE is estimated using the Capital Asset Pricing Model (CAPM). CAPM has been introduced to capture a positive linear relationship between firm risk and expected investor returns (Black & Scholes, 1973; Lintner, 1965; Markowitz, 1952; Sharpe, 1964). Recent studies have enhanced the predictive validity of the model with additional firm risk proxies (Carhart, 1997; Fama & French, 1992; 2016). Whilst some critics argue that the relationship between risk and returns is not strictly linear, analysts, investors and members of the public utilise CAPM to link risk and expected returns on a daily basis (Gregory et al., 2018). COD and COE estimation is based on the accepted Finance theory that all available information is used by market participants when making investment decisions. Thus, if workforce human capital information is reported on a structured, comparable year-on-year basis on financial reports, it can be expected to have an incremental influence on WACC.

However, human capital reporting quality is limited in the mainstream accounting framework. The Annual Report is considered the most important financial document for information users (Dumay, 2016). However, no policy exists to mandate that employee human capital information should be reported on Annual Reports. The lack of employee-level data on Annual Reports stems from disagreements about how human capital information should be disclosed. There have been arguments that human capital should be recognised as assets/equity on the balance sheet (Flamholtz, 1974; Hekimian & Jones, 1967). However, developing a numerical asset/equity basis for human capital has lost impetus following Flamholtz's (1975) assertion that human capital should not be treated as an asset because employees have free will to move to other organisations if employment terms are not satisfactory. CSR reports have the potential to legitimize (human capital) business activities (Leung & Gray, 2016; Rao & Tilt, 2016; Wilburn & Wilburn, 2013). However, because sustainability information is not provided on a structured basis, critics argue that CSR disclosures are symbolic (Cho et al., 2012; Hopwood, 2009; Husillos et al., 2011; Merkl-Davies & Brennan, 2007; Michelon et al., 2015). Third, Integrated Reports can be considered a breakthrough in intellectual (human) capital reporting (De Villiers & Sharma, 2017; IIRC, 2021; Melloni, 2015). However, Integrated Reporting adoption is slower than expected (Dumay et al., 2016; Flower, 2015).

The Non-Financial Reporting literature has risen to prominence, against the backdrop of the aforementioned financial reporting limitations. NFR refers to the process of disclosing information that is not required within the mainstream accounting framework but utilised by market participants for decision-making purposes (Baboukardos, 2017; Eastman, 2018; Jackson et al., 2020; Stolowy & Paugam, 2018). NFR information is shown to be used by market participants to make assertions about (i) firm performance/value; (ii) policy-making (Deloitte, 2015; KPMG, 2016; and (iii) and business ethics (Baboukardos, 2017; Baboukardos & Rimmel, 2016; Hrasky, 2012; Mahadeo et al., 2011). The practice of disclosing social responsibility commitment, via NFR, can be considered a legitimacy strategy that reduces borrowing costs (Chava, 2014; El Ghoul et al., 2011; Goss & Roberts, 2011; Ng & Rezaee, 2015; Sharfman & Fernando, 2008). Furthermore, Guthrie et al. (2004, 2006) assert that reporting NFR human capital information over and above legislative requirements is considered a legitimacy strategy by market participants.

Based on this assertion, studies show that firms with a higher propensity to disclose NFR human capital information can enjoy lower borrowing costs (Mangena et al., 2010).

Using a sample of 164 Integrated Reports, Salvi et al. (2020) conducted textual content analysis to show that firms with higher levels of human capital NFR disclosures have lower cost of capital and higher firm value. Cormier et al. (2009) examine the association between the disclosure of human capital and information asymmetry using voluntary disclosures on websites. They find that human capital disclosures reduce stock price volatility and increase Tobin's Q. There is evidence that firms that publish intellectual/human capital disclosures on Integrated Reports enjoy lower capital costs (García-Sánchez & Noguera-Gámez, 2017). Furthermore, Cao et al. (2015) show that firms with good reputations including "An ability to attract and retain talented people" have lower implied cost of equity capital. Taken together, the extant literature shows that a firm's propensity to transparently disclose human capital information influences the risk perceptions of market participants, hence reducing borrowing costs. However, whether or not market participants use numerical human capital (AYS) information for decision-making purposes is a question left unanswered.

Whilst there is international evidence demonstrating that firms with a high propensity to report human capital information (using unstructured disclosures) enjoy lower borrowing costs (Cormier et al., 2009; García-Sánchez & Noguera-Gámez, 2017; Mangena et al., 2010; Salvi et al., 2020), the directional relationship between employee human capital and firm performance is not well-established in the literature. Meta-analysis by Rouse and Daellenbach (1999), and Crook et al. (2011) show a statistically insignificant relationship between employee human capital and financial performance. An insignificant association can be explained by management having to trade-off investment in employees, and salary expense considerations (Flamholtz & Coff, 1994; Merino, 1993; Stovall & Neill, 2017). However, others surmise that an association between firm performance and employee tenure should exist because workforce skills and knowledge develop over time (Coff, 1999; Crook et al., 2011; Grant, 1996; Penrose, 1959). Consistent with a resource-based theory assertion, numerous studies report that investment in employee skills (input) is a comparative advantage (output) (Ballot et al., 2006; Barney et al., 2011; Grant, 1996; Hitt et al., 2016; Mousavi & Takhtaei, 2012; Shiu, 2006; Singh & Van der Zahn, 2011; Sun et al., 2020). Employee tenure is associated with human capital development, knowledge, expertise, loyalty and motivation (Humphrey et al., 2009; Kline & Peters, 1991). There is also evidence that employee turnover has a negative effect on firm performance (Hancock et al., 2013; Hausknecht & Trevor, 2011; Kacmar et al., 2006; Shaw et al., 2005). Given these differing views, we surmise that in a rare instance such as South Korea, where human capital information is available on Annual Reports, based on a resource-based theory supposition, market participants can perceive that increasing AYS is a comparative advantage that is associated with firm performance, hence reduces risk.

2.2. South Korean context

South Korea is selected as a benchmark case-study because South Korea has a significantly higher propensity to report employee-level human capital information compared to other developed economies (Lim & Mali, 2021). The literature suggests three reasons human capital data is included on a structured basis in South Korean Annual Reports: (i) Following the Korean War, because of a lack of natural resources on the Korean

peninsula, South Korea's national productivity strategy has emphasised developing human capital (Kim et al., 2010; Lee, 2005). (ii) South Korean labour unions are recognised as having more power compared to many other western countries (Durazzi et al., 2018). (iii) Historically, South Korea has been considered to have a weak legal infrastructure (La Porta et al., 1997; Woods, 2013). As a result, South Korean legislators have been "innovators/early adopters" of financial reporting quality policies to enhance public confidence (Choi et al., 2017; Lim & Mali, 2020, 2023; Mali & Lim, 2018, 2020, 2023b).

From 2010, Article 159 (the Financial Investment Services and Capital Market Act and Fundamental Act of Employment Policy requires) mandates that all employee and management level data must be reported on Annual Reports (Appendix 1 and 2 English/Korean). Thus, aggregated numerical human capital information (such as AYS, contract type, gender ratios, maternity information, amongst others) is available on a relative basis for all firms. Thus, market participants can monitor AYS data. For example, from 2016 to 2018, AYS has the potential to increase from 19 years to 19.8 for firm X. On the other hand, AYS can decrease from 17.8 to 13.2 for firm Y. We envision that this type of information can be used by capital providers to make human capital and business risk/strategy/ethics assertions. Taken together, the extant literature demonstrates that both equity and debt providers are effective monitors of risk (Bharath et al., 2008; Carhart, 1997; Dhaliwal et al., 2011; Fama & French, 1992, 2016; Francis et al., 2005), thus, use all available forms of information when determining borrowing cost. South Korean market participants are provided with AYS human capital information on Annual Reports as a rule. Thus, AYS is likely to affect WACC.

2.3. Hypothesis development

Resource-based theory conceptualises that managers utilise firm's internal resources, including human resources, in an effort to identify those resources, capabilities, and competencies to deliver superior competitive advantages. However, whilst some consider human capital to be a firm's most valuable asset, management is required to consider employee expenses when implementing business strategy (Flamholtz & Coff, 1994; Merino, 1993; Stovall & Neill, 2017). Thus, longer tenure could imply that firms are not efficiently managing human capital resources. Given that employees' wages generally increase with tenure, longer tenure may suggest that firms pay relatively higher wages. Longer tenure may also imply that firms are having difficulty turning over their employees. Given that all firms would like to maintain the optimal level of tenure, longer tenure may suggest that firms are in a sub-optimal stage in terms of human capital management. Therefore, there is the potential that capital providers associate shorter tenures with more efficient staffing from a resource allocation perspective. Based on the above assertion, AYS can have an insignificant or positive effect on WACC.

However, we hypothesise that that increasing AYS will reduce a firm's borrowing costs, based on three assertions. First, employee retention is associated with positive firm performance characteristics, such as enhanced business knowledge, loyalty and motivation (Humphrey et al., 2009; Kline & Peters, 1991). Employee retention is also associated with an employee's satisfaction with work-life balance; commitment to an organisation's vision; and an acceptance of employment conditions, including training

compensation, amongst others (Kossivi et al., 2016; Monsen & Wayne Boss, 2009). On the other hand, as a result of a loss of skills, disruption to operations, and increased recruitment costs, an inability to retain staff is shown to reduce financial performance (Hancock et al., 2013; Hausknecht & Trevor, 2011; Kacmar et al., 2006). Shaw et al. (2005) report that turnover negatively impacts organisational performance because business knowledge is embedded in employee relationships. Thus, we conjecture that borrowers will associate staff retention with employee satisfaction. As a result, borrowers can adopt a resource-based theory perspective, that employee tenure is associated with positive firm-level characteristics, that are likely to improve (reduce) firm performance (risk). Based on this assertion, firms with higher employee retention are expected to pay lower WACC.

Second, Harris and Brannick (1999) surmise that people are willing to stay at a firm with effective management. Kossivi et al. (2016) report that employee tenure is directly associated with a firm's ability to manage human capital. On the other hand, a firm's weak reputation (Cao et al., 2015; Ramlall, 2003) and leadership are shown to increase employee turnover (Kossivi et al., 2016; Monsen & Wayne Boss, 2009). An (in)ability to retain employees can be a signal that management has been (in)effective. Thus, we envision market participants will make an assertion that employee tenure is a signal of effective management and, hence, lower risk.

Third, workforce retention is shown to be positively associated with ethical business practices, and instances where the values of employee and employer are shared (Bharadwaj & Yameen, 2021; Carnahan et al., 2017; Flammer & Kacperczyk, 2019; Flammer & Luo, 2017; Kim et al., 2020; Lee & Chen, 2018). Therefore, market participants can consider that employee tenure is a signal that firms and employees share a similar ideology, which will have a negative impact on risk. Furthermore, employee retainment can be considered indicative of staff treatment, which is one of the important elements of Environmental, Social, and Governance (ESG) performance (Zumente and Bistrova, 2021). Thus, market participants are likely to consider that firms that retain employees, treat them well by implementing ethical/sustainable human capital practices. As a result, such firms can be expected to be less risky compared to firms that do not look after their employees. Based on the above, the following hypothesis is introduced:

H.1 Increasing levels of workforce AYS reduces a firm's borrowing costs (WACC).

3. Research design

3.1. Research model

As shown in equation (1), WACC is estimated as aggregated *COE* (equation 2) plus aggregated *COD* in equation (4). CAPM is used to measure *COE. COD* is taken from the annual reports. To "aggregate" WACC consistent with the Korean market rate, *COE* and *COD* are multiplied by weightings; W1 (Equation 5) and *W2* (Equation 6):

$$WACC = COE{*}W1 + COD{*}W2 \tag{1}$$

$$COE = R_f + \beta_i{*}MP_i, \tag{2}$$

where:

R_f: the risk-free rate of interest listed for each year in our study.

β_i: market beta, taken from the Korean Equally Weighted Index (EWI).

***Beta* (β)** is a measure of the volatility (systematic risk) of a stock, compared to the market as a whole (Korean Equally Weighted Index). Stocks with betas higher than 1.0 can be interpreted as more volatile than KOSPI/KOSDAQ market stocks.

$$(\beta) = \ Beta\ coefficient(\beta) = \frac{Covariance\ (R_e, R_m)}{Variance\ (R_m)} \tag{3}$$

where:

Re: the return on an individual stock.

***Rm*:** the return on the overall market (KOSPI/KOSDAQ) stocks.

Covariance: how changes in a stock's returns are related to changes in the market's returns.

Variance: how far the market's data points spread out from their average value.

MP_i: a market risk premium of 3.3% (fixed rate) is based on previous literature (Choo et al., 2017; Kim et al., 1998; Lee et al., 2015; Mali & Lim, 2021). It is the value provided by KISVALUE, the largest South Korean financial database. Since the market risk premium is constant regardless of the firm and year in this study, the rate can be considered equivalent, and will therefore not influence the results (see limitation section for discussion).

$$\begin{aligned} COD = {} & (Bank\ loan\ interest\ expenses + Corporate\ bond\ interest \\ & + Loss\ on\ corporate\ bond\ retirement - Gain\ on\ corporate\ bond\ retirement \\ & + interest\ on\ the\ construction\ capital)/(Short\ term\ corporate\ bond \\ & + Short/long\ term\ borrowings\ including\ bank\ loans \\ & + Current\ maturities\ of\ long-term\ debt \\ & - \ -Other\ current\ maturities\ of\ long-term\ debt \\ & + Long-term\ corporate\ bond + Financial\ lease\ liabilities \\ & + Asset\ backed\ debt + Liabilities\ without\ preference) \end{aligned} \tag{4}$$

Weightings are firm-level values suggested by the Korean stock exchange (KRX). The COD weighting is the average IBDC (interest-bearing debts for cost) divided by IBDC plus AMC (average annual market capitalisation of common and preferred stock) in equation (5). The weighting for COE is AMC divided by IBDC and AMC in equation (6). For clarity, we list the weighing below:

$$W1 = AMC/(IBDC + AMC) \tag{5}$$

$$W2 = IBDC/(IBDC + AMC) \tag{6}$$

In equation (7), WACC is the dependent variable. AYS is the average service of a firm's entire workforce. AYS data is taken from the Annual Report. AYS is a continuous variable that captures employee/workforce tenure. Annual Report notes define AYS as an

employee's initial contract/employment period, minus the current year's Annual Report date, aggregated for all employees. As explained in the hypothesis, a negative relationship is expected between AYS and WACC.

$$WACC_{i,t} = \beta_0 + \beta_1 AYS_{i,t} + \beta_2 Firm\_Size_{i,t} + \beta_3 Big4_{i,t} + \beta_4 MB_{i,t} + \beta_5 Market\_Risk_{i,t} + \beta_6 LOSS_{i,t} + \beta_7 Default\_Risk_{i,t} + \beta_8 ROA_{i,t} + \beta_9 BigOwn_{i,t} + \beta_{10} Foreign_{i,t} + ID + YD + \varepsilon_{i,t} \quad (7)$$

In Table 1, variable definition and predicted signs are listed. In many studies, interdependent variables are included in empirical models, simply based on predicted signs. However, there is a growing impetus to only include variables that are highly statistically significantly related to the dependent variables in econometric tests. Woodside (2016) infers that including variables that are not highly associated with dependent variables reduces the predictive validity of empirical models. Therefore, to enhance the predictive validity of the model, control variables are divided into established categories that are known to influence WACC. Then for each category, only the most statistically significant variables in each category are included in the model. As shown by VIF, R2 and F values in the analysis section, this sample selection criterion is robust.

The first category, Size, includes *Firm size*, *Big4* and *MB*. It is well established that because of economies of scale, *Firm size* and *MB* will influence firm risk (Carhart, 1997; Fama & French, 1992, 2016; Lim & Mali, 2024). In isolation, the selection of a Big4/NonBig4 auditor may not influence WACC. However, consistent with evidence from Korean audit quality studies (Mali & Lim, 2020, 2021), after controlling for other risk determinants, it is likely that market participants associate AYS (risk) differently for Big4 clients because they are accepted as having higher audit quality. Next, we

Table 1. Variable definitions.

Dependent Variable	Sign	Definition
WACC		Weighted average cost of capital (see manuscript for details)
Variables of Interest		
AYS	-	Employee's initial contract/employment period, minus the current year's Annual Report date.
Control Variables		
1. Size		
Firm Size	-	Natural logarithm of total assets
Big4	-	A dummy variable that takes 1 if an auditor is Big4, 0 otherwise
MB	-	Average book value, divided by market value
2. Business Risk		
Beta (Market risk)	+	Systematic risk proxied by beta (see manuscript for details)
Loss (Downside risk)	+	A dummy variable that takes 1 if previous NI is negative, 0 otherwise
CR (Default risk)	-	Credit rating score ranging from 1 - 10
3. Performance		
ROA (Financial performance)	-	Return on assets (=net income /Avg total assets)
4. Ownership Structure		
Bigown	-	Biggest shareholder's share holdings(%)
Foreign	-	Foreign investors' share holdings(%)
5. Fixed effect		
ID		Industry fixed effect
YD		Year fixed effect

Table 2. Sample selection.

Panel A: WACC and AYS sample from 2011–2020	
Initial WACC and AYS Sample from 2011–2020	21,069
Excluding financial firms and firms with insufficient AYS data	(7,966)
Potential Sample	13,103
Excluding firms with no audit & financial data available	(2,016)
Final Sample (Final data used from 2011 to 2020)	11,087

Panel B: WACC by year

Year	Obs.	Mean WACC	Year	Obs.	Mean WACC
2011	1,103	6.88	2016	1,212	4.63
2012	1,150	6.63	2017	1,077	3.97
2013	1,085	5.62	2018	1,075	4.65
2014	1,182	5.17	2019	1,016	4.42
2015	1,248	5.19	2020	939	4.05

Panel C: AYS by year

Year	Obs.	Mean AYS	Year	Obs.	Mean AYS
2011	1,103	7.81	2016	1,212	6.73
2012	1,150	7.61	2017	1,077	6.97
2013	1,085	7.24	2018	1,075	6.51
2014	1,182	7.14	2019	1,016	6.51
2015	1,248	6.80	2020	939	6.50

proxy for business risk using *Beta* (market risk), *Loss* (downside risk), and *CR* (default risk). It is well established that *Beta* and *Loss* will have a positive influence on WACC. A credit rating is a measure of a firm's ability to survive a business cycle (Carey & Hrycay, 2001; Kraft, 2015). Thus, as CR increases, WACC should decrease. Next, profitability is proxied using *ROA*. More profitable firms are less risky; thus, a negative relationship is expected between *ROA* and WACC. We control ownership structures using the percentage ownership of the largest foreign and domestic shareholders. There is evidence that powerful international (Shleifer & Vishny, 1997) and Korean (Mali & Lim, 2019) shareholders have the power to demand the implementation of governance systems and enhanced monitoring. Thus, as shareholder power increases, WACC is expected to decrease. Finally, dummy variables are added for each year and industry to control for year and industry-fixed effects. All variables are winsorized at the top and bottom 1% to control for the effect of outliers.

3.2. Sample selection

Details of the sample selection process are included in Table 2. All firm data is downloaded from the Dataguide 5.0, KISVALUE and TS-2000 databases, then merged into a panel. Initially, 21,069 firm-year observations were downloaded for all firms listed on the Korean Stock Exchange (KRX), over the 2011–2020 sample period. 7,966 firm-year observations are excluded for financial firms and firms with insufficient AYS data. An additional 2,016 firm-year observations are deleted if firms do not have sufficient financial data to conduct the analysis, leaving a final sample of 11,087. In Panel B, the mean of WACC and AYS for each year is provided during the sample period. WACC

decreases on a consistent basis from 2011-2020. This can be expected given South Korea's economic growth. The levels of AYS have decreased by 1.31 years over the 2011–2020 sample period.

4. Empirical results

4.1. Descriptive statistics

Table 3 provides the results of descriptive statistics. In Panel A, mean, median, standard deviation, and maximum/minimum values are shown. All mean and median levels apart from dummy variables are virtually at parity demonstrating a normal distribution. The average level of AYS for South Korean employees is 6.91. The maximum and minimum levels of AYS in years are 18.9 and 1. Next, the results of Person Correlations are provided in Panel B. As expected, there is a negative relationship between AYS and WACC (−0.13***). The results suggest that even without controlling for risk determinants, firms that retain employees enjoy reduced capital costs. All variables show the

Table 3. Descriptive statistics and Pearson correlations.

Panel A: Descriptive Statistics

Stats	*Obs.*	*Mean*	*Median*	*S.D.*	*Max*	*Min*
WACC	11,087	5.15	4.93	1.65	17.14	0.76
AYS	11,087	6.91	6	3.78	18.9	1
Firm Size	11,087	19.06	18.81	1.37	26.16	15.18
Big4	11,087	0.45	0	0.49	1	0
MB ratio	11,087	1.18	0.90	1.08	17.37	−3.12
Beta (Market risk)	11,087	0.89	0.87	0.45	20.24	−0.29
Loss (Downside risk)	11,087	0.28	0	0.45	1	0
CR (Default risk)	11,087	4.79	5	1.91	10	1
ROA (Financial performance)	11,087	1.06	2.52	10.40	26.45	−43.5
Bigown	11,087	0.39	0.38	0.16	1	0.16
Foreign	11,087	0.07	0.02	0.11	0.78	0.00

Panel B: Pearson Correlations

	1.	*2.*	*3.*	*4.*	*5.*	*6.*
1. WACC	1					
2. AYS	−0.13***	1				
3. Firm Size	−0.21***	0.43***	1			
4. Big4	−0.01	0.20***	0.33***	1		
5. MB	−0.27***	0.18***	0.21***	−0.06***	1	
6. Beta (Market risk)	0.59***	−0.09***	−0.02*	−0.04***	−0.06***	1
7. Loss (Downside risk)	0.13***	−0.13***	−0.19***	−0.09***	−0.06***	0.07***
8. CR (Default risk)	−0.08***	−0.04***	−0.07***	−0.07***	−0.04***	0.09***
9. ROA (Financial performance)	−0.09***	0.12***	0.22***	0.09***	0.06***	−0.04***
10.. Bigown	−0.25***	0.19***	0.18***	0.12***	0.16***	−0.19***
11. Foreign	−0.03***	0.18***	0.46***	0.23***	−0.08***	−0.03***

	7.	*8.*	*9.*	*10.*	*11.*	
7. Loss (Downside risk)	1					
8. CR (Default risk)	0.51***	1				
9. ROA (Financial performance)	−0.71***	−0.49***	1			
10. Bigown	−0.16***	−0.16***	0.16***	1		
11. Foreign	−0.14***	−0.22***	0.16***	−0.03***	1	

*Note: See Table 1 for variable definitions. Note3: *, **, *** indicate significance level at 10%, 5%, 1% respectively.

expected sign apart from the Big4/NonBig4 dummy variable. This result shows that without controlling for firm risk, the effect of a Big4/NonBig4 auditor is unlikely to be an intervening variable that influences business risk perceptions.

4.2. Multivariate analysis

In Table 4, OLS regression results are listed. In row 2, the relationship between AYS and WACC is negative after controlling for known WACC/firm risk determinants (coeff – 0.03, t value, – 13.37). The results show that firms that are able to retain their employees for longer periods relative to peers are required to pay lower capital costs. The results also infer that firms that are unable to retain the services of staff are considered riskier by equity/debt providers. Thus, capital providers adjust WACC accordingly by impounding a risk premium into capital costs. The model statistics are highly statistically significant. The adjusted R2 is 0.72 and the F value is 1,531.54. The mean VIF value of 1.71 shows that the model does not have a multicollinearity problem. Independent variables are statistically significant and show the expected sign.

Next, economic significance is reported. One standard deviation of AYS reduces WACC by 0.11 (0.03*3.78). Thus, a 1-year increase in AYS can reduce WACC by 0.11%. Therefore, firm A, with AYS of 12 years, has a 1.10% ([12years-2years] *0.11) lower WACC compared to Firm B, with 2 year's AYS. Thus, each year, if both firms A and B raise $400 million in capital finance, firm A will make a saving of $4.40 million. Over 10 years, firm A would make an incremental saving of $44.00 million. Whether or not the results are economically significant will depend on the firm. We conjecture that the results are economically significant for firms with high borrowing costs, and short AYS. Taken together, the results allow us to accept the first hypothesis.

Table 4. Employment tenure (AYS) and WACC.

Hypothesis: AYS reduces WACC.

Model:

$$WACC_{i,t} = \beta_0 + \beta_1 AYS_{i,t} + \beta_2 Firm\_Size_{i,t} + \beta_3 Big4_{i,t} + \beta_4 MB_{i,t} + \beta_5 Market\_Risk_{i,t} + \beta_6 LOSS_{i,t} + \beta_7 Default\_Risk_{i,t} + \beta_8 ROA_{i,t} + \beta_9 BigOwn_{i,t} + \beta_{10} Foreign_{i,t} + ID + YD + \varepsilon_{i,t}$$

	Pred. sign	Parameter estimate	t-statistic
Intercept	+/-	7.21***	50.17
AYS	-	−0.03***	−13.37
Firm Size	-	−0.08***	−10.17
Big4	-	−0.03*	−1.66
MB ratio	-	−0.05***	−5.95
Beta (Market risk)	+	2.11***	110.56
Loss (Downside risk)	+	0.35***	13.00
CR (Default risk)	-	−0.07***	−12.98
ROA (Financial performance)	-	−0.01***	−7.00
Bigown	-	−0.66***	−12.40
Foreign	-	0.08	0.96
ID		*Included*	
YD		*Included*	
Mean VIF		1.71	
F value		1,531.54***	
Adj. R2		0.7240	
Obs.		11,087	

*, **, *** indicate significance level at 10%, 5%, 1% respectively.

5. Additional analysis

5.1. Investment grade (IG)/ Non-investment grade (NIG) analysis

Next, additional analysis is conducted to add robustness. Capital providers are shown to be effective monitors of risk (Bharath et al., 2008; Carhart, 1997; Dhaliwal et al., 2011; Fama & French, 1992, 2016; Francis et al., 2005). NIG firms are considered to have inherently higher levels of risk, relative to IG firms (Ashbaugh-Skaife et al., 2006; Kisgen, 2006; Mali & Lim, 2019, 2023a). Thus, there is the potential that capital providers interpret the association between AYS and risk differently for IG firms, relative to NIG firms. IG status (low risk) implies that firms possess positive characteristics that enhance a firm's potential to survive a business cycle, including robust financial fundamentals, effective management, an established business strategy, the availability of resources, stability, amongst others (Alissa et al., 2013). Thus, we hypothesise that the positive characteristics inferred by IG status will be perceived by capital providers as a platform that enables human capital (AYS) to further reduce firm risk (consistent with H.1. interpretations). Therefore, for IG firms, an increase in AYS can significantly bolster capital providers' confidence, leading to a relatively more substantial reduction in perceived risk, and thus, decrease in WACC.

On the other hand, NIG status (high risk) is a signal of weaker financial fundamentals, less effective management, a less effective business strategy, less resources, and relatively higher instability. Thus, whilst we hypothesise that AYS will reduce

Table 5. Comparative analyses: Investment grade vs Non-investment grade firms.

Hypothesis: AYS reduces WACC.

Model:

$$WACC_{i,t} = \beta_0 + \beta_1 AYS_{i,t} + \beta_2 IG_{i,t} + \beta_3 AYS{*}IG_{i,t} + \beta_4 Firm\_Size_{i,t} + \beta_5 Big4_{i,t} + +\beta_6 MB_{i,t} + \beta_7 Market\_Risk_{i,t} + \beta_8 LOSS_{i,t} + \beta_9 Default\_Risk_{i,t} + \beta_{10} ROA_{i,t} + \beta_{11} BigOwn_{i,t} + \beta_{12} Foreign_{i,t} + ID + YD + \varepsilon_{i,t}$$

Panel A: Univariate Analyses

		(1) IG	(2) NIG	(3) Diff (1)-(2)
		Mean (Med)	Mean (Med)	t (z)
	Obs.	6,141	4,946	
WACC		5.23(5.01)	5.05(4.83)	5.64***(6.67***)
AYS		7.06(6.21)	6.79(5.81)	3.69***(5.56***)

Panel B: Multivariate Analyses using Audit fees as dependent variable

DV: Audit Hours	Pred. sign	IG vs NIG	IG	NIG
Intercept	+/-	7.10*** (48.83)	7.25*** (31.66)	6.07*** (42.77)
AYS	+/-	−0.02*** (−6.07)	−0.04*** (10.53)	−0.02*** (−6.75)
IG	-	−0.16*** -(3.75)		
*AYS*IG*	+/-	−0.02*** (−4.84)		
Controls		*Included*	*Included*	*Included*
ID		*Included*	*Included*	*Included*
YD		*Included*	*Included*	*Included*
Mean VIF		2.32	1.65	1.67
F value		1,407.96***	542.35***	2,140.40***
Adj. R2		0.7272	0.6273	0.8920
Obs.		11,087	6,141	4,946

Note: *IG* is a dummy variable that takes a value of 1 if a firm is invested grade firms 0 otherwise.
*, **, *** indicate significance level at 10%, 5%, 1% respectively. Figures in parenthesis indicate t value
See Table 1 for variable definitions.

the risk for NIG firms, the negative characteristics impounded into NIG status will be perceived as a limiting factor that mitigates the effect of AYS (human capital) on firm risk. In short, the risk reduction improvements enacted with extended AYS are unlikely to compensate for a firm's high inherent risk status. As a result, we envision that the effect of AYS on risk, hence WACC, will be less substantial (more pronounced) for NIG (IG) firms. Empirical evidence supporting this association would provide evidence that capital providers are nuanced when making risk assessments, based on AYS.

In Table 5, Panel A, mean difference tests show that IG firms are expected to pay higher borrowing costs (5.64***). This result is not surprising, because without controlling for other risk determinants, larger complex IG firms will pay higher capital costs. AYS (3.69***) levels are higher for IG firms, as predicted. In Panel B, regression analysis results infer that regardless of partitioning, AYS reduces WACC for both the IG sample (coeff – 0.04, t value, – 10.53) and the NIG sample (coeff – 0.02, t value, – 6.75). In column 1, a dummy variable takes the value of 1 (0) for IG (NIG) firms. The *AYS**IG interaction term shows that increasing levels of AYS have a more negative effect on WACC for IG firms compared to NIG firms (coeff – 0.02, t value, – 4.84). Taken together, the results suggest that low-risk IG firms (with access to more diverse sources of capital) enjoy reduced borrowing costs, compared to higher-risk NIG firms as AYS increases, consistent with our expectation.

Table 6. Male and female AYS.

Hypothesis: Both male/female AYS reduces WACC.

Model:

$$WACC_{i,t} = \beta_0 + \beta_1 AYS\_Male/Female\_{j,t} + \beta_2 Firm\_Size_{i,t} + \beta_3 Big4_{i,t} + \beta_4 MB_{i,t} + \beta_5 Market\_Risk_{i,t} + \beta_6 LOSS_{i,t} + \beta_7 Default\_Risk_{i,t} + \beta_8 ROA_{i,t} + \beta_9 BigOwn_{i,t} + \beta_{10} Foreign_{i,t} + ID + YD + \varepsilon_{i,t}$$

Panel A: Descriptive statistics

	WACC	*AYS*	*Male_AYS*	*Female_AYS*
Mean	5.15	6.91	7.28	5.37
Median	4.93	6	6.3	4.8

Panel B: Regression analysis

	Pred. sign	
Intercept	+/-	7.56***(51.66)
AYS_male	+/-	−0.02***(−7.17)
AYS_female	+/-	−0.01**(−2.54)
Firm Size	-	−0.09***(−11.32)
Big4	-	−0.03*(−1.77)
MB ratio	-	−0.06***(−6.45)
Beta (Market risk)	+	2.09***(108.71)
Loss (Downside risk)	+	0.36***(12.91)
CR (Default risk)	-	−0.07***(−12.93)
ROA	-	−0.01***(−6.56)
Bigown	-	−0.69***(−12.65)
Foreign	-	0.12(1.30)
ID & YD		Included
Mean VIF		1.76
F value		1,400.47***
Adj. R2		0.7210
Obs.		11,087

*, **, *** indicate significance level at 10%, 5%, 1% respectively.

5.2. Male/female samples

In Table 6, an analysis is conducted to discover the incremental effect of male/female AYS on WACC. Untabulated results show that male (coeff – 0.02, t value, – 7.17) and female (coeff – 0.01, t value, – 2.54) AYS have a similar, negative effect on WACC. The results imply that market participants do not differentiate between male/female employee tenure when making cost of capital assessments. Furthermore, when an analysis is conducted using separated male and female samples, male (coeff – 0.03, t value, – 11.74) and female (coeff – 0.03, t value, – 9.67) AYS is shown to consistently reduce WACC. The results suggest that regardless of gender, AYS consistently reduces WACC.

5.3. Cost of debt/equity

The efficiency-risk hypothesis infers that firms with higher levels of organisational effectiveness are expected to have a higher concentration of debt in their capital structure (Margaritis & Psillaki, 2010). Thus, there is the potential that the incremental effect of AYS on COD may be more negative, compared to COE. Table 7 shows that regardless of whether capital is acquired as equity (coeff – 0,01, t value, – 6.41) or debt (coeff – 0.07, t value, – 5.79), a firm's ability to retain employees reduces capital costs, consistent with the main analysis. In addition, the reduction in COD is more pronounced compared to COE, consistent with the efficient market hypothesis assertion.

COE is determined by; the risk-free rate; firm-specific beta; and market premium, as shown in equation (3). As a result, there will be no variation in the risk-free rate and market-premiums among the sample. The only source of variation in the cost of capital is firm-specific beta, which is controlled for in the empirical model. Therefore, in Table 7,

Table 7. AYS and COE/COD.

Hypothesis: AYS reduces cost of equity (firm risk).

Hypothesis: AYS reduces cost of debt (firm risk).

Model:

$$WACC_{i,t} = \beta_0 + \beta_1 AYS_{i,t} + \beta_2 Firm\_Size_{i,t} + \beta_3 Big4_{i,t} + \beta_4 MB_{i,t} + \beta_5 Market\_Risk_{i,t} + \beta_6 LOSS_{i,t} + \beta_7 Default\_Risk_{i,t} + \beta_8 ROA_{i,t} + \beta_9 BigOwn_{i,t} + \beta_{10} Foreign_{i,t} + ID + YD + \varepsilon_{i,t}$$

	Pred. sign	DV: Cost of equity	DV: Cost of debt
Intercept	+/-	4.85*** (54.11)	11.06*** (14.74)
AYS	-	−0.01*** (−6.42)	−0.07*** (−5.79)
Firm Size	-	0.01* (1.81)	−0.18*** (−4.30)
Big4	-	−0.00 (−0.28)	−0.44*** (−4.39)
MB ratio	-	−0.00 (−0.44)	−0.06 (−1.43)
Beta (Market risk)	+	2.66*** (223.39)	0.07 (0.79)
Loss (Downside risk)	+	0.03** (2.15)	0.66*** (4.78)
CR (Default risk)	-	−0.00 (−0.05)	−0.01 (−0.52)
ROA (Financial performance)	-	−0.00 (−5.17)	−0.08*** (−14.61)
Bigown	-	−0.29*** (−8.70)	−2.16*** (−7.78)
Foreign	-	−0.15*** (−2.67)	0.34 (0.68)
ID		Included	Included
YD		Included	Included
Mean VIF		1.71	1.72
F value		5,122.70***	76.37***
Adj. R2		0.8978	0.1309
Obs.		11,083	11,083

*, **, *** indicate significance level at 10%, 5%, 1% respectively.

the effects of covariates in column (1) may be lower, compared to column (2). Mali and Lim (2022) report that stock price volatility, (estimated as the standard deviation of yearly stock return multiplied by the square root of trading days) can be considered an alternate systematic risk proxy to beta. Therefore, to address the above co-variate issue, the analysis is repeated after replacing beta (equation 3), with stock price volatility. Untabulated empirical results using an alternate systematic risk proxy (SPV) are largely qualitatively indifferent to WACC (Coeff: – 0.04***, t value-10.89, Adj R2 0.4567), COE (coeff – 0,03, t value, – 6.42, Adj R2 0.8979) and COD (coeff – 0.07, t value, – 5.79, Adj R2 0.1309). However, Adj R2 value decreases (0.46). Taken together, the results provide evidence of model robustness, and provides further evidence in support of the efficiency-risk hypothesis.

5.4. Endogeneity issues

A firm's risk may affect employees' decision to stay at the firm (Monsen & Wayne Boss, 2009; Ramlall, 2003). Specifically, Ramlall (2003) reports that job security is one of the factors considered by employees in choosing to remain. Moreover, Monsen and Wayne Boss (2009) point out that department-level entrepreneurial orientation such as risk-taking affects individual workers' decision to leave the organisation. If this is the case, this study may be subject to an endogeneity problem. Specifically, lower WACC may effect an employee's decision to remain at a firm. Thus, to address potential endogeneity issues, additional analyses are conducted.

Firstly, additional analysis is conducted using a propensity score matched (PSM) sample. The PSM 1st stage model is listed below (Equation 8). Following Shipman et al. (2017), we include all variables used in the 2nd stage, in the 1st stage model. After developing the model, based on the closest predicted value from Equation (8), firms with shorter AYS are matched with firms with longer AYS. In order to confirm all the variables are balanced after the matching process, we conduct mean difference tests between the two groups and find that the mean values of all variables disappear in the matched sample. Therefore, we do not reject the null hypothesis of no mean difference for each covariate. For brevity, we report untabulated results. Using the propensity-score matched sample (5,722 firm-year observations), AYS is shown to reduce a firm's WACC (Coeff – 0.03, t value – 5.26, f value 92.27, Adj R2 0.5512).

$$\begin{aligned} AYS_D i,t = {} & \beta_0 + \beta_1 Firm\_Size_{i,t} + \beta_2 Big4_{i,t} + \beta_3 MB_{i,t} + \beta_4 Market_{Risk} i,t \\ & + \beta_5 LOSS_{i,t} + \beta_6 Default_{Risk} i,t + \beta_7 ROA_{i,t} \\ & + \beta_8 BigOwn_{i,t} + \beta_9 Foreign_{i,t} + YD + ID + \varepsilon_{i,t} \end{aligned} \tag{8}$$

where for firm i and fiscal year t:

AYS_D: A dummy variable that takes a value of 1 if AYS is above the median level by industry and year, 0 otherwise.

However, according to Shipman et al. (2017), PSM analysis is motivated to mitigate concerns related solely to functional form misspecification. PSM does not offer a comprehensive remedy to endogeneity issues associated with selection bias emanating from unobservable factors. Thus, while PSM analysis provides evidence that outcomes are not contingent upon systematic dissimilarities in observable covariates (between long-AYS and short-AYS firms), it does not ameliorate endogeneity concerns in a

broader, holistic sense. Therefore, two-stage least square (2SLS) regression analysis is considered to add further robustness (Ullah et al., 2021). We test for endogeneity using the 2SLS model listed in equations (9) and (10). In the first stage regression, Equation (9), (i) $Wage\_per\_capita_{i,t-1}$ (average income, per employee in the previous year) and (ii) *CSR* (Social score provided by Korea Institute of Corporate Governance and Sustainability) are included, along with WACC controls previously introduced in the main analysis.

The literature reports that employee salary expectations are directly associated with AYS (Hausknecht et al., 2009; Hung et al., 2018; Pitts et al., 2011). No previous study infers that the previous year's workforce-level salary is associated with WACC. Thus, we posit that Wage per capita at t-1 will impact AYS at time t, but have no direct impact on WACC at time t. Firms that align their CSR values with employee expectations are shown to retain employees (Kim et al., 2020; Lee & Chen, 2018). However, using South Korean data, Jang et al. (2013) report that CSR does not reduce WACC. Therefore, we include the previous year's CSR scores in the 1st stage model. In equation (9), AYS in period t is listed as the dependent (endogenous) variable.

Model: 1st stage.

$$\begin{aligned} AYS_{i,t} = {} & \beta_0 + \beta_1 Wage\_per\_capita_{i,t-1} + \beta_2 CSR_{i,t-1} + \beta_3 Firm\_Size_{i,t} + \beta_4 Big4_{i,t} + \beta_5 MB_{i,t} \\ & + \beta_6 Market\_Risk_{i,t} + \beta_7 LOSS_{i,t} + \beta_8 Default\_Risk_{i,t} + \beta_9 ROA_{i,t} \\ & + \beta_{10} BigOwn_{i,t} + \beta_{11} Foreign_{i,t} + ID + YD + \varepsilon_{i,t} \end{aligned} \tag{9}$$

Model: 2nd stage

$$\begin{aligned} WACC_{i,t} = {} & \beta_0 + \beta_1 \widehat{AYS}_{i,t} + \beta_2 Firm\_Size_{i,t} + \beta_3 Big4_{i,t} + \beta_4 MB_{i,t} + \beta_5 Market\_Risk_{i,t} \\ & + \beta_6 LOSS_{i,t} + \beta_7 Default\_Risk_{i,t} + \beta_8 ROA_{i,t} + \beta_9 BigOwn_{i,t} \\ & + \beta_{10} Foreign_{i,t} + ID + YD + \varepsilon_{i,t} \end{aligned} \tag{10}$$

Untabulated results show that AYS is positively influenced by $Wage\_per\_capita_{t-1}$ (Coeff 0.00, t value 18.28), and CSR_{t-1} (Coeff 0.65, t value 24.52). All control variables are equivalent to the main analysis. After deriving a value of AYS in Equation (9), the computed predicted AYS value is included as a control variable, in the 2nd stage model, Equation (10). All other control variables are consistent (with Equation 7). Untabulated results show that empirical results are qualitatively indifferent (Predicted AYS, Coeff – 0.04, t value – 5.31). Next, Durbin and Wu-Hausman tests are conducted, where the null hypothesis implies that AYS is exogenous. The Wooldridge score is insignificant, implying that the model (the negative relationship between the two main dimensions) is free from endogeneity (score = 1.11, $p = 0.29$).

Finally, in order to control for the possibility that all variables are dependent across years within a firm, the main analysis is reconducted using the firm fixed effect's approach to control for unobservable time-invariant firm characteristics and to partially mitigate the concern regarding omitted variables. Again, untabulated are consistent with previous findings (Coeff – 0.02, t value – 12.74).

5.5. Other additional analyses

Cost of capital and AYS data may be dependent across years within a firm. Because dependency exists "within a firm" rather than across "years", to address this issue, standard errors are clustered by a firm. Using this approach, results remain qualitatively indifferent (Coeff: – 0.03***, t value – 5.20). We also cluster standard errors for all other analyses conducted and continue to find consistent results. Furthermore, untabulated results show that Fama and MacBeth (1973) yearly regressions (Coeff: – 0.03***, t value – 8.20), Random effect GLS regression (Coeff: – 0.04***, t value – 10.89) and lagged variable analyses (Coeff: – 0.04***, t value-11.68) all show the predicted sign. There may be a concern that AYS is correlated with firm age, suggesting older firms enjoy lower WACC. Thus, the analysis is reconducted after controlling for firm age. Firm age does not have a statistically significant association with WACC. However, AYS's association with WACC is consistent (Coeff, – 0.03, t value – 12.14).

We also conduct additional analysis after controlling for Growth (sales growth), Wage (wage per capita) and CSR (Overall CSR/ESG scores provided by the Korean Institute of Corporate Governance and Sustainability), which may influence both WACC and AYS simultaneously. Untabulated results show that AYS remains significantly negatively associated with WACC (Coeff – 0.04, t value – 11.59). Since the VIF score is far below 10 (1.62), the results are free from multi-collinearity problems. Finally, because AYS is a continuous variable, it may be difficult to interpret the results. To resolve this issue, AYS is presented as an indicator variable that equals one if AYS is above the industry median, 0 otherwise. This value replaces the continuous $\beta_1 AYS_{i,t}$ variable, in equation (7). We report untabulated results that the dummy AYS variable is negatively associated with WACC (Coeff – 0.12), suggesting that the firm group with longer AYS (above the median), has a lower cost of capital compared to firms with relatively shorter AYS.

6. Discussion, conclusion and recommendations

This study makes several important contributions. First, using a unique South Korean dataset, the study shows that after controlling for firm risk determinants, a firm's ability to retain employees for 1 year reduces WACC at an economically significant level of 0.11% (see section 4.2). The results infer that capital providers associate employee tenure with firm risk and, thus, offer lower capital costs to firms with the ability to retain employees (services/experience/knowledge). To the best of our knowledge, this is the very first to show that capital providers associate AYS and firm risk, thus adjust WACC accordingly. The study therefore provides applied business knowledge to management, as well as contributes to the literature by providing clear evidence that firms with an ability to develop strategies to retain employees, will enjoy economic advantages.

Second, the study shows that in a situation where a low-risk (IG) firm is unable to retain employees, capital providers perceive this situation more negatively, hence increase WACC at an incrementally higher rate, relative to an inherently risky (NIG) firm. By providing evidence that capital providers are nuanced when setting WACC rates, based NIG/IG status, the study contributes to the human resource and credit rating/risk literatures. Third, to the best of our knowledge, no previous study captures the potentially different effects AYS can have on COD/COE. A more negative association

is shown to exist between COD and AYS, compared to COE. The study therefore contributes to industry by providing evidence that firms that develop effective human capital strategies (to retain employees) can enjoy cheaper borrowing in the form of COD, thus, extending the efficiency-risk hypothesis literature. Fourth, Stubbs and Higgins (2018) suggest empirical studies demonstrating the value-adding effect of NFR information is limited. This study extends the NFR literature by providing evidence that in a situation where legislators explicitly mandate the availability of numerical (AYS, human capital) NFR information, it can inform the decision-making process of important market participants, consistent with long-standing assertions that structured NFR disclosures can enhance Annual Reporting informativeness (Caddy, 2000; Gowthorpe, 2009; Power, 2001; Siegel, 2006).

Fifth, in leading economies such as the U.S. (Omens et al., 2021) and UK (Lim & Mali, 2021) human capital reporting quality/legislation is relatively weak. In the UK, employers are increasingly providing employees with lower-quality contracts (Farina et al., 2020; Koumenta & Williams, 2019). Thus, a situation has emerged where legislative oversights can disadvantage employees. By comparison, as a result of the introduction of Article 159 in South Korea, transparent firm-level human capital data is available on a yearly basis to allow stakeholders to make assertions about a firm's human capital strategy. The study therefore speaks to how excluding (including) human capital information from the mainstream accounting framework can negatively (positively) impact employees, and as an extension society. Sixth, Babington (2021) and Power (2021) surmise that the financial reporting ecosystem should shift from primarily considering the information needs of investors, to include the requirements of various stakeholders. In line with this assertion, we encourage international legislators to adopt an equivalent policy to Article 159.

Next, avenues for future research are discussed. Future studies may consider the association between AYS (human capital quality variables) and other firm risk determinants, including stock price volatility or Tobin Q. Also, this study does not investigate the mechanism between AYS and the perceptions of capital providers. We encourage future studies to collect questionnaire data to investigate how capital providers interpret employee-level human capital information. Because structured AYS data is unavailable in most countries, results are not easily generalised. To generalise our findings, future studies may adopt a textual analysis approach, such as the one suggested by Hoberg and Maksimovic (2015). Furthermore, implied cost of equity/capital results are not reported because of a lack of analyst coverage in South Korean. Where data is available, future studies may associate human capital/AYS and WACC, using the implied cost of equity/capital.

To conclude, limitations are introduced. Following Hughes et al. (2007), diversifying risk has become an important theoretical issue in the literature. We envision there must be systematic covariance between short employee tenure and something investors/creditors dislike, that leads to higher expected returns. However, whilst unhappy employees can be expected to do poorly, in other firms, they will not. In our bi-directional hypothesis, it is surmised that AYS can be interpreted by market participants in two ways. First, AYS will be associated with higher salary expenses. Thus, higher AYS can infer that firms are in a suboptimal stage of human capital management, as a result of having difficulty turning over staff. However, empirical results provide evidence contrary to this supposition. It can therefore be assumed that debt and equity holders attribute low AYS to

employees voluntarily leaving firms, due to an unsatisfactory work environment, which implies low compensation; lack of growth opportunities; less benefits; and poor work-life balance, etc (voluntary turnover). To extend the literature, we encourage future studies to identify a strategy to determine 4 different types of turnover, (*Good turnover*: (i) inefficient worker voluntarily leaves a firm, (ii) inefficient worker is fired; (*Bad turnover):* (iii) efficient worker voluntarily leaves a firm, (iv) efficient worker is fired), and repeat the analysis using the four sub-samples.

Because of data unavailability, and based on previous studies (Choo et al., 2017; Kim et al., 1998; Lee et al., 2015; Mali & Lim, 2021), we employ the "constant" risk-free rate and risk premium levels provided by the established South Korean database, KISVALUE. However, the assumption that these values are constant over the entire sample period has certain limitations. Regardless, we envision that (1) because of the constant rate, results would not be qualitatively affected by changes in the constant market premium rate, (2) whilst the market risk premium is assumed to be constant over time, firm-specific systematic risk (beta) differently influences the amount of compensation the investor needs for taking on additional risk because it is estimated as β∗Risk Premium. Future studies may explore the effect of different risk premium levels, using international data.

Finally, when conducting 2SLS endogeneity tests, instruments must exhibit a robust correlation with the endogenous variable (AYS), whilst having no correlation with the dependent variable (WACC). Our 2SLS procedure includes variables known to have a significant impact on AYS, whilst having a negligible effect on WACC. We acknowledge that an instrument representing "job satisfaction" would be optimal, as it will directly affect AYS, without influencing WACC. However, this information is unavailable in a numerical/quantifiable format at the firm level. Consequently, we acknowledge the possibility that empirical findings may imply an association between AYS and WACC, rather than a causal link.

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Appendix

Appendix 1: Extract from an Annual Report from a South Korean firm

Employee	Total	Number of people	26,815	28,975	29,184
	Full-time workers	Number of people	26,261	27,824	28,073
	Contract workers	Number of people	554	1,151	1,111
	Ratio of contract workers	%	2.1	4.0	3.8
	Women workers	Number of people	1,750	1,892	1,870
	Ratio of women workers	%	6.5	6.5	6.4
	Total number of women executives	Number of people	1	2	4
	Workers with disabilities	Number of people	640	645	649
	Ratio of workers with disabilities[3]	%	1.7	1.8	1.8
	Training hours per capita[3]	hours	77	71	61
	Training expenses per capita	thousand KRW	1,010	1,091	1,023
	Employee satisfaction[3]	points	72.0	71.9	69.0
	Continuous service[3]	years	12.9	13.7	13.8
	Turnover rate	%	5.1	2.5	3.4
	Rate of return from childcare leave[3]	%	74.0	77.4	97.4

Appendix 2: Employee (Human capital) information in annual report

Samsung Electronic

바. 직원 등의 현황

(기준일 : 2022년 12월 31일) (단위 : 백만원)

직원										소속 외 근로자			비고
사업부문	성별	직원 수				합 계	평 균 근속연수	연간급여 총 액	1인평균 급여액	남	여	계	
		기간의 정함이 없는 근로자		기간제 근로자									
		전체	(단시간 근로자)	전체	(단시간 근로자)								
DX	남	38,023	-	333	-	38,356	16.0	-	-				-
DX	여	11,948	223	94	-	12,042	12.8	-	-				-
DS	남	51,079	-	126	-	51,205	10.5	-	-				-
DS	여	19,777	181	24	-	19,801	10.7	-	-	26,721	11,771	38,492	-
성별합계	남	89,102	-	459	-	89,561	12.9	12,408,336	143				-
성별합계	여	31,725	404	118	-	31,843	11.5	3,189,421	110				-
합 계		120,827	404	577	-	121,404	12.5	15,597,757	135				-

LG Energy Solution

3) 직원 등 현황

(기준일 : 2022년 12월 31일) (단위 : 백만원)

직원										소속 외 근로자			비고
사업부문	성별	직원 수				합 계	평 균 근속연수	연간급여 총 액	1인평균 급여액	남	여	계	
		기간의 정함이 없는 근로자		기간제 근로자									
		전체	(단시간 근로자)	전체	(단시간 근로자)								
에너지솔루션	남	9,115	-	90	-	9,205	7년 4개월	962,120	105				-
에너지솔루션	여	1,804	2	71	-	1,875	5년 2개월	132,996	71	1,182	543	1,725	-
합 계		10,919	2	161	-	11,080	7년 0개월	1,095,116	99				-

SK

나. 직원 등 현황

(기준일 : 2022년 12월 31일) (단위 : 백만원)

직원										소속 외 근로자			비 고
사업부문	성별	직 원 수				합 계	평 균 근속연수	연간급여 총 액	1인평균 급여액	남	여	계	
		기간의 정함이 없는 근로자		기간제 근로자									
		전체	(단시간 근로자)	전체	(단시간 근로자)								
SK㈜	남	3,417	1	110	-	3,527	10.9	421,261	126				-
SK㈜	여	1,005	-	54	-	1,059	8.8	89,420	92	67	36	103	-
합 계		4,422	1	164	-	4,586	10.4	510,681	118				-

Translation

		Employee								Outsourcing worker			
		Number of employees											
		Regular worker		Non-regular worker									
Segment	Gender	Total	Short-term worker	Total	Short-term worker	Total	Average years of service	Total salary per annum	Salary per capita	Male	Female	Total	Others
Seg1	Male												
Seg2	Female												
Total													