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Can employee welfare as measured by an Employee Welfare Index in publicly traded European companies predict firm performance?

Master thesis

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Abstract: This paper investigates the predictive power of a constructed Employee Welfare Index (EWI) and Workforce Index (WFI) on firm performance for European firms, measured as forward stock returns and Tobin's Q. To address reverse causality; we measure firm performance by using forward stock returns and lagged EWI for Tobin's Q, controlling for risk, firm characteristics, and sectors. We find a positive and weak association between the changes in EWI and longer-term forward returns. However, this connection is not as robust as in comparable US studies. Interestingly, in our market-based performance models, the impact of EWI on Tobin's Q is negative and highly significant. While this finding is surprising, this could be explained by the rigid labor market landscape in Europe, marked by stringent regulations, social protections, and a more centralized approach to wage-setting.

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1 Introduction

Environment, Social and Governance (ESG) ratings have become crucial in investment decisions, with institutional investors mainly relying on external providers for these ratings. However, Berg et al. (2019) highlight that a significant variation in ESG ratings exists across different agencies, and Giese et al. (2019) present mixed evidence on whether high ESG scores lead to superior financial performance.

Stakeholder theory suggests that organizations have a responsibility to consider the impact of their actions on all stakeholders because it significantly affects a company's ability to create value. A more nuanced version of stakeholder theory, the business materiality perspective, states that to create value, companies should focus on the most relevant ESG factors in their business or industry (Khan et al., 2016). However, research by Lee and Suh (2022) and Orlitzky et al. (2003) indicates that the relationship between ESG characteristics and financial performance remains inconclusive.

Meanwhile, pioneering research by Edmans (2011) demonstrates that intangible metrics, such as Employee Satisfaction (ES), contribute to value creation in the long run. Having used the Forbes "*100 best companies to work for*" list as far back as data allowed, he found that these companies outperformed their peers in creating financial value over more than three decades.

It has become common knowledge that the US lags behind European countries on Employee Welfare and social benefits; a Llewellyn Consulting report of 2016 compared workplace social programs in European countries and found a pattern in them generally being much more extensive than in the U.S. Union policies over the second half of the 20th century have resulted in European workers enjoying greater job security and fewer working hours. Since a higher marginal tax rate has financed these, Europeans tend to place a higher value on leisure (Alesina et al., 2005), giving rise to the saying, "*Europeans work to live, and Americans live to work*" (Okulicz-Kozaryn, 2011).

Edmans (2011), found that US firms that scored high on Employee Satisfaction outperformed their peers in creating financial value, **a finding which has been the primary motivation for this paper**. Intuitively, one can assume that happy employees are productive employees, but is it possible to test this assumption in a scientifically robust way?

Our main research question becomes:

Does Employee Welfare performance predict value creation in European firms?

It makes intuitive sense that providing better conditions for employees induces higher motivation and retention of the most skilled employees, increasing the net value creation (Edmans, 2021). However, in the context of different priorities of work-life balance, the structure of social benefits, job security and working hours between the US and Europe, the mechanism of Employee Satisfaction may not directly translate to Europe firms since European workers have a higher "base level" of ES.

In this paper, we build and expand on the work above in the following ways;

i) we change the **geographical scope** from the U.S. to Europe, using STOXX 600 constituents within the period 2007-2021 as a broad representation of European publicly traded companies,

ii) we construct an Employee Welfare Index (EWI) based on workforce metrics reported by Refinitiv Eikon within the S-dimension of ESG to act as a proxy of aggregated employee welfare. The aim is not to replicate the methodology behind the *Fortune "100 Best Companies to Work for"* list but to investigate whether **employee welfare metrics** are indicative of value creation, and

iii) accounting for the **materiality of Human Capital** disclosure topics as defined in the Sustainability Accounting Standards Board (SASB) materiality map for firms in our sample.

In short, our analysis intends to assess whether *Employee Welfare* creates firm value in Europe and to determine whether investors fully account for the potential of employee welfare in their valuations.

To investigate the relationship between EWI (WFI) *scores* and firm performance, our research consists of **two main approaches**. The first measures financial performance as forward stock return, evaluated against the lagged change in score, while the second assesses market-based performance as Tobin's Q, against the lagged score level.

We postulate a divergence between Edmans' (2011; 2012) results and ours. Given that employee welfare is generally higher in Europe (Alesina et al., 2005; Okulicz-Kozaryn, 2011), the relationship between EWI scores and financial performance may be weaker in Europe than that found by Edmans (2011) for Employee Satisfaction (ES) in the US. Moreover, we add a dummy to reflect the importance of Human Capital (HC) to the given firm. In line with the findings of Khan et al. (2016), we postulate that when HC is more critical to the core business, increasing EWI (WFI) should have a positive effect on value creation.

From a professional lens, focusing on employee welfare could yield several advantages if a positive relationship exists between EWI and firm performance. First, it can enable investors to achieve higher returns through more efficient capital allocation. This implies that the market underestimates the impact of companies with high employee welfare on stock performance, an oversight perhaps attributable to the limited literature in the area. Second, it would allow management in relevant industries to more consistently put employee welfare aspects on the agenda and thus attract top talent. Modern businesses are expected to emphasize employee satisfaction to attract and retain talent, which can help build a strong brand reputation (Minahan, 2021).

By prioritizing employee welfare, managers can improve the company's competitive strategy, widen its investor base, and attract and retain top talent.

In our results, we find a positive correlation between the changes in EWI and longer-term forward returns in Europe, albeit weaker than the one found by Edmans (2011) in the U.S. This discovery aligns with the initial line of research investigating the impact of employee-friendly practices on firm performance. However, the relative weakness of the link is likely influenced by the strict labour market regulations in Europe, which could establish higher baseline standards for Employee Welfare (Edmans et al., 2023).

When analyzing Tobin's Q, we note a consistently negative association between EWI levels and Tobin's Q, contrasting existing literature. We propose a further examination of the components of Tobin's Q to clarify this finding. While our EWI findings on the role of materiality in stock performance do not confirm findings by Khan et al. (2016), evidence of such a connection appears when analyzing the WFI for firms with material Human Capital disclosure topics.

The rest of our paper is structured as follows: we begin by discussing Background and Literature (Section 2), specifically identifying three main strands of literature to which our analysis connects. This is followed by Data and Approach (Section 3), where we describe the step-by-step process of constructing the Employee Welfare Index (EWI), and compare it with the Workforce Index (WFI). In Methodology and Models (Section 4), we explain the rationale behind our main approaches; changes vs Forward Returns and levels vs Tobin's Q. The outputs of our base models and robustness checks are presented in Results and Robustness (Section 5). We follow with a Discussion (Section 6) of the results and their implications before rounding off in Conclusion (Section 7).

2 Background and Literature

Our research relates to three main strands of literature. The **first** strand deals with the effect of stakeholder theory and firm performance. The **second** strand regards the relationship between employee satisfaction and firm performance in the US. This strand was recently expanded upon by increasing the geographical scope to account for different levels of labor market flexibility. The **third** strand entails the relationship between employee-friendly (Human Resource, HR) practices and individual performance. Our analysis deals with the effect of employee welfare - a reflection of employee-friendly practices and employee satisfaction - on financial performance in the European market.

Strand I: Stakeholder Theory

The first strand of stakeholder theory suggests that organizations should consider the impact of their actions on all stakeholders because it significantly affects a company's ability to create value. Stakeholders include employees, customers, shareholders, suppliers, and the environment. For instance, one can deem employees as a key stakeholder in creating value as they execute the company's strategies that lead to value creation (Aoki, 1984). Stakeholder theory is in contrast to the traditional view of corporate responsibility, which focuses primarily on maximizing profits for the shareholders.

Harrison and Wicks (2013) posit that the concept of value has been overly simplified and limited in scope to focus solely on economic returns, before suggesting that stakeholder theory gives a more apt lens to account for a complex value dynamic. Still, Bird et al. (2007) find a lack of consensus on the relationship between corporate social responsibility (CSR) and firm performance due to inadequate CSR measures, sample size, and methodology. Cennamo et al. (2009) emphasized the need for further research into the relationship between stakeholder treatment and firm performance.

The principle of materiality is a more nuanced version of stakeholder theory. As Khan et al. (2016) demonstrated, firms with high scores in sustainability issues that are highly related to their core business have better future performance than firms that score poorly on the same issues.

Strand II: Employee-Friendly Programs and Firm Value

The second strand of literature presents mixed evidence regarding whether investments in employee-friendly programs create firm value. On the one hand, traditional theories, including Taylor (1911), suggest minimizing employee costs to maximize firm value. The principal-agent theory adopts a zero-sum perspective, supporting this view, where maximizing profit involves keeping employees at their reservation wage. During this period, firms were capital-intensive, and employees performed menial and repetitive tasks. Still, more recently, Faleye and Trahan (2011) show that employee-friendly programs are expensive to implement and may destroy firm value. For instance, such programs may create agency costs: management may excessively pursue employee-friendly programs in a self-serving way (Eisenhardt, 1989). Namely, management can take advantage of the company by receiving excessive compensation because they are generous towards regular employees, which makes employees less likely to object to excess executive pay.

MacDuffie and Pfeffer (1995) look at a possible change in how unions affect the workplace concerning company competitiveness; there is little evidence that unions are harmful, and some evidence suggests positive effects on productivity. Additionally, modern firms are generally (required to be) more customer-centric and emphasize collaboration within and across partnerships. Huselid (1995) demonstrates a relationship between human resource management practices and decreased staff turnover, as well as increased sales, market value, and profits per individual employee. Edmans suggests that employee satisfaction improves a firm's ability to motivate, attract, and retain employees, which enhances firm value (Edmans (2011)). Furthermore, Faleye and Trahan (2011) find that the benefits of supportive labor practices generally surpass the associated costs. In comparison, Edmans (2011) uses future stock return to measure firm performance, while Faleye and Trahan (2011) study profitability, firm value, and long-run stock return. Nevertheless, these studies only focus on the US, which has particularly permissive labor regulations; hence their generalizability to other countries is limited.

Recently, the second strand was geographically expanded upon, where Edmans et al. (2023) argue that the positive effect of employee satisfaction on stock returns varies depending on how flexible the labor market is. Namely, he found the effect more robust in countries with more flexible labor markets, such as the US. While the US has a flexible labour market, Europe has stronger regulations, social protections, and a more centralized system of wage-setting and collective bargaining (Sparrow et al., 1994). Furthermore, there are nuances within Europe. For example, Scandinavia has a particularly rigid labor market, such that when we divide our portfolio into different regions, we expect to see a relatively weaker effect in Scandinavia.

Strand III: Employee-Friendly Practices and Individual Employee Performance

The findings have evolved in the third and largest strand of literature regarding employee-friendly practices and individual performance. Initially, a meta-analysis by Brayfield and Crockett (1955) argued for a "minimal" correlation, and a meta-analysis by Iaffaldano and Muchinsky (1985) found only a low and positive correlation of 0.17. More recently, advocates suggest that high levels of employee well-being cause superior productivity, retention, and customer service. For instance, Somers (1995) and Pandita and Ray (2018) found lower turnover and absenteeism in companies that treat their employees well. Furthermore, less turnover implies lower training costs associated with new hires and can improve productivity, positively influencing firm performance. A meta-analysis by Krekel et al. (2019) finds a strong positive connection between employees' contentment with their organization and indicators of employee productivity, customer loyalty, and employee retention. Related, employees that feel valued are more prone to be more productive (March and Simon, 1958).

Our approach contributes to the existing literature in three main ways. **First**, most studies investigate the relationship between job satisfaction and individual job performance (third strand) rather than its aggregate effect on firm value. Forward stock returns help capture all channels through which employee welfare can impact a firm's value (prioritizing them and accounting for associated costs). It allows for a more comprehensive and risk-controlled analysis. **Second**, the existing literature mainly focuses on the relationship between employee satisfaction and financial performance in the US. These results are not necessarily transferable to Europe, as there are both cultural differences related to work- and life priorities, and labor regulation differences may affect the link. **Third**, our model takes into consideration the distinction between firms for which Human Capital is material and firms for which it is less so, which constitutes a novel approach compared to the studies of Edmans (2011) and Faleye and Trahan (2011).

3 Data and Approach

We begin this section by presenting the Data, specifically the metrics used for Constructing an Employee Welfare Index (EWI), where we explain the rationale behind Metric removal and Metric creation, leading to a Final list of metrics aggregated to a single score. For our analysis, we continue with an introduction of Workforce Index score (WFI), which compares results with the EWI models. We discuss and plot the EWI and WFI score distributions, showing why we standardize them for ease of interpretation and comparison. Inspired by Khan et al. (2016), we discuss how we retrieve and include Materiality of Human Capital topics for the firms in our sample.

3.1 Data

Refinitiv Eikon's **Workforce metrics**, under the Social dimension of ESG data, is the primary source of our approach - to create an Employee Welfare Index (EWI) based on these metrics. However, not all apply to our analysis. We narrowed down the list of metrics included in the final EWI score. For comparison, we include a WFI as a secondary analysis, a workforce score calculated and reported by Refinitiv Eikon based on just 8 of the 84 total metrics. While Refinitiv does not rationalize why they only base the score on 8 metrics, it may be due to data availability and that they believe some metrics are more important than others. As we compare EWI and WFI significance, this allows for discussion of metric relevance.

Nested under "ESG > Social > Workforce", Refinitiv Eikon reports 84 workforce metrics within the broader ESG data. The metrics come in different formats, from Bool $(1, 0)$, ratios $(\%)$, and numerical. They are historical entries available as time-series.

Table 3.1 gives an overview of the essentials behind our analysis; the included firms are large European companies listed on the STOXX600 index during the sample period; $2007 - 2021$. In retrieving the constituent list of the STOXX600 over the time period, we use data for a total of $n = 1037$ companies. Our sample consists of any companies included in the STOXX 600 at any time during the sample period, regardless of whether they have remained in the index – this removes survival bias.

2007-2021	Sample period (15 years) of our analysis
$n = 1037$	Number of companies in STOXX600 during our time period
84	Number of metrics reported in Refinitiv Eikon under "ESG > Social > Workforce"
58	Number of metrics kept in the constructed Employee Welfare Index (EWI)

Table 3.1: Data essentials

3.2 Constructing an Employee Welfare Index (EWI)

The following sections explain why and how we treat each metric. Of the 84 reported metrics, several are overlapping (page 9), redundant (page 8) or irrelevant (page 8).

We construct the EWI index to reflect the *level* of employee welfare, and the score reads as a proxy of aggregated Employee Welfare (EW) in the company. A higher EWI score is interpreted as a higher level of Employee Welfare.

3.2.1 Metric removal

From the 84 reported metrics, we remove a total of 15; 4 due to redundancy and 11 due to irrelevance.

Redundant metrics

By closely examining the list of metrics, we identify some which are perfectly contained in another metric. They are typically reported in **both** a '*total*' **and** a '*per employee*' format. Table 3.2 lists these metrics, which are classified as redundant and thus removed to avoid 'double counting'. One metric, *Number of Employees from CSR reporting* (SOEQDP019), from the Workforce section, is removed in favour of the general and well-reported *Number of Employees* (WC07011) metric, which we use to adjust from 'totals' to a 'per-employee' basis for our *created* metrics, which are further described on page 9.

Symbol	**Name**	**Treatment**
SOEQDP019	Number of Employees from CSR reporting	remove
WC07011	*Number of Employees*	
SOEQDP035	Announced Layoffs	remove
SOEQO10V	Announced Layoffs To Total Employees	
SOTDDP021	Training Costs Total	remove
SOTDO02V	Training Costs Per Employee	
SOTDDP019	Training Hours Total	remove
SOTDDP018	Average Training Hours	

Table 3.2: Redundant metrics

Irrelevant metrics

Table 3.3 shows a list of metrics which are straight-up irrelevant due to their geographical scope. Since our list of firms is European, we exclude 10 %-type metrics for US-listed companies[1], as well as the BBBEE[2] for a total of 11 irrelevant metrics.

Another class of metrics will be removed after they have been combined or transformed into new metrics which captures their original information.

[1]Refinitiv: "Percentage of (employees/managers) for U.S. operations which are {. . . }"
[2]Refinitiv: "Level of broad-based black economic empowerment (BBBEE) for the South African companies where . . . "

Symbol	Name	Data type
SODODP038	Asian - Ethnic Minorities Employees Percentage	%
SODODP044	Asian - Ethnic Minorities Managers Percentage	%
SODODP039	Black or African American - Ethnic Minorities Employees Percentage	%
SODODP045	Black or African American - Ethnic Minorities Managers Percentage	%
SODODP040	Hispanic or Latino - Ethnic Minorities Employees Percentage	%
SODODP046	Hispanic or Latino - Ethnic Minorities Managers Percentage	%
SODODP042	Other - Ethnic Minorities Employees Percentage	%
SODODP048	Other - Ethnic Minorities Managers Percentage	%
SODODP041	White - Ethnic Minorities Employees Percentage	%
SODODP047	White - Ethnic Minorities Managers Percentage	%
SODODP014	BBBEE Level	level 1-8

Table 3.3: Irrelevant metrics are reported for non-European companies only

3.2.2 Metric creation

Some of the remaining metrics contain overlapping information, which will be combined into a new set of metrics that captures the totality of the individual metrics. Others require a size adjustment, and others are transformed by 'flipping the sign' to be consistent in a 'higher is better' proxy of Employee Welfare.

Treatment	Description
combine	new metric captures information from more than one old metric, see table 3.6
div-emp	the new metric is adjusted to a per-employee basis; size-adjustment
flip	when lower is better, the sign of the original metric is flipped

Table 3.4: Types of metric treatments

Combining overlapping metrics

Some subsets of metrics have an internal relationship given by $x_3 = x_1 + x_2$, such that the complete information of both x_1 and x_2 are contained within x_3. For these metrics, we retrieve all x_1, x_2, x_3, but combine them into a newly created metric which captures the totality of the individual measures according to a Hierarchical rule:

IF x_3 is available $\rightarrow$ use x_3	**ELSE** $\rightarrow$ use $x_1 + x_2$

Table 3.5: Hierarchical rule

Since the information contained in a *primary metric* (x_3) is also reported in separate *submetrics* (x_1, x_2), they are *overlapping*. These are combined by their respective subset, as seen in table 3.6, showing 5 subsets of 3 overlapping metrics. Some (*Turnover, Injury Rate*) are listed as ratios, whilst others are numerical. When combined, numerical values will be adjusted to a '*per employee*' basis, and others will have their sign flipped. Metrics and their treatments are shown in table 3.8.

Each subset is combined into a new metric, "**TOTAL** $(\ldots)$" according to the Hierarchical rule; IF $x_3 \rightarrow x_3$, ELSE use $x_1 + x_2$. The bottom two metrics in Table 3.6, *Contractor Fatalities* and *Employee Fatalities*, are combined into a new metric **Total Fatalities**.

Symbol	Name		Type
SOEQDP039	Involuntary Turnover of Employees	x1	%
SOEQDP038	Voluntary Turnover of Employees	x2	%
SOEQDP034	**Turnover of Employees**	**x3**	%
SOHSDP034	Lost Time Injury Rate Contractors	x1	%
SOHSDP035	Lost Time Injury Rate Employees	x2	%
SOHSDP033	**Lost Time Injury Rate Total**	**x3**	%
SOHSDP025	Total Injury Rate Contractors	x1	%
SOHSDP026	Total Injury Rate Employees	x2	%
SOHSDP024	**Total Injury Rate Total**	**x3**	%
SOHSDP028	Contractor Accidents	x1	num
SOHSDP029	Employee Accidents	x2	num
SOHSDP027	**Accidents Total**	**x3**	num
SOHSDP038	Contractor Lost working Days	x1	num
SOHSDP037	Employee Lost Working Days	x2	num
SOHSDP036	**Lost Working Days**	**x3**	num
SOHSDP032	*Contractor Fatalities*	x1	num
SOHSDP031	*Employee Fatalities*	x2	num

Table 3.6: Subsets of overlapping metrics

NEW metric name	Type
TOTAL Lost Time Injury Rate (contractors+employees)	%
TOTAL Lost Working Days (contractors+employees)	num
TOTAL Turnover (involontary+volontary)	%
TOTAL Injury Rate (contractors+employees)	%
TOTAL Accidents (contractors+employees)	num
TOTAL Fatalities (contractors+employees)	num

Table 3.7: New metrics from combined metrics

The new metric ***TOTAL** Lost Working Days*[3], when adjusted to a '*per employee*' basis, is not to be confused with another ratio: *Lost Days To Total Days* (SOHSO02V)[4]. Since the ratios are not exclusive, both are kept.

Other treatments

Non-combined metrics are transformed with a 1:1 treatment. Thus, *17 (old)* metrics (Table 3.6) are combined into **6 new** (Table 3.7) – for a final list of 58 (Table 3.9). Table 3.8 shows how any of the treatments transform 15 metrics; (i) combine according to the Hierarchical rule, (ii) divided by the number of employees, or (iii) flipping the sign to align in a "higher is better" score for Employee Welfare.

Metrics and their treatment	combine	div-emp	flip
Strikes			1
Wages Working Condition Controversies			1
Lost Days To Total Days			1
Diversity and Opportunity Controversies pr employee		1	1
Recent Diversity Opportunity Controversies pr employee		1	1
Employees Health & Safety Controversies pr employee		1	1
Recent Employee Health & Safety Controversies pr employee		1	1
Wages Working Condition Controversies Count pr employee		1	1
Recent Wages Working Condition Controversies pr employee		1	1
Employee Health & Safety Training Hours pr employee		1	
Salaries and Wages from CSR reporting pr employee		1	
TOTAL Lost Time Injury Rate (contractors+employees)	1		1
TOTAL Lost Working Days (contractors+employees) pr employee	1	1	1
TOTAL Turnover (involontary+volontary)	1		1
TOTAL Injury Rate (contractors+employees)	1		1
TOTAL Accidents (contractors+employees) pr employee	1	1	1
TOTAL Fatalities (contractors+employees) pr employee	1	1	1

Table 3.8: Metrics and their treatments

Flipping the sign is the only treatment for the metrics Lost Days to Total Days (SOHSO02V) and the Boolean metrics *Strikes*[5] (SOEQDP037) and *Wages Working Condition Controversies*[6] (SOEQO13V). Other metrics that are subjected to more comprehensive treatments generate 'NA' if none of x_1, x_2, x_3 are present, and similarly for 'div-employee' type metrics, which also generate 'NA' to avoid keeping numerical entries which cannot be adjusted for "number of employees" in the firm.

3.2.3 Final list of metrics

As seen in table 3.8, the top 11 metrics are treated in a 1:1 ratio, whereas the bottom 6 capture the subsets of metrics from Table 3.6. The list of completely untreated metrics (41) is given in table A1.2. In Section 6.3, we open a discussion of the direction and interpretation for a couple of these.

[3]Refinitiv: "Number of lost working days of the employees and contractors." (**Treatment**: divided by the number of employees), see table 3.8

[4]Refinitiv: "Total lost days at work divided by total working days. (Refers to an employee absent from work because of incapacity of any kind, not just as the result of occupational injury or disease)"

[5]Refinitiv: "Has there been a strike or an industrial dispute that led to lost working days?"

[6]Refinitiv: "Is the company under the spotlight of the media because of a controversy linked to the company's employees, contractors or suppliers due to wage, layoff disputes or working conditions?"

	84	Original list of metrics
-	**4**	redundant (Table 3.2)
-	**11**	irrelevant (Table 3.3)
-	**17**	combined (overlapping) (Table 3.6)
+	**6**	'TOTAL ...' (new metrics as seen in Table 3.8)'
=	**58**	**final list of metrics**

Table 3.9: Number of metrics for the final inclusion in EWI

3.2.4 EWI score computation

Having first narrowed down the list and later aligned the direction of the metrics, these 58 metrics are to be combined into a single numerical score for each firm at each point in time based on their availability. This is achieved through a cross-sectional standardization:

1. Each metric (58) is standardized to a $N \sim [0, 1]$[7] distribution, for each year (2007-2021), across all firms (1037)
2. The available metrics are combined into a $1/n$-weighted average EWI score for the firm.

Each company receives an EWI score for each year where metrics are reported, allowing for an analysis of both levels and changes to predict future levels of Tobin's Q and forward returns over the next 12 months.

3.2.5 EWI Essential Assumptions

The construction of the EWI is based on availability in the reported metrics, and the score can be computed when the first of two events occur:

(i) **all** (58) metrics are **reported by all** (1037) companies

(ii) calendar **year ends (31.12)**; score is computed based on what has been reported

Appendix table A1.3 (page 47) shows the availability (%) for the top-25 most reported metrics, of which 23 are Boolean $(1, 0)$. Even though these Boolean metrics are the most well-reported, they barely eclipse 85% availability, which is why we conclude that the EWI score is 'as of 31.12' for the year.

In essence, the EWI score is assumed to be available at 31.12, which is why it is lagged in full-year increments in our models. As seen in the schematic of EWI score availability, the EWI as of 31.12 is effectively the opening level (1.1) for the following year. We are interested in seeing the effects of past $(t-1)$ levels and changes on current (t) levels of Tobin's Q and forward returns, respectively.

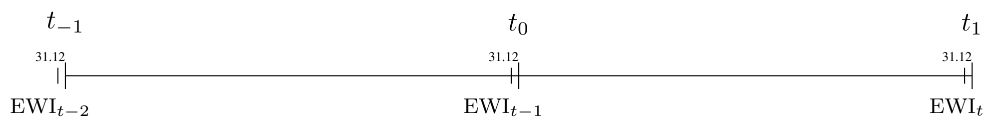

Figure 3.1: Schematic of EWI score availability, as of 31.12

[7] $Z = \frac{X-\mu}{\sigma}$

3.3 Workforce Index score (WFI)

Having computed an aggregated EWI score in Section 3.2.4, we want to evaluate it relative to the WFI score computed by Refinitiv Eikon. The WFI is based on 8 of the 84 workforce metrics and is defined as a measure of a company's effectiveness in terms of providing job satisfaction, a healthy and safe workplace, maintaining diversity and equal opportunities, and development for its workforce (Refinitiv, 2022).

The metrics considered to compute the WFI are presented in Table 3.10, while their respective weighting and scoring methods are shown in Table 3.11.

Workforce metric	Themes	Weight method
TR.WomenEmployees	Diversity and inclusion	Quant industry median
TR.AvgTrainingHours	Career development and training	Transparency weights
TR.TradeUnionRep	Working conditions	Transparency weights
TR.AnalyticLostDays	Health and safety	Quant industry median
Workforce controversy metric		
TR.ControvDiversityOpportunity	Diversity and opportunity controversies	Controversy scores
TR.ControvEmployeeHS	Employee health and safety controversies	Controversy scores
TR.ControvWorkinCondition	Wages or working conditions controversies	Controversy scores
TR.Strikes	Strikes	Controversy scores

Table 3.10: Workforce Index (WFI) metrics explanation

Weighting & scoring methods	Explanation
Industry median	It compares relative median values within each industry group and assigns a weight depending on Refinitiv's materiality - from 1 to 10.
Transparency weights	Weight from 1 to 10 depending on the disclosure percentage in a given industry group.
Controversy scores	Score is based on recent controversies and is benchmarked on the industry group. It also adjusts for market cap bias, for instance, large-cap companies (> 10 billion) attract more media attention.

Table 3.11: Workforce Index (WFI) Weighting and Scoring methods

3.4 EWI and WFI score distributions

We will look at the distributions of EWI and WFI for each year in the sample period. The goal is to normalize both types of scores in a uniform $[0, 1]$ distribution, such that changes from one year to the next can be more easily interpreted; a value of 0.85 would mean that the original value is greater than 85% of all other values in the dataset.

Normalizing EWI

The standard, non-winsorized EWI score of a firm is denoted as 'EWI_0' and has a yearly distribution as seen in Figure 3.2, with the mean (white vertical marker) close to the center in zero (black vertical marker).

We observe a greater spread in the early years $(2007 - 2014)$, whereas the later years $(2015 - 2021)$ display a more compact distribution. Over the total sample, the mean is very close to the center; see more details in Appendix Table A2.2 on page 51. Figure 3.2 supports our assumption that it is close to normally distributed. To make this data more interpretable, we transform the EWI distribution using the Cumulative Distribution Function (CDF) into a range $[0, 1]$ where the values indicate the percentile rank in the dataset.

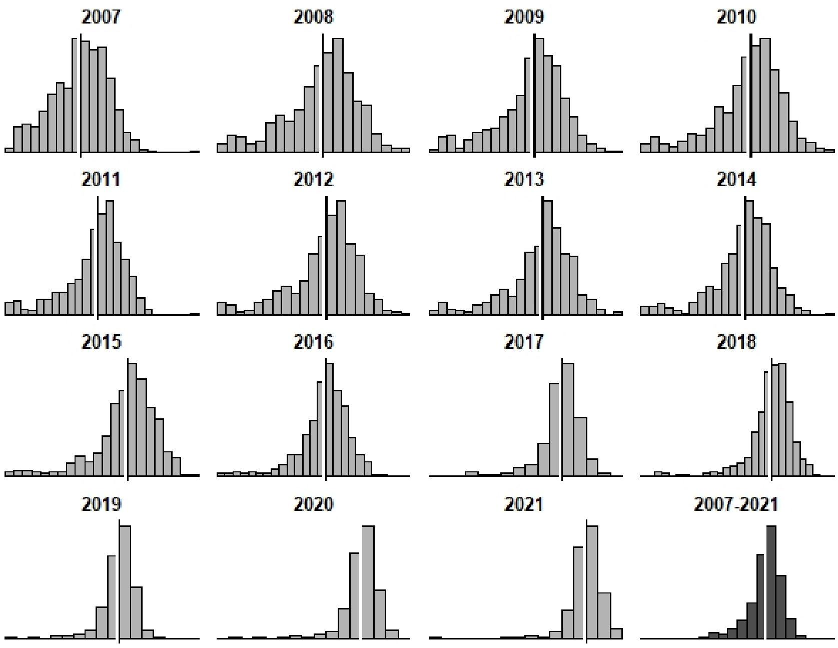

Figure 3.2: Plotted distribution of EWI_0 scores 2007-2021

Vertical marker: white = mean value, black = center (0)

We apply the Cumulative Distribution Function (CDF) for the EWI, whilst for the WFI, we use empirical quantiles to account for the skewed distribution.

Normalizing WFI

A firm's standard, non-winsorized WFI score is denoted as 'WFI_0' and ranges from $0 - 100$. It has a yearly distribution as seen in Figure 3.3, with the mean (white vertical marker) close to the center in fifty (black vertical marker). For each year, the data is heavily skewed to the right, and the skew becomes increasingly pronounced over time. The mean value is hovering around $67-79$ (see Appendix Table A2.4 on page 53). To account for the skewed distribution, WFI scores are transformed using **empirical quantiles**[8] to normalize the yearly levels into a range $[0,1]$ where the values indicate the percentile rank in the dataset.

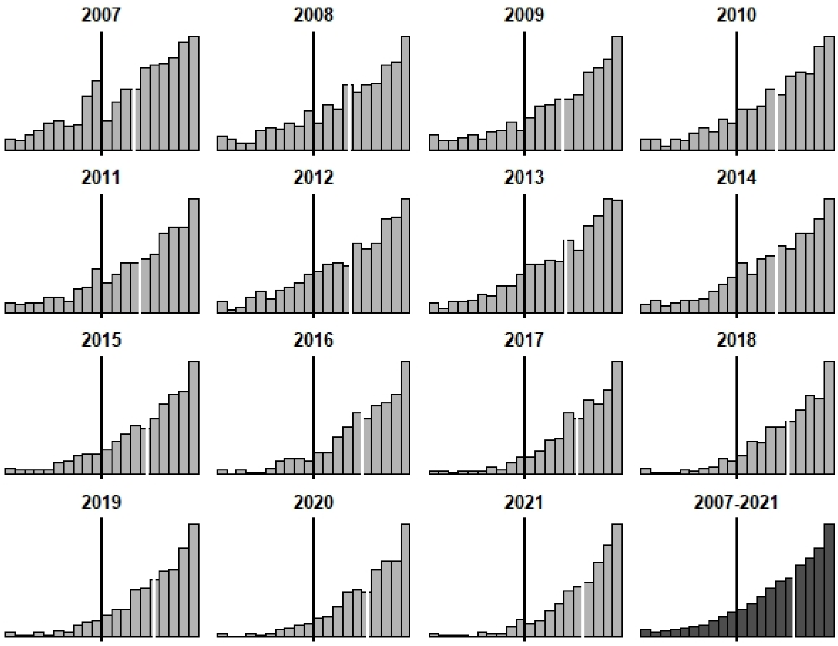

Figure 3.3: Plotted distribution of WFI_0 scores 2007-2021

EWI scores range from 0-100. Vertical marker: white = mean value, black = center (50)

[8] constructed by sorting the data into ascending order to obtain a sequence of order statistics $x_{(1)} \leq x_{(2)} \leq \ldots \leq x_{(n)}$

3.5 Materiality of Human Capital topics

The Sustainability Accounting Standards Board (SASB) was established in 2011 as a nonprofit organization to develop reliable measurement standards for reporting on ESG issues. They have published a 'materiality map' that covers 11 sectors, divided into 77 sub-industries. This map indicates the material ESG issues relevant to companies across various industries and even assigns a degree of importance to each issue within the industry.[9] We used the International Securities Identification Numbers (ISIN) to pair the companies in our sample of $n = 1037$ firms with their respective Sustainable Industry Classification System (SICS[10]) industry code in order to lookup Human Capital material issues. ISIN is also used to map the GICS[11] sector used in our robustness checks, see page 18.

Research by Khan et al. (2016) has shown that firms emphasizing material issues generate superior returns. To explore whether 'Human Capital' is predictive of future value creation (Tobin's Q and Forward Returns), we map each firm's number of Human Capital material disclosure topics into a score $(0, 1, 2, 3)$ based on the number of listed material issues for each firm (Table 3.13).

The Human Capital topics are seen in Table 3.12, with *Labor Practices* being the 'least important', being a 'material' topic for only 10.7% of the firms, and *Employee Health & Safety* being the most material topic - for 32.2% of firms in our sample. Table 3.13 shows that no firm in our sample has all three Human Capital disclosure topics as material, with the majority (94.1%) having either 0 or 1 topics. Since only a small fraction (5.9%) of firms have two material topics, we have opted to use a dummy variable, **HC_dum**, which takes a value of 1 for firms with #HC_mat ≥ 1. A dummy approach assumes that all topics are equally relevant for firms where either is material, we acknowledge this as a limitation in Section 6.2.1.

Human Capital material disclosure topic		**Count**	**(%)**
Labor Practices	LP	111	10.7%
Employee Health & Safety	EHS	334	32.2%
Employee Engagement; Diversity & Inclusion	EEDI	233	22.5%
	Total	678	65.4%

Table 3.12: Human Capital issues, as listed by SASB

Count of companies in our sample of n = 1037 firms having this Human Capital issue listed as material.

#HC material topics	**#Firms**	
0	441	42.5%
1	535	51.6%
2	61	5.9%
3	0	0.0%
SUM	**1037**	**100.0%**

Table 3.13: Number of companies with material Human Capital issues

[9] Exploring Materiality - SASB
[10] SASB's Sustainable Industry Classification System (SICS) not to be confused with (Standard Industrial Classification (SIC)
[11] Global Industry Classification Standard

4 Methodology and Models

We split the methodology into two main approaches; first, we introduce Forward Return Models - changes in EWI & WFI and follow this up with Tobin's Q Model - levels of EWI & WFI. Then, we rationalize relevant risk characteristics to control for, before presenting an Overview of our models. Lastly, we discuss Descriptive statistics.

4.1 Methodology

Introduction - Two Main Approaches

We split our analysis into two main approaches to investigate the relationship between (a) EWI and (b) WFI on firm performance. In the **first approach**, performance is measured as the 12-month **forward stock return**, measured against the *change* in main_IV:

$$\text{(a) } \Delta\text{EWI}_{t-12,t} \rightarrow \text{Return}_{t,t+12} \qquad \text{(b) } \Delta\text{WFI}_{t-12,t} \rightarrow \text{Return}_{t,t+12} \qquad \text{for t in mo.}$$

The choice of forward returns is motivated by two factors, echoing the rationale that Edmans (2011) posited. First, under the concept of market efficiency: a company's market value should, over time, encapsulate all publicly accessible information that impacts its worth (Fama, 1970). The significance of a particular factor can be determined by its impact on the stock market value, as measured in dollars (Fama, 1970). The market value eventually considers how employee welfare metrics impact a company's value (not limited to earnings), prioritizes them based on their level of importance, and accounts for any associated costs. Furthermore, using stock returns as a performance measure allows for a more comprehensive and risk-controlled analysis, which is not as commonly employed in HR and management literature.

Second, studying a firm's current market valuation raises two problems. First, there is the issue of reverse causality, where an increase in market value could result in improvements in Employee Welfare rather than the other way around. Second, stock returns are not persistent and may not immediately reflect the full benefits of employee welfare if investors do not consider it essential. Still, since stock returns help capture all channels through which employee welfare can impact a firm's value, future equity returns enable the market to recognize these benefits eventually.

In the **second approach**, we measure market-based performance as **Tobin's Q**, evaluating it against the level of the main_IV. Following Faleye and Trahan (2011), Tobin's Q is widely accepted as a representative measure of market-based performance or "firm value". A high Tobin's Q ratio suggests that the company's assets are more valuable than their replacement cost, reflecting positive market sentiment and possibly superior financial performance. To mitigate validity threats from simultaneous causality in examining EWI's (and WFI's) effect on market-based performance, we use a 1-year time-lagged EWI similar to Velte (2017), to account for better-performing firms' likely greater investment in employee-friendly practices (Edmans, 2011). We study the main_IV:

$$\text{(a) } \text{EWI}_{t-1} \rightarrow \text{Tobin's Q}_t \qquad \text{(b) } \text{WFI}_{t-1} \rightarrow \text{Tobin's Q}_t \qquad \text{for t in years}$$

We run a range of **robustness checks** for both approaches. We control for sector-specific effects by adding a GICS[12] sector category variable. Also, both levels and changes of the main_IV are winsorized on 1% to remove effects of extreme outliers. For the forward return models, we run additional $\text{fwds(mo)} \in [6, 3, 1]$, as well as lagging ΔEWI and ΔWFI for 24 months. For Tobin's Q models we run regressions with additional EWI $\text{lags} \in \{2, 3\}$ years.

For all models, we calculate standard errors according to the specifications provided by Newey and West (1987) to adjust for autocorrelation and heteroskedasticity.

4.1.1 Anticipated Effects of EWI on Stock Performance and Firm Value

In the **forward return models**, we postulate one main mechanisms *ceteris paribus*; IF $\Delta\text{EWI} > 0 \rightarrow$ leads to *increased value creation* within the company, then the stock's market valuation will increase over a longer time horizon as the generated value materialises. Therefore, we postulate a positive effect on the 12-month forward returns.

Although we anticipate a positive relationship, it is also possible that improvements in EWI could be associated with lower returns if improvements in EWI indicate lower "employee dissatisfaction risk" and therefore reduce the overall risk and return of the firm. For instance, employee dissatisfaction can entail higher turnover rates and strikes, which can impact a firm's stock performance. In the **second model**, the EWI at year $t-1$ could have a positive relationship with firm value, as measured by Tobin's Q ratio in year t. In line with Faleye and Trahan (2011), the market might place a premium on firms with superior EWI scores if it perceives strong employee welfare practices as a net positive.

If EWI and WFI are similar proxies for Employee Welfare, the arguments above apply to both.

4.2 Forward Return Models - changes in EWI & WFI

Our base **model (1)** on forward return, with main_IV (a) EWI and (b) WFI for t in mo.:

$$\begin{aligned}\log(\text{fwd\_return}_{12}) = \alpha &+ \beta_1(\Delta\text{main\_IV}_{t-12,t}) + \beta_2(\text{LogSize}_{t-1}) \\ &+ \beta_3(\text{B/M}_{t-1}) + \beta_4(\text{Return}_{t-12,t-2}) + \beta_5(\text{ROA}_{\text{Yr}-1}) \\ &+ \beta_6(\text{LogAG}_{i,\text{Yr}-1}) + \beta_7(\text{Beta}_{t-1,t-36}) \\ &+ \epsilon_t\end{aligned} \tag{4.1}$$

Model (2) builds on this model by including a dummy variable for Human Capital materiality (HC_dum). This lets us examine the influence of material HC issues on stock performance.

Model (3) builds on model (2) and adds an interaction term between HC_dum. and the main independent variable (main_IV: EWI, WFI). The rationale is to test whether EWI affects returns differently for firms with less material HC and firms with material HC.

[12]Global Industry Classification Standard

To align with the monthly computation of returns, we multiply the yearly scores of $\mathrm{EWI\_CDF}$ and $\mathrm{WFI\_quant}$ by 12, transforming them into a monthly basis. This procedure also explains the lags $\in [12, 24]$ months.

Calculation of forward return

The forward return is measured using the natural logarithm[13]:

$$\log(\frac{P_{fwd}}{P_t}); \Rightarrow \log(1 + \mathrm{r})$$

Where price (P), "*Total Return*" consist of stock price and relevant dividends, gathered from Refinitiv Eikon.Forward returns are calculated with **non-overlapping periods**. This implies that 3-month forwards have only one observation every 3 months, i.e. a third of the 1-month forward observations.

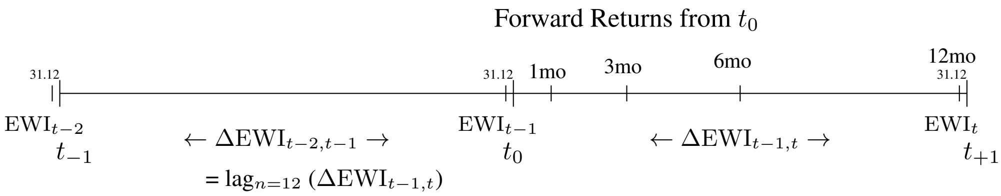

Figure 4.1: Schematic of Forward Return and EWI change

By lagging $\Delta\mathrm{EWI}_{t-1,t}$ one period, we effectively study the change in EWI from $t-2$ to $t-1$, that is over the year prior rather than the current, against the change in 12 mo. stock return between t and $t+1$, for t in years.

4.2.1 Control Variables for Return Models

When analyzing the effect of changes in EWI and WFI on future stock returns, we control for a range of characteristics provided by Lewellen (2014). The characteristics include firm size, $\mathrm{B/M}$, $\mathrm{Return\_} -12, -2$, Beta, ROA, and $\mathrm{AssetGrowth}$, as shown in Table 4.1. We decide to use B/M rather than log B/M[14] because low B/M values would result in substantially negative log values.

While Edmans (2012) opt for Carhart (1997) as control variables, we have chosen Lewellen's firm characteristics for several reasons. Firstly, Lewellen (2014) indicates that cross-sectional regressions deliver relatively reliable estimates of expected returns. Moreover, his study demonstrates that the projections derived from characteristic-based regressions have superior out-of-sample predictive power compared to the CAPM and the Fama and French (1993) three-factor model. Finally, while the Fama factors and Carhart Four are market-based and capture broad risk factors that influence the returns of many stocks, firm characteristics control for factors specific to the individual firm, which can be more relevant when studying EWI and WFI scores, which are also firm-specific. They represent important determinants of a firm's risk profile and expected return. These six firm characteristics with

[13]Our regression outputs uses "log(...)" syntax for the natural logarithm, which is why we use the log notation hereforth. Forward returns are calculated using non-overlapping periods.
[14]Log B/M proposed by Lewellen (2014)

high predictive power share similarities with Fama & French's (2015) 5-factor model plus momentum (Jegadeesh and Titman, 1993). Table (4.1) is an overview table of all variables in the regression.

Variable	Explanation
Dependent variable	
Forward stock return log(fwd_return)	Measured as natural log(P_fwd/P_0) using non-overlapping fwd periods. Price consists of stock price and relevant dividends. Provided by Refinitiv Eikon
Independent variables	
(a) Δ(EWI_0_CDF)	Change in EWI score, normalized with CDF to $[0, 1]$. Non-winsorized. Based on 84 Workforce metrics provided by Refinitiv Eikon (see p 8)
(b) Δ(WFI_0_quant)	Change in WFI score, normalized with empirical quantiles to $[0, 1]$. Non-winsorized. Provided by Refinitiv Eikon, based on 8 metrics.
Control variables	
LogSize_−1	Log market value of equity at the end of the prior month
Return_−12, −2	Stock return from month -12 to month -2 (momentum)
B/M_−1	book value of equity minus log market value of equity at the end of the prior month
LogAG_−1yr	Log growth in total assets in the prior fiscal year
Beta_−1, −36	Market beta estimated from weekly returns from month -36 to month -1 (systematic risk)
ROA_−1yr	(Net Income – Bottom Line + ((Interest Expense on Debt-Interest Capitalized) * (1-Tax Rate))) / Average of Last Year's and Current Year's Total Assets * 100

Table 4.1: Variables in the Return Models

4.3 Tobin's Q Model - levels of EWI & WFI

Tobin's Q is calculated as the market value of equity plus the book value of preferred stock and debt divided by the book value of total assets. Tobin's Q is a yearly measure, thus matching with the EWI (a) and WFI (b) scores and allowing lags to be measured in years.

Our base **Model (4)** on Tobin's Q, with *t* in years, is given by:

$$\begin{aligned} \text{Tobin's Q}_t &= \alpha + \beta_1(\text{main\_IV})_{t-1} \\ &\quad + \beta_2\text{Size} + \beta_3\text{LEV.} + \beta_4\text{R\&D} + \beta_5\text{ROA} + \beta_6\text{CAP.INT} \end{aligned} \tag{4.2}$$

Model (5) builds on this model by including a dummy variable for Human Capital materiality (HC_dum). This lets us examine the influence of more material Human Capital issues on stock performance.

Model (6) builds on model (2) and adds an interaction term between HC_dum and the main independent variable (EWI, WFI). The rationale here is to test whether EWI affects returns differently for firms with less material HC and firms with material HC. Thus, models 4-6 mirror models 1-3, as seen in overview Table 4.3.

4.3.1 Control Variables for Tobin's Q Models

To isolate the effect of EWI and WFI on Tobin's Q, we account for various control variables that are commonly used in the research area (Choi and Wang, 2009; Faleye and Trahan, 2011). These include R&D intensity, leverage, firm size, RoA and capital expenditure intensity, as defined in Table 4.2.

Firstly, we control for **R&D** intensity as it can be an important source of competitive advantage (Kogut and Zander, 1992). Firms that allocate more resources to R&D could likely emphasize Human Capital more, influencing their EWI or WFI scores. Moreover, R&D intensity can affect firm performance by affecting current and future profitability. It is measured as R&D divided by total assets, similar to Faleye and Trahan (2011). Firms with higher R&D intensity may emphasise Human Capital more, which could relate to EWI or WFI score. Moreover, R&D intensity can be related to the firm performance by affecting current and future cash flows.

Despite the limited availability of R&D data from Refinitiv Eikon, we have decided to include R&D intensity as a control variable in our model. Although this choice inevitably excludes some data points, the remaining dataset still offers a sufficient number of observations to make significant inferences. This decision reflects the belief of Choi and Wang (2009) regarding the importance of R&D intensity as a potential determinant of Tobin's Q, thereby improving the specification of our model.

We control for **leverage**, calculated as the ratio between long-term debt and common equity, representing firm risk. Leverage is important because debt structures can propel and limit a firm's performance (Faleye and Trahan, 2011). Additionally, **firm size** is integrated into our model to account for potential economies of scale that larger firms may enjoy (Roberts and Dowling, 2002).

We also use Return on Assets (ROA) as a proxy for profitability, a factor shown to have a positive relationship with Tobin's, Q according to Choi and Wang (2009). (Choi and Wang, 2009). Additionally, we incorporate **capital intensity** as a control variable, recognizing its demonstrated positive correlation with Tobin's Q. (Choi and Wang, 2009). Table 4.2 is an overview of all variables and formulas used in the models, gathered from Refinitiv Eikon.

4.4 Overview of our models

The key characteristics of our models 1-6 are summarized in Table 4.3.

Dependent variable	Explanation
Tobin's Q	Market value of equity plus book value of preferred stock and debt divided by book value of total assets
Independent variables	
(a) EWI_0_CDF (level)	Employee welfare index Based on its CDF level. Based on 84 metrics provided by Refinitiv Eikon (section 3.2). 0 = Non-winsorized.
(b) WFI_0_quant (level)	Workforce score based on its empirical quantile level. It is provided by Refinitiv Eikon, based on only 8 metrics from workforce ratings. 0 = Non-winsorized.
Control variables	
R&D intensity	R&D expenditure / average total assets year t and t-1
LEV	Long-term debt / total assets (Firm risk)
SIZE	Natural logarithm of market value (firm size)
CAPINT	Capital expenditure as % of total assets
ROA	(Net Income – Bottom Line + ((Interest Expense on Debt-Interest Capitalized) * (1-Tax Rate))) / Average of Last Year's and Current Year's Total Assets * 100

Table 4.2: Variables in the Tobin's Q models

Model_id		Dependent Variable	Lag Main IV	HC_dum	Interaction	lags
1	a	log(Return_fwd12mo)	lag(ΔEWI_CDF)			12m
	b	log(Return_fwd12mo)	lag(ΔWFI_quant)			12m
2	a	log(Return_fwd12mo)	lag(ΔEWI_CDF)	HC_dum		12m
	b	log(Return_fwd12mo)	lag(ΔWFI_quant)	HC_dum		12m
3	a	log(Return_fwd12mo)	lag(ΔEWI_CDF)	HC_dum	HC_dum x IV	12m
	b	log(Return_fwd12mo)	lag(ΔWFI_quant)	HC_dum	HC_dum x IV	12m
4	a	Tobin's Q	lag(EWI_CDF)			1 yr
	b	Tobin's Q	lag(WFI_quant)			1 yr
5	a	Tobin's Q	lag(EWI_CDF)	HC_dum		1 yr
	b	Tobin's Q	lag(WFI_quant)	HC_dum		1 yr
6	a	Tobin's Q	lag(EWI_CDF)	HC_dum	HC_dum x IV	1 yr
	b	Tobin's Q	lag(WFI_quant)	HC_dum	HC_dum x IV	1 yr

Table 4.3: Overview of Models 1a - 6b

4.5 Descriptive statistics

Here we report the descriptive statistics and correlations from the period spanning from 2007 to 2021 for the dependent variables, main independent variables (main_IV (a) EWI and (b) WFI), as well as the control variables.

Descriptive Statistics for Return Model

The main independent variables (ΔEWI, ΔWFI) show mean values near zero, suggesting they typically do not change much. The standard deviation of ΔEWI is relatively low (0.06), which signifies that changes in EWI are typically small. The WFI changes have a larger standard deviation (0.13). The 12-month forward return correlates close to zero with ΔEWI (-0.002), with a very low and positive correlation with ΔWFI. Moreover, ΔEWI and ΔWFI are moderately correlated (0.36).

The Human Capital dummy has a mean value close to 0.57, indicating that around 57% of the observations have a Human Capital dummy variable equal to 1, that is number of material HC topics is either 1 or 2 (see table 3.13).

Variable	**Mean**	**Median**	**Std.Dev**	**Min**	**Max**
Panel A - Dependent variables					
Log_Return_fwd12mo	0.08	0.11	0.37	-5.81	1.75
Panel B - Main Independent variables					
EWI_0_CDF_change	0	0	0.06	-0.51	0.61
EWI_CDF_change_win1	0	0	0.06	-0.16	0.21
WFI_0_quant_change	0.01	0	0.13	-0.58	0.83
WFI_quant_change_win1	0.01	0	0.12	-0.3	0.41
Panel C - Control variables					
Beta	1.03	0.97	0.51	-0.73	5.7
B/M_1	0.78	0.55	1.54	0	100
LogSize_1	8.75	8.61	1.49	2.97	13.61
Log_Return_12_2	0.03	0.07	0.38	-4.01	2.53
LogAG_1	0.89	1.45	2.06	-4.61	8.95
ROA_1	5.82	4.81	12.15	-90.85	269.11
HC_dum	0.57	1	0.5	0	1

Table 4.4: Descriptive Statistics for variables in Return Regressions

$\log(\text{Return\_fwd\_12})$ is the dependent variable, calculated using non-overlapping periods, measured as natural $\log(\text{P\_fwd}/\text{P\_0})$, where price includes stock price and any relevant dividends. $\text{LogSize\_} - 1$ is the log market value of equity at the end of the prior month. $\text{Return\_} - 12\_ - 2$ is a stock return from month -12 to month -2. $\text{B/M\_} - 1$ is the book value of equity minus the log market value of equity at the end of the prior month. $\text{LogAG\_yr} - 1$ is the natural log growth in total assets in the prior fiscal year. $\text{Beta\_} - 1, -36$ is estimated from weekly returns from month -36 to month -1 (systematic risk). ROA is (Net Income – Bottom Line + ((Interest Expense on Debt-Interest Capitalized) * (1-Tax Rate))) / (Average Total Assets of year t and t-1) * 100. *Win1* indicates winsorization of the variable on a 1% level.

Descriptive Statistics for Tobin's Q Model

The main independent variables (level of EWI and WFI) reveal that the mean and median values of all EWI and WFI variables are close to 0.52 - 0.53 in the CDF and quantile, showing that these measures are centered around similar values. However, the standard deviation for the WFI variables is considerably larger, suggesting more variation in these measures. The level of EWI and WFI are moderately highly correlated (0.64). Interestingly, the size of a firm is moderately correlated

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Log_Return_fwd12mo	1											
2. EWI_0_CDF_change	-0,002	1										
3. EWI_CDF_change_win1	-0,004	0,979	1									
4. WFI_0_quant_change	0,038	0,356	0,363	1								
5. WFI_quant_change_win1	0,038	0,35	0,36	0,994	1							
6. Beta	-0,016	-0,019	-0,02	0,01	0,011	1						
7. B/M_1	-0,042	-0,015	-0,016	-0,012	-0,013	0,182	1					
8. LogSize_1	-0,005	-0,025	-0,027	-0,016	-0,014	-0,163	-0,181	1				
9. Log_Return_12_2	-0,065	0,008	0,01	0,009	0,011	-0,247	-0,325	0,185	1			
10. LogAG_1	0,047	0,034	0,036	-0,006	-0,006	-0,113	-0,175	0,104	0,093	1		
11. ROA_1	0,073	0,029	0,031	0,02	0,021	-0,133	-0,4	0,09	0,159	0,201	1	
12. HC_dum	-0,015	-0,001	0	-0,001	-0,002	0,002	0,02	-0,127	-0,014	-0,012	0,001	1

Table 4.5: Correlation matrix for variables in forward return regressions from 2007-2021.

with both EWI (0.40) and WFI (0.38), indicating that larger firms tend to score higher in Employee Welfare metrics.

For the value of Tobin's Q, the median value (1.09) is substantially lower than the mean (1.66), indicating a skewed distribution with a few firms having very high Tobin's Q values. Tobin's Q is slightly negatively related to EWI (-0.059), while it has a correlation close to zero with WFI (-0.006). The high correlation of 0.71 between Tobin's Q and ROA underscores the significance of ROA as an essentail control variable in our models.

Variable	**Mean**	**Median**	**Std.Dev**	**Min**	**Max**
Panel A: Dependent variable					
Tobinsq	1.66	1.09	3.02	0.04	80.29
Panel B: Independent variables					
EWI_0_CDF	0.52	0.53	0.11	0.02	0.91
EWI_CDF_win1	0.52	0.53	0.11	0.06	0.75
WFI_0_quant	0.53	0.53	0.29	0	1
WFI_quant_win1	0.53	0.53	0.29	0.01	1
Panel C: Control variables					
R&D intensity	0.02	0.01	0.04	0	0.62
Leverage	87.92	46.18	494.83	0	26352
LogSize	8.91	8.75	1.53	2.8	13.62
ROA	6.44	5.59	14.2	-90.85	269.11
CAPINT	4.35	3.38	3.79	0	55.03

Table 4.6: Descriptive Statistics for variables in Tobin's Q Model.

$\mathrm{Tobin's}$ Q is the dependent variable and is the market value of equity plus the book value of preferred stock and debt divided by book value of total assets. $\mathrm{Leverage}$ is the ratio of long-term debt to total assets. SIZE is the natural logarithm of market value. CAPINT is capital expenditure as a percentage of total assets. ROA is (Net Income – Bottom Line + ((Interest Expense on Debt-Interest Capitalized) * (1-Tax Rate))) / (Average Total Assets of year t and t-1) * 100. *Win1* indicates winsorization of the variable on a 1% level.

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Tobinsq	1										
2. EWI_0_CDF	-0,059	1									
3. EWI_CDF_win1	-0,061	0,999	1								
4. WFI_0_quant	-0,006	0,641	0,643	1							
5. WFI_quant_win1	-0,006	0,641	0,643	1	1						
6. R&D intensity	0,14	-0,077	-0,08	-0,012	-0,012	1					
7. Leverage	-0,022	-0,008	-0,008	-0,024	-0,024	-0,041	1				
8. LogSize	0,025	0,401	0,4	0,383	0,382	-0,037	-0,054	1			
9. ROA	0,711	0,046	0,042	0,027	0,027	-0,016	-0,025	0,085	1		
10. CAPINT	-0,017	0,112	0,112	0,035	0,035	-0,135	-0,006	0,084	0,055	1	
11. HC_dum	0,019	-0,077	-0,077	-0,103	-0,103	0,006	-0,001	-0,127	0,014	-0,023	1

Table 4.7: Correlation Matrix for variables in the Tobin's Q Regressions from 2007-2021.

5 Results and Robustness

In this section we present the output of our models. We begin with the results of Forward Return Models (1-3), which presents a 'base' model (Model 1) in full, before a summary output of all models. This is followed by robustness checks. A similar structure follows for Tobin's Q Models.

5.1 Forward Return Models

The number of observations for models (Models 1-3) is around 8850 over the sample period 2007 – 2021, giving us a large enough sample for analysis. The full output for Model 1, our 'base model' is seen in Table 5.1. The model takes a 12-month non-overlapping forward return and a 12-month lag in the change of the main independent variable (main_IV). In **1a**, the main_IV is the change in EWI CDF; in **1b**, the main_IV is the change in WFI empirical quantile. In this simple model, we have a very low adjusted $R^2 \approx 0.012$, and find no significance in either of the main_IV coefficients.

Model 2 builds on this model by including a dummy variable for Human Capital materiality (HC_dum). This lets us examine the influence of material Human Capital issues on stock performance.

Model 3 builds on Model 2 by adding an interaction term, HC x IV, between the HC_dum and the main independent variable (EWI, WFI). This lets us explore the differential impact of the main IV on returns for firms with less material HC score versus firms with higher HC materiality.

Table 5.2 provides a summary output of the estimated coefficients for our variables of interest in models 1-3. The coefficients are mostly non-significant, except for model 3b, where both the change in WFI and the interaction term (WFI_change x HC_dum) are significant on the 5% level. The WFI change is slightly negative (-0.0848), implying that for each percentile increase in the WFI score, the 12-month forward return decrease by 0.085%, ceteris paribus. The interaction term is positive (0.1277), suggesting that improving WFI score leads to increased forward returns when the firm has material Human Capital issues. The net effect of these terms is positive (0.0429), implying that increasing the WFI score, when the firm has at least one material Human Capital disclosure topics, lead to positive forward returns of about 50% of the magnitude of the negative WFI coefficient. The explanatory power remains at an adjusted R^2 of around 0.012.

fwd = 12, lag = 12	**1a (EWI)**	**1b (WFI)**
(Intercept)	0.0618	0.0598
lag(Δmain_IV)	0.1031	-0.0152
Beta	-0.0032	-0.003
B/M_1	-0.0109	-0.0108
LogSize_1	0.001	0.0011
Log_Return_12_2	-0.0709 ***	-0.0707 ***
LogAG_1	0.0068 **	0.0068 **
ROA_1	0.0021 **	0.0022 **
Adj. R^2	**0.01198**	**0.01168**
N =	**8,852**	**8,842**

Table 5.1: Base model output 1a, 1b

The Δmain_IV in 1a is the change in EWI CDF score, and in 1b it is the change in WFI empirical quantiles HC_dum is a dummy when human capital materiality equals 1 or 2. HC_dum x main_IV is an interaction term between HC_dum and the main independent variable: EWI or WFI. log(Return_fwd_12) is the dependent variable, calculated using non-overlapping periods, measured as natural log(P_fwd/P_0), where price includes stock price and any relevant dividends. LogSize_ − 1 is the log market value of equity at the end of the prior month. Return_ − 12_ − 2 is a stock return from month −12 to month −2. B/M_ − 1 is the book value of equity minus the log market value of equity at the end of the prior month. LogAG_yr − 1 is the natural log growth in total assets in the prior fiscal year. Beta_ − 1, −36 is estimated from weekly returns from month −36 to month −1 (systematic risk). ROA is (Net Income – Bottom Line + ((Interest Expense on Debt-Interest Capitalized) * (1-Tax Rate))) / (Average Total Assets of year t and t-1) * 100. Standard errors are adjusted for serial correlation using Newey and West (1987) standard errors. **Significance: '***' = 0.1%, '**' = 1%, '*' = 5%, '.' = 10%**

Summary outputs: Models 1-3

Model 1	**fwd12, lag12**	**1a**	**1b**
	Δmain_IV	0.1031	-0.0152
	Adj. R^2	0.01198	0.01168
	N =	8852	8842
Model 2	**fwd12, lag12**	**2a**	**2b**
	Δmain_IV	0.1033	-0.015
	HC_dum	-0.0132	-0.0122
	Adj. R^2	0.01217	0.01182
	N =	8852	8842
Model 3	**fwd12, lag12**	**3a**	**3b**
	Δmain_IV	0.0396	-0.0848 *
	HC_dum	-0.0135	-0.0139
	IV x HC	0.1087	0.1277 *
	Adj. R^2	0.01214	0.01221
	N =	8852	8842

Table 5.2: Summary output - Models 1-3

The Δmain_IV in 1a, 2a, 3a is the change in EWI CDF score, and in 1b, 2b, 3b. it is the change in WFI empirical quantiles HC_dum is a dummy when human capital materiality equals 1 or 2. HC_dum x main_IV is an interaction term between HC_dum and the main independent variable: EWI or WFI. log(Return_fwd_12) is the dependent variable, calculated using non-overlapping periods, measured as natural log(P_fwd/P_0), where price includes stock price and any relevant dividends. LogSize_ − 1 is the log market value of equity at the end of the prior month. Return_ − 12_ − 2 is a stock return from month −12 to month −2. B/M_ − 1 is the book value of equity minus the log market value of equity at the end of the prior month. LogAG_yr − 1 is the natural log growth in total assets in the prior fiscal year. Beta_ − 1, −36 is estimated from weekly returns from month −36 to month −1 (systematic risk). ROA is (Net Income – Bottom Line + ((Interest Expense on Debt-Interest Capitalized) * (1-Tax Rate))) / (Average Total Assets of year t and t-1) * 100. Standard errors are adjusted for serial correlation using Newey and West (1987) standard errors. **Significance: '***' = 0.1%, '**' = 1%, '*' = 5%, '.' = 10%**

5.1.1 Robustness Checks Models 1-3

For robustness checks, we add three elements. **First**, to control for sector-specific risks not captured in the Lewellen (2014) firm characteristics for future returns (Models 1-3), we add GICS sector category variables[15]. As mentioned in Section **??**, SASB has defined material issues for companies

[15] GICS provides 11 broad sectors for the 1037 firms in our sample

in their SICS classification[16]. GICS is chosen over SICS to reduce potential correlation with the materiality variable $\mathrm{HC\_dum}$. **Second**, to account for extreme outliers, the changes in $\mathrm{main\_IV}$ are winsorized on 1% level for each year, (see Appendix Tables A2.6, A2.7 for EWI_changes and Tables A2.8, A2.9, for WFI_changes, on pages 55–58). **Third**, the forward return models are run with $\mathrm{fwd} \in [12, 6, 3, 1]$ mo., and $\mathrm{lag} \in [12, 24]$ mo.

Table 5.3 gives the robustness output of $\mathrm{Model\ 1}$ coefficients. First, we find that the adjusted R^2 has doubled (≈ 0.024). Moreover, the EWI change coefficient becomes positive and significant on a 10% level. The $\mathrm{EWI\_change}$ coefficient of 0.136 implies that for each percentile increase in the EWI score, the 12-month forward return increase by 0.136%[17].

Table 5.4 shows a summary output of the robustness checks of Models 1-3 with $\mathrm{lag} = 12$. $\mathrm{Model\ 1a}$ and $2\mathrm{a}$ show that the EWI change coefficient remains positive at 10% significance level for $\mathrm{fwd} \in [12, 6]$ mo. Moreover, the WFI change coefficient from $\mathrm{Model\ 3b}$ remains negative and significant at 5% level for all $\mathrm{fwd} \in [12, 6, 3, 1]$ mo.; the same is true for the positive interaction term.
The **net effect** remains positive, at a magnitude $\approx 50\%$ of the $\Delta\mathrm{EWI\_CDF}$ coefficient. The $\mathrm{HC\_dum}$ variable remains non-significant for all Models 1-3 with an exception for $\mathrm{Model\ 3b}$ on $\mathrm{fwd} = 1$ mo. where it (-0.0012) is significant on a 10% level.

For $\mathrm{lag} = 24$, none of our variables of interest are significant in any of the Models 1-3, as seen in Appendix Table A4.1 (page 60). Adjusted R^2 falls with shorter forwards in both $\mathrm{lag} \in [12, 24]$ mo.; for $\mathrm{fwd} = 1$ mo. it is $\approx 1/10$ of $\mathrm{fwd} = 12$ mo.

[16]SICS (SASB's Sustainable Industry Classification System), not to be confused with SIC (Standard Industrial Classification)

[17]$0.136 \cdot 0.01 \cdot 100\%$

lag=12	1a	1b
(Intercept)	0.0399	0.039
lag(Δmain_IV_win1)	0.1362 .	-0.0188
Beta	0.003	0.0032
B/M_1	-0.0087	-0.0086
LogSize_1	0.0009	0.001
Log_Return_12_2	-0.077 ***	-0.0768 ***
LogAG_1	0.0059 **	0.006 **
ROA_1	0.0019 ***	0.002 ***
GICSConsumer Discretionary	0.0629 ***	0.0611 ***
GICSConsumer Staples	0.0257	0.0264
GICSEnergy	-0.122 ***	-0.1225 ***
GICSFinancials	-0.0121	-0.0122
GICSHealth Care	0.0593 **	0.0603 **
GICSIndustrials	0.0521 **	0.0517 **
GICSInformation Technology	0.0431	0.0432
GICSMaterials	0.032	0.0317
GICSNULL	-0.0309	-0.0323
GICSReal Estate	0.0323	0.0334 .
GICSUtilities	0.0251	0.0246
Adj. R^2	0.02410	0.02375
N =	8852	8842

Table 5.3: Robust Base model output 1a, 1b

The $\Delta\mathrm{main\_IV}$ in 1a, 2a, 3a is the change in EWI CDF score, and in 1b, 2b, 3b it is the change in WFI empirical quantiles. GICS is category variables for each of the (11) sectors in GICS. *Win1* indicates winsorization of the variable on a 1% level. $\mathrm{HC\_dum}$ is a dummy when human capital materiality equals 1 or 2. $\mathrm{HC\_dum}$ x $\mathrm{main\_IV}$ is an interaction term between $\mathrm{HC\_dum}$ and the main independent variable: EWI or WFI. $\log(\mathrm{Return\_fwd\_12})$ is the dependent variable, calculated using non-overlapping periods, measured as natural $\log(\mathrm{P\_fwd/P\_0})$, where price includes stock price and any relevant dividends. $\mathrm{LogSize\_} - 1$ is the log market value of equity at the end of the prior month. $\mathrm{Return\_} - 12\_ - 2$ is a stock return from month -12 to month -2. $\mathrm{B/M\_} - 1$ is the book value of equity minus the log market value of equity at the end of the prior month. $\mathrm{LogAG\_yr} - 1$ is the natural log growth in total assets in the prior fiscal year. $\mathrm{Beta\_} - 1, -36$ is estimated from weekly returns from month -36 to month -1 (systematic risk). ROA is (Net Income – Bottom Line + ((Interest Expense on Debt-Interest Capitalized) * (1-Tax Rate))) / (Average Total Assets of year t and t-1) * 100. Standard errors are adjusted for serial correlation using Newey and West (1987) standard errors. **Significance: '***' = 0.1%, '**' = 1%, '*' = 5%, '.' = 10%**

Robustness checks for Models 1-3 with $\mathrm{lag} = 12$ mo. and $\mathrm{fwd} \in [12, 6, 3, 1]$ mo.

lag = 12mo	**fwd12**		**fwd6**		**fwd3**		**fwd1**	
Model 1	**1a**	**1b**	**1a**	**1b**	**1a**	**1b**	**1a**	**1b**
Δmain_IV	0.1362 .	-0.0188	0.0592 .	-0.0141	0.0262	-0.0052	0.0081	-0.0026
Adj. R^2	0.024103	0.023749	0.010996	0.010890	0.006145	0.006122	0.001857	0.00185
N =	8852	8842	18478	18460	36321	36283	107694	107576
Model 2	**2a**	**2b**	**2a**	**2b**	**2a**	**2b**	**2a**	**2b**
Δmain_IV	0.1364 .	-0.0187	0.0592 .	-0.0141	0.0262	-0.0052	0.008	-0.0026
HC_dum	-0.0141	-0.0132	-0.0047	-0.0041	-0.0026	-0.0023	-0.0011	-0.001
Adj. R^2	0.024331	0.023936	0.011018	0.010896	0.006162	0.006131	0.001875	0.001865
N =	8852	8842	18478	18460	36321	36283	107694	107576
Model 3	**3a**	**3b**	**3a**	**3b**	**3a**	**3b**	**3a**	**3b**
Δmain_IV	0.0544	-0.0901 *	0.0338	-0.0494 *	-0.0003	-0.0266 *	-0.0018	-0.009 *
HC_dum	-0.0145	-0.015	-0.0048	-0.0051	-0.0027	-0.0029	-0.0012	-0.0012 .
IV x HC	0.1414	0.13 *	0.044	0.0646 *	0.046	0.0392 **	0.0171	0.0119 *
Adj. R^2	0.024339	0.024291	0.010988	0.011076	0.006184	0.006270	0.001889	0.001907
N =	8852	8842	18478	18460	36321	36283	107694	107576

Table 5.4: Summary outputs for Models 1-3 Robustness - lag = 12mo

5.2 Tobin's Q Models

The number of observations in Models 4-6 is around 5800 over the sample period $2007 - 2021$, giving us a sufficient sample for analysis. The full output for Model 4, our 'base model' is seen in Table 5.5. The model takes a 1-year lag in the level of the main independent variable (main_IV). In **4a**, the main_IV is the level of EWI CDF, and in **4b**, the main_IV is the level of WFI empirical quantile. In this simple model, we observe a moderately high adjusted $R^2 \approx 0.515$. The lagged EWI is negative (-1.2382) and significant at a 0.1% level. This implies that a 0.01 higher level in the lagged EWI score is associated with a 0.01282[18] lower level of Tobin's Q. Meanwhile, we find no significance for the WFI coefficient.

Similarly to the forward return approach, Model 5 adds HC_dum and Model 6 adds HC_dum and interaction term (HC x IV).

Table 5.6 shows that the EWI_CDF coefficient of Model 4a remains highly significant (on at least 1% level) for Models 4a, 5a, 6a. We also observe that both the HC_dum and the interaction term (HC x IV), similar to the WFI_quant coefficient, are non-significant across Models 4-6.

lag = 1y	**4a (EWI)**	**4b (WFI)**
(Intercept)	1.3474 ***	1.0161 **
lag(main_IV)	-1.2382 ***	-0.0314
'R&D intensity'	11.5065 ***	11.6768 ***
Leverage	0.0001	0
LogSize	-0.0219	-0.0537
ROA	0.1457 **	0.1459 **
CAPINT	-0.0241	-0.026
Adj. R^2	0.51591	0.51390
N =	5834	5829

Table 5.5: Base model output 4a, 4b

EWI is the main IV for 4a. WFI is the main IV for 4b
Tobin's Q is the dependent variable and is the market value of equity plus the book value of preferred stock and debt divided by book value of total assets. Leverage is the ratio of long-term debt to total assets. SIZE is the natural logarithm of market value. CAPINT is capital expenditure as a percentage of total assets. ROA is (Net Income – Bottom Line + ((Interest Expense on Debt-Interest Capitalized) * (1-Tax Rate))) / (Average Total Assets of year t and t-1) * 100. Standard errors are adjusted for serial correlation using Newey and West (1987) standard errors. **Significance: '***' = 0.1%, '**' = 1%, '*' = 5%, '.' = 10%**

5.2.1 Robustness Checks Models 4-6

We saw a significant and negative impact of EWI across Models 4-6. To scrutinize this coefficient, we add **three elements** for robustness checks. **First**, to control for sector-specific risks not captured in the control variables outlined by Choi and Wang (2009); Faleye and Trahan (2011) for Tobin's Q (Models 4-6), we add GICS sector category variables[19]. As mentioned in Section **??**, SASB has defined material issues for companies in their SICS classification[20]. Similar to for Models 1-3, GICS is chosen over SICS to reduce potential correlation with the materiality variable HC_dum. **Second**, to account for extreme outliers, the levels of the main_IV are winsorized on 1% level for each year. See

[18] $1.282 \cdot 0.01$
[19] GICS provides 11 broad sectors for the 1037 firms in our sample
[20] SICS (SASB's Sustainable Industry Classification System), not to be confused with SIC (Standard Industrial Classification)

Model 4	lag 1y	4a	4b
	main_IV	-1.2382 ***	-0.0314
	Adj. R^2	**0.51591**	**0.51390**
	N =	**5,834**	**5,829**
Model 5	**lag 1y**	**5a**	**5b**
	main_IV	-1.2385 ***	-0.0309
	HC_dum	-0.0021	0.0043
	Adj. R^2	**0.51582**	**0.51381**
	N =	**5,834**	**5,829**
Model 6	**lag 1y**	**6a**	**6b**
	main_IV	-1.4617 **	-0.215
	HC_dum	-0.1964	-0.1608
	IV x HC	0.3774	0.3136
	Adj. R^2	0.51579	0.51396
	N =	5834	5829

Table 5.6: Summary output - Models 4-6

EWI is the main IV for 4a, 5a, 6a. WFI is the main IV for 4b, 5b, 6b
$\mathrm{HC\_dum}$ is a dummy when human capital materiality equals 1 or 2. $\mathrm{HC\_dum}$ x $\mathrm{main\_IV}$ is an interaction term between $\mathrm{HC\_dum}$ and the main independent variable: EWI or WFI. $\mathrm{Tobin's}$ Q is the dependent variable and is the market value of equity plus the book value of preferred stock and debt divided by book value of total assets. $\mathrm{Leverage}$ is the ratio of long-term debt to total assets. SIZE is the natural logarithm of market value. CAPINT is capital expenditure as a percentage of total assets. ROA is (Net Income – Bottom Line + ((Interest Expense on Debt-Interest Capitalized) * (1-Tax Rate))) / (Average Total Assets of year t and t-1) * 100. Standard errors are adjusted for serial correlation using Newey and West (1987) standard errors.
Significance: '*' = 0.1%, '**' = 1%, '*' = 5%, '.' = 10%**

Appendix Tables A2.2, A2.3 for EWI_CDF levels and Tables A2.4, A2.5, for WFI_quant levels, on pages 51–54. **Third**, the models are run with $\mathrm{lag} \in [1, 2, 3]$ years.

In the summary Table 5.8, the EWI level coefficient remains negative and highly significant across all Models 4-6. However, the coefficient is slightly less significant (on the 5% level) for Model 6. The WFI level coefficient stays non-significant for all Models 4-6. Further, both the HC_dum and the interaction term HC_dum and interaction term (HC x IV) remains non-significant in Models 4-6. The adjusted R^2 increases with each additional year of main_IV lag, from 0.53 to 0.62 going from $\mathrm{lag} = 1$ year to $\mathrm{lag} = 3$ years, hinting to a possible time delay between the level of EWI and its effect on Tobin's Q.

lag=1y	**4a**	**4b**
(Intercept)	2.6144 **	2.2151 *
lag(main_IV_win1)	-1.2989 ***	0.0068
‘R&D intensity‘	9.4688 ***	9.5925 ***
Leverage	0	0
LogSize	-0.0393	-0.0712
ROA	0.1505 *	0.1508 *
CAPINT	-0.0267	-0.0281
GICSConsumer Discretionary	-1.1823 .	-1.1996 .
GICSConsumer Staples	-0.8953	-0.8874
GICSEnergy	-0.9966 *	-0.9627 *
GICSFinancials	-1.627 **	-1.4108 *
GICSHealth Care	-0.592	-0.5794
GICSIndustrials	-1.2219 .	-1.2028 .
GICSInformation Technology	-1.0737	-1.0379
GICSMaterials	-1.2178 *	-1.2101 .
GICSNULL	-1.1116 .	-1.0807 .
GICSReal Estate	-1.4603 *	-1.3564 *
GICSUtilities	-1.1349 *	-1.1631 *
Adj. R^2	0.52825	0.52555
N =	5834	5829

Table 5.7: Robust Base model output 4a, 4b

EWI is the main IV for 4a. WFI is the main IV for 4b
GICS is category variables for each of the (11) sectors in GICS. *Win1* indicates winsorization of the variable on a 1% level. HC_dum is a dummy when human capital materiality equals 1 or 2. HC_dum x main_IV is an interaction term between HC_dum and the main independent variable: EWI or WFI. Tobin's Q is the dependent variable and is the market value of equity plus the book value of preferred stock and debt divided by book value of total assets. Leverage is the ratio of long-term debt to total assets. SIZE is the natural logarithm of market value. CAPINT is capital expenditure as a percentage of total assets. ROA is (Net Income – Bottom Line + ((Interest Expense on Debt-Interest Capitalized) * (1-Tax Rate))) / (Average Total Assets of year t and t-1) * 100. Standard errors are adjusted for serial correlation using Newey and West (1987) standard errors.
Significance: '*' = 0.1%, '**' = 1%, '*' = 5%, '.' = 10%**

Tobin's Q	Robustness checks for models 4-6 with lags $\in [1, 2, 3]$ years					
	lag = 1 year		**lag = 2 year**		**lag = 3 years**	
Model 4	**4a**	**4b**	**4a**	**4b**	**4a**	**4b**
main_IV	-1.2989 ***	0.0068	-1.0672 **	-0.0879	-1.1302 ***	-0.0319
Adj. R^2	0.528251	0.525546	0.536266	0.534519	0.617565	0.615142
N =	5834	5829	5803	5797	5774	5769
Model 5	**5a**	**5b**	**5a**	**5b**	**5a**	**5b**
main_IV	-1.3049 ***	0.004	-1.0711 **	-0.0908	-1.1336 ***	-0.0345
HC_dum	-0.043	-0.0344	-0.0396	-0.0368	-0.0395	-0.0354
Adj. R^2	0.528275	0.525546	0.536264	0.534506	0.617614	0.615182
N =	5834	5829	5803	5797	5774	5769
Model 6	**6a**	**6b**	**6a**	**6b**	**6a**	**6b**
main_IV	-1.6173 **	-0.2284	-1.3746 *	-0.2255	-1.4402 *	-0.2282
HC_dum	-0.3118	-0.2468	-0.3025	-0.1591	-0.3041	-0.21
IV x HC	0.5205	0.3954	0.511	0.2282	0.5164	0.3272
Adj. R^2	0.528347	0.525908	0.536599	0.534864	0.617794	0.615504
N =	5834	5829	5803	5797	5774	5769

Table 5.8: Summary outputs for Models 4-6 Robustness - lags = 1,2,3 years

6 Discussion

We begin the discussion with results from our models; first Forward Returns, which is followed by Tobin's Q. The discussion continues with Limited Effect of Materiality and the Adjusted R^2 of the models. Further, we cover Methodology limitation and Data limitations, before introducing an EWI metric discussion. Finally, we propose some ideas for Further Research

6.1 Discussion of Results

6.1.1 Forward Returns

Models 1a and 2a show a positive and significant association between changes in **EWI** and longer forward returns after controlling for risk, firm characteristics, sectors, and material Human Capital disclosure topics. This implies that improving the EWI score leads to positive forward returns. On the one hand, this is consistent with the relationship Edmans (2011) found between employee satisfaction (ES) and future stock performance for US firms. Yet, this weaker link may not be surprising given the context of rigid labor markets in Europe, as outlined by Edmans et al. (2023), where regulatory measures may ensure higher baseline standards and benefits for Employee Welfare. This could mean that variations in EWI do not impact returns as much because they are less of a differentiating factor between firms. Investing in Employee Welfare practices beyond this point may not yield sufficient benefits to outweigh the related costs. Despite this, it is important to note that our comparison to Edmans (2011) has its limitations, primarily because EWI is not a direct proxy for employee satisfaction. This idea is further discussed in Section 6.3.

Further, model 3b - which incorporates a dummy variable for HC and an interaction between WFI and this dummy - finds a negative relationship between changes in WFI and forward returns, even after controlling for relevant risk factors and sectors. However, if a firm has at least one Human Capital disclosure topic and increases its WFI score, it has a net positive impact on forward returns. This impact is about 50% as strong as the magnitude of the initial negative WFI coefficient.

We find that the effect of EWI on forward return ($\mathrm{fwd} \in [12, 6]$ mo.) takes some time to become evident, while the impact of WFI manifests at shorter periods $\mathrm{fwd} \in [3, 1]$ mo. This can hint towards the WFI being more readily accessible to investors as it is directly reported and calculated by Refinitiv Eikon. Further, due to the WFI only having 8 metrics as components (Section 3.3), it may not be limited by the 31.12-assumption of EWI (Section 3.2.5). This interpretation aligns with the assumptions of efficient markets quickly incorporating new information.

Edmans (2011) found that firms with higher employee satisfaction led to higher future returns. Our models suggest that increasing the EWI leads to positive forward returns (1a, 2a - see section 5.1). Moreover, the net positive effect of the WFI with interaction term on forward returns (3b) aligns with Khan et al. (2016).

6.1.2 Tobin's Q

For Tobin's Q, the story is the opposite; now, a higher level of EWI implies a lower level of Tobin's Q. Section 5.2 has shown a significant negative correlation between EWI and Tobin's Q after controlling for risk, firm characteristics, sectors, materiality, and winsorization of EWI. There are several possible explanations for this relationship:

I. There could be diminishing returns to employee satisfaction beyond a certain point. Since the baseline is already high in Europe compared to the US (Edmans et al., 2023), further improvements may not yield sufficient increases in market-based performance.

II. It is also possible that the market does not fully value investments in employee welfare, perceiving them as more costly than beneficial, leading to a lower Tobin's Q. In such cases, the numerator of Tobin's Q (market value) may stagnate or even fall if the market perceives the investment as a misallocation of resources. Meanwhile, a high level of EWI may indicate high investments in employee welfare, which increase the denominator (replacement cost or book value) of Tobin's Q.

III. Another possible explanation is that investors might view investments in employee-friendly practices as destroying firm value if the benefits cannot be quantified.

6.1.3 Limited Effect of Materiality

Across Tobin's models and forward return models, the estimated coefficient of materiality (HC_dum) is found to be mostly **not statistically significant**[21], which is inconsistent with the findings presented by Khan et al. (2016), who found that companies addressing material issues tend to outperform their counterparts that overlook these issues.

In the **interaction term** HC x IV in model 3b, we find coefficients for both the main_IV (WFI change) and the interaction term to be significant on a 5% level. The WFI change was negative (-0.0901), and the interaction term positive (0.13), resulting in a net positive effect of increasing the WFI score when the firm has material Human Capital disclosure topics.

6.1.4 Adjusted R^2

Our Forward Return models (1-3) have a much lower adjusted R^2 (at most 0.024 in our robustness checks), signalling that it has low explanatory power. This can be due to several omitted variables, among other factors.

However, the Tobin's Q models (4-6) present a significantly higher adjusted R^2, maintaining a minimum of 0.51 across all Tobin's Q models. This signals that these model are more suitable to explain the impact of the level of our main IVs, EWI and WFI.

[21] with the exception of model 3b for $\text{fwd} = 1$ mo., where it is significant on 10% level

6.2 Limitations

6.2.1 Methodology limitation

The negative correlation between Tobin's Q and EWI is unexpected, as discussed in 4.1.1. Separate regressions of the numerator ("market value") and the denominator ("replacement cost") could clarify which effect is more substantial.

Moreover, our selection of predictive firm characteristics, as proposed by Lewellen (2014), may omit other relevant characteristics. For example, Ang et al. (2006) found that idiosyncratic volatility negatively forecasts upcoming returns over the past 1 to 12 months, even after controlling for various firm features, such as size, B/M, beta, turnover, and momentum.

Theoretically, studying future stock returns has the advantage of incorporating all channels by which employee welfare might influence a firm's fundamental value. Still, these returns may be susceptible to irrational speculation.

It is also worth noting that our dummy approach assumes that all (3) Human Capital disclosure topics are equally relevant when either of them is material (see Section 3.5). This is a limitation which could invite further research.

6.2.2 Data limitations

Regarding the Employee Welfare Index construction, there are **three** main limitations:

First, The EWI scoring method is limited to assigning **equal weights** to each metric regardless of relative importance. For instance, turnover may be a more critical metric than some of the 'Policy' type variables, for instance, "Policy Supply Chain Health & Safety[22]" or "Supplier ESG training[23]".

Second, the metric **alignment** used to build the EWI may need clarification. Several of the metrics in the EWI, both treated (Table 3.8) and untreated (Table A1.2) can benefit from further research on the alignment with a "higher is better" proxy of Employee Welfare in the firms' EWI score. Finally, metrics may not connect to long-term value creation.

Third, the EWI is assumed to be available by 31.12, as it is not fully reported during the year and has to be constructed based on the metrics being available for the firm by year's end, as explained in Section 3.2.5 (Page 12). This presumption underlines the importance of longer forwards, as confirmed by the significance of the EWI change coefficient in Models 1a, 2a at a 10% significance level for $\text{fwd} \in [12, 6]\ \text{mo.}$, but not for shorter fwd. Coupled with the relative drop in adjusted R^2, we find little relevance for the short $\text{fwd}\ [3, 1]\ \text{mo.}$

6.3 EWI metric discussion

Several of the untreated metrics in table A1.2 allow for deeper discussion. In Table 6.1, we have chosen 10 metrics as a starting point for discussion. These have been included in the EWI, 'as is', but

[22]Refinitiv: "Does the company have a policy to improve employee health & safety in its supply chain?"
[23]Refinitiv: "Does the company provide training in environmental, social or governance factors for its suppliers?"

their alignment towards "higher is better" will spark a debate and encourage extended research.

We briefly mention some common concerns as a starting point for further discussion on categorized types of metrics below.

I. Announced Layoffs to Total Employees - appears to favor a "lower is better" approach. However, if layoffs are well-managed, wherein employees may be transitioned into new careers, this efficiency measure could benefit both terminated and retained employees.

II. "Salary gap metrics" - generally considered "bad" for high levels. However Edmans (2021) show that this is not necessarily the case - at least for executives' Salary Gap [24]. Average executive pay has grown quicker than the average worker's, into an increased salary gap spread over the past decade. This follows the growth in average firm size, and the value created by high-level (CEO) decisions scales with firm size. For a deeper discussion on how Employee Welfare may even increase with a greater Salary Gap, we suggest the section on "Pay Ratios" (pages 129-130) in the book "Grow The Pie" by Edmans (2021).

For the Gender Pay Gap[25], the ratio should be 1:1 for the same tasks and responsibilities. For Ethnic Minorities Salary Gap[26], it is unclear from the documentation how it controls for "same work", but also the alignment. From the documentation, we read it as the ratio should converge towards 1, so we have kept the alignment for all Salary Gap metrics. We argue that further documentation into how it is measured would be helpful, and its alignment as the best proxy for Employee Welfare should be researched more.

III. "Gender metrics" - are described by Eikon as "Percentage of Women (employees/managers)". These are aligned in a "higher is better". However the optimal ratio may vary between industries as well as firms. If a $1:1$ ratio between women and men is ideal, the metric value $(\%)$ should be 0.50. On this topic, further research may shed more light on optimal ratios across industries. The metric "New Women Employees" falls under the same discussion.

IV. "Other": Management Departures, HIV-AIDS & Employees with disabilities: have all been kept 'as is' rather than subjectively flipping signs/alignment. For Management Departures[27] (Bool), it may just as well be favorable for Employee Welfare if a 'bad' manager quits as it would be bad if a 'good' manager quits. Further research may be required to properly align other metrics, of which "HIV-AIDS Program" and "Employees with disabilities" may be a starting point.

The conclusion to all untreated metrics (complete list in Appendix Table A1.2 – page 46) is that without an obvious argument as to **why** a metric should be flipped or otherwise treated, we have chosen to keep it 'as is', but we have prioritized type II [28] errors over type I[29].

[24] Refinitiv: "CEO's total salary (or the highest salary) divided by average salaries and benefits"

[25] Refinitiv: "Percentage of remuneration of women to men, often for doing the same work." → ideally converging towards 1.00

[26] Refinitiv: "Percentage of salary gap with racial/ethnicity minority groups." – more detailed documentation on 'same work' required.

[27] Refinitiv: "Has an important executive management team member or a key team member announced a voluntary departure (other than for retirement) or has been ousted?"

[28] a metric which should be flipped is left unchanged

[29] to wrongly flip a metric which should not have been changed

Symbol	Name	Type
SOEQO10V	Announced Layoffs To Total Employees	peremp
SODODP049	Ethnic Minorities Salary Gap	%
SOEQO06V	Salary Gap	%
SODODP016	Gender Pay Gap Percentage	%
SODODP018	New Women Employees	%
SODODP017	Women Employees	%
SODODP019	Women Managers	%
SOEQDP036	Management Departures	Bool
SOHSDP039	HIV-AIDS Program	Bool
SODODP032	Employees with disabilities	%

Table 6.1: Metrics to spark discussion and research

6.4 Further Research

We have three main suggestions for further research:

First, our analysis could be enriched by dividing the STOXX Europe firms into regions based on their labor market flexibility. This could be achieved by introducing dummy variables based on a proxy for labor market flexibility levels.

Second, one can investigate individual metrics' explanatory power on forward returns, splitting the EWI into its components and looking to establish a panel. This would allow one to purposefully create a weighted EWI index based on the relative importance of each metric.

Finally, similar to the approach by Hong and Kacperczyk (2009), one addition to the methodology is to execute a portfolio analysis using a long-short portfolio strategy concentrated on the upper and lower quintiles of variations in EWI scores. In that case, using Fama 5 factors and momentum would make it comparable to the risk characteristics used in our study (see page 20).

7 Conclusion

We find a positive relationship[30] between changes in EWI and longer[31] **forward returns**, but perhaps a weaker link than that found in the US by Edmans (2011). This aligns with the second strand of literature, which looks at the impact of employee-friendly practices on firm performance. Moreover, this weaker link may not be surprising given the context of rigid labor markets in Europe, as Edmans et al. (2023) outlined, where regulatory measures may ensure higher baseline standards and benefits for Employee Welfare.

However, in the **Tobin's Q** analysis, we find a consistently negative relationship between levels of EWI and Tobin's Q, which is inconsistent with Faleye and Trahan's (2011) findings. Notably, the Tobin's Q models present substantially higher goodness-of-fit compared to the forward return models. As proposed earlier (page 38), separate regressions on the numerator and denominator may unpack this negative association. Meanwhile, the WFI is non-significant across all Tobin's Q models. If management opts for a shotgun strategy to achieve a high EWI score, it is associated with a lower Tobin's Q, potentially suggesting that the market does not fully appreciate these broad efforts.

For **EWI models**, our results concerning the role of materiality in stock performance do not echo Khan et al.'s (2016) findings on outperformance among firms with high scores on material issues. For the WFI models, the coefficient is negative in isolation but gives a net positive effect through the interaction term for firms with material Human Capital disclosure topics (3b).

From a professional standpoint, our results present a nuanced relationship between Employee Welfare and firm performance in Europe. For investors, a positive link between firms increasing their EWI score and forward returns may be noted, although these models have low explanatory power. A noteworthy observation for firms improving their WFI score (only 8 metrics) is the impact of material Human Capital issues. If a firm without material Human Capital topics improves its WFI score, it negatively impacts forward returns. Yet, if Human Capital is material, an increase in WFI yields a net positive effect on forward returns.

Despite its grounding in ESG Workforce metrics, the constructed EWI may not accurately reflect Employee Welfare or Satisfaction, as it includes a hodgepodge of equally weighted metrics.

[30] at a 10% significance level

[31] $\text{fwd} \in [12, 6]$ months

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Appendix

A1 Tables

A1.1 List of Abbreviations

List of Abbreviations	
HC	Human Capital
ES	Employee Satisfaction
EW	Employee Welfare
IV	Independent Variable
CSR	Corporate Social Responsibility
ESG	Environmental, Social and Governance
EWI	Employee Welfare Index, constructed
WFI	Workforce Score Index, reported
GICS	Global Industry Classification Standard
ISIN	International Securities Identification Number
SIC	Standard Industrial Classification
SICS	Sustainable Industry Classification Standard
SASB	Sustainability Accounting Standards Board
STOXX 600	Stock index of European stocks

Table A1.1: List of Abbreviations

A1.2 List of Unchanged metrics

Symbol	Name	Data type
SOEQO10V	Announced Layoffs To Total Employees	peremp
SOEQDP047	**Average Employee Length of Service**	**years**
SOTDDP018	Average Training Hours	peremp
SODODP027	Day Care Services	Bool
SODODP013	Employee Resource Groups	Bool
ECPEDP039	Employee Satisfaction	%
SOHSDP014	Employees Health & Safety OHSAS 18001	Bool
SOHSDP004	Employees Health & Safety Team	Bool
SODODP032	Employees with disabilities	%
SODODP037	Ethnic Minorities Employees Percentage	%
SODODP043	Ethnic Minorities Managers Percentage	%
SODODP049	Ethnic Minorities Salary Gap	%
SODODP026	Flexible Working Hours	Bool
SODODP016	Gender Pay Gap Percentage	%
SOHSD01V	Health & Safety Policy	Bool
SOHSDP0081	Health & Safety Training	Bool
SOHSDP039	HIV-AIDS Program	Bool
SODODP023	**HRC Corporate Equality Index**	**Score**
SOHSDP021	HSMS Certified Percentage	%
SOHSO01V	Injuries To Million Hours	%
SOTDDP023	Internal Promotion	Bool
SOEQDP036	Management Departures	Bool
SOTDDP024	Management Training	Bool
SOEQO08V	Net Employment Creation	%
SODODP018	New Women Employees	%
SOHSDP030	Occupational Diseases	%
SOTDDP0092	Policy Career Development	Bool
SODODP0081	Policy Diversity and Opportunity	Bool
SOHSDP0121	Policy Employee Health & Safety	Bool
SOTDDP0091	Policy Skills Training	Bool
SOHSDP0123	Policy Supply Chain Health & Safety	Bool
SOTDD01V	Training and Development Policy	Bool
SOEQO06V	Salary Gap	%
SOTDDP030	Supplier ESG training	Bool
SOHSDP0183	Supply Chain Health & Safety Improvements	Bool
SOHSDP0083	Supply Chain Health & Safety Training	Bool
SODODP0151	Targets Diversity and Opportunity	Bool
SOEQDP031	Trade Union Representation	%
SOTDO02V	Training Costs Per Employee	peremp
SODODP017	Women Employees	%
SODODP019	Women Managers	%

Table A1.2: List of (41) unchanged metrics for EWI

See also table 3.8 listing the new metrics to capture the essence of treated metrics in the total index.

metricname	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Avg.
Wages Working Condition Controversies	67.50%	70.11%	71.84%	74.25%	75.99%	76.57%	77.05%	78.88%	81.10%	81.49%	83.99%	85.25%	83.99%	82.55%	78.11%	**77.91%**
Health & Safety Policy	67.21%	69.91%	71.75%	74.16%	75.80%	76.37%	76.95%	78.88%	81.10%	81.49%	83.99%	85.25%	83.99%	82.55%	78.11%	**77.83%**
Announced Layoffs To Total Employees	67.21%	69.91%	71.65%	74.16%	75.80%	76.37%	76.95%	78.88%	81.10%	81.49%	83.99%	85.25%	83.99%	82.55%	78.11%	**77.83%**
Training and Development Policy	67.12%	69.82%	71.65%	74.06%	75.70%	76.28%	76.86%	78.78%	81.00%	81.39%	83.90%	85.15%	83.90%	82.45%	78.01%	**77.74%**
Policy Diversity and Opportunity	67.12%	69.62%	71.65%	73.96%	75.60%	76.57%	76.86%	78.40%	80.81%	81.39%	83.51%	85.25%	84.09%	82.74%	78.40%	**77.73%**
Policy Skills Training	67.31%	69.82%	71.46%	73.87%	75.51%	76.18%	76.66%	78.40%	80.52%	81.29%	83.41%	85.15%	83.99%	82.64%	78.30%	**77.63%**
Policy Career Development	67.31%	69.72%	71.55%	73.96%	75.51%	76.18%	76.37%	78.40%	80.62%	81.20%	83.41%	85.15%	83.99%	82.64%	78.30%	**77.62%**
Policy Employee Health & Safety	67.12%	69.53%	71.36%	73.67%	75.12%	76.08%	76.18%	78.11%	80.81%	81.20%	83.32%	85.15%	83.99%	82.64%	78.30%	**77.51%**
Health & Safety Training	67.21%	69.53%	71.26%	73.67%	75.22%	76.08%	76.08%	77.82%	80.52%	80.91%	82.93%	85.25%	84.09%	82.74%	78.40%	**77.45%**
Management Training	66.83%	69.24%	71.17%	73.48%	74.93%	76.18%	76.18%	77.92%	80.04%	80.71%	82.74%	84.96%	83.80%	82.45%	78.11%	**77.25%**
Employees Health & Safety Team	67.02%	69.24%	70.88%	73.48%	74.83%	76.08%	76.08%	77.63%	80.23%	80.71%	81.97%	85.25%	84.09%	82.74%	78.40%	**77.24%**
Flexible Working Hours	66.92%	69.33%	71.07%	73.77%	75.12%	75.99%	75.80%	77.15%	79.36%	79.85%	81.20%	85.15%	83.99%	82.64%	78.30%	**77.04%**
Internal Promotion	67.21%	69.62%	71.46%	73.67%	74.93%	75.99%	75.70%	76.86%	79.07%	79.65%	80.52%	85.25%	84.09%	82.74%	78.40%	**77.01%**
Employees Health & Safety OHSAS 18001	66.92%	69.05%	70.78%	73.38%	74.45%	75.89%	75.12%	76.57%	80.04%	80.62%	81.49%	85.25%	84.09%	82.74%	78.40%	**76.98%**
Policy Supply Chain Health & Safety	66.63%	68.85%	70.30%	73.38%	74.64%	75.89%	75.31%	76.28%	79.07%	79.75%	80.81%	85.15%	83.99%	82.64%	78.30%	**76.73%**
Day Care Services	66.73%	68.56%	70.40%	73.29%	74.25%	75.89%	75.12%	75.89%	78.59%	79.36%	79.85%	85.25%	84.09%	82.74%	78.30%	**76.55%**
Supply Chain Health & Safety Training	66.63%	68.37%	70.20%	72.90%	74.25%	75.80%	75.12%	75.60%	78.30%	79.36%	79.27%	85.25%	84.09%	82.74%	78.40%	**76.42%**
Supplier ESG training	65.77%	68.27%	70.30%	72.90%	74.06%	75.80%	74.83%	75.70%	78.50%	79.46%	79.46%	85.25%	84.09%	82.74%	78.40%	**76.37%**
HIV-AIDS Program	66.54%	68.85%	70.59%	73.29%	74.16%	75.60%	74.83%	75.31%	78.30%	78.98%	78.40%	85.15%	83.99%	82.64%	78.30%	**76.33%**
Net Employment Creation	66.44%	69.14%	71.07%	73.38%	74.45%	74.73%	75.51%	76.18%	78.59%	79.36%	82.35%	83.70%	81.97%	80.71%	76.37%	**76.26%**
Management Departures	66.63%	68.47%	70.11%	72.81%	73.87%	75.70%	75.12%	75.60%	78.01%	78.98%	77.92%	85.25%	84.09%	82.74%	78.40%	**76.25%**
Strikes	66.83%	68.47%	70.20%	72.81%	73.87%	75.60%	74.73%	75.12%	78.01%	78.88%	78.21%	85.25%	84.09%	82.74%	78.40%	**76.21%**
Employee Resource Groups	65.77%	67.98%	70.01%	72.81%	73.77%	75.60%	74.64%	75.02%	77.82%	78.69%	77.92%	85.15%	83.99%	82.64%	78.30%	**76.01%**
Targets Diversity and Opportunity	43.88%	56.03%	65.86%	72.61%	74.25%	75.99%	75.51%	75.51%	78.69%	79.17%	79.27%	85.25%	84.09%	82.74%	78.40%	**73.82%**
Supply Chain Health & Safety Improvements	40.41%	51.49%	64.61%	72.42%	73.87%	75.60%	74.54%	74.83%	77.82%	78.88%	78.11%	85.25%	84.09%	82.55%	78.11%	**72.84%**

Table A1.3: Top 25 metrics reported (availability %)

metricname	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Avg.
Recent Diversity Opportunity Controversies per_emp	0.00%	0.00%	0.00%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.19%	0.58%	**0.29%**
Recent Employee Health & Safety Controversies per_emp	0.00%	0.00%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.10%	0.10%	0.19%	0.19%	0.77%	1.74%	**0.45%**
Recent Wages Working Condition Controversies per_emp	0.00%	0.00%	0.00%	0.10%	0.29%	0.00%	0.00%	0.10%	0.00%	0.10%	0.00%	0.00%	0.19%	1.16%	4.63%	**0.94%**
Diversity and Opportunity Controversies per_emp	2.12%	1.74%	1.25%	0.87%	1.25%	1.25%	0.87%	0.29%	0.48%	0.68%	0.48%	0.68%	0.96%	0.39%	0.87%	**0.95%**
Average Employee Length of Service	0.00%	0.00%	0.00%	0.10%	0.29%	0.00%	0.00%	0.10%	0.00%	0.10%	0.00%	0.00%	0.19%	1.16%	4.73%	**0.95%**
Ethnic Minorities Salary Gap	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.16%	1.25%	**1.21%**
Ethnic Minorities Managers Percentage	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.19%	0.39%	1.83%	2.89%	**1.33%**
Employees Health & Safety Controversies per_emp	2.22%	3.18%	2.31%	3.18%	3.86%	3.38%	2.70%	2.99%	0.58%	0.87%	0.29%	1.35%	1.16%	1.06%	0.29%	**1.96%**
Ethnic Minorities Employees Percentage	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.19%	0.48%	2.31%	5.50%	**2.12%**
Wages Working Condition Controversies Count per_emp	0.19%	2.12%	2.89%	4.73%	5.01%	3.28%	2.99%	2.60%	1.93%	2.31%	2.80%	2.99%	4.82%	2.12%	0.87%	**2.78%**
HRC Corporate Equality Index	1.93%	3.09%	3.57%	1.93%	2.80%	2.89%	2.99%	2.89%	3.47%	3.95%	5.30%	5.50%	6.46%	6.65%	6.56%	**4.00%**
Employee Health & Safety Training Hours per_emp	3.86%	4.92%	5.69%	6.36%	7.33%	8.10%	8.78%	9.55%	9.26%	8.68%	9.16%	8.97%	8.68%	9.16%	8.29%	**7.79%**
HSMS Certified Percentage	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.10%	0.39%	0.58%	10.80%	14.37%	16.78%	17.84%	17.74%	**9.82%**
Occupational Diseases	3.95%	4.34%	5.40%	6.56%	7.81%	9.06%	10.90%	11.57%	12.34%	13.79%	15.53%	16.01%	17.55%	17.55%	16.20%	**11.24%**
Employees with disabilities	2.51%	8.78%	9.74%	10.51%	12.34%	13.11%	13.79%	14.95%	16.10%	16.59%	17.55%	17.84%	17.74%	19.19%	18.61%	**13.96%**
Employee Satisfaction	2.70%	9.64%	11.28%	11.38%	14.08%	14.37%	16.10%	17.65%	18.03%	19.00%	19.77%	22.18%	24.49%	24.20%	26.33%	**16.75%**
New Women Employees	3.38%	4.34%	5.79%	6.75%	10.51%	12.73%	14.85%	16.78%	17.74%	20.15%	24.59%	26.71%	29.12%	31.15%	31.82%	**17.09%**
Gender Pay Gap Percentage	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.10%	0.96%	16.68%	24.69%	25.55%	27.29%	26.90%	**17.45%**
Training Costs Per Employee	13.11%	16.30%	16.30%	17.26%	18.13%	18.80%	18.90%	19.29%	19.58%	19.09%	19.29%	18.23%	17.84%	17.74%	17.16%	**17.80%**
Salaries and Wages from CSR reporting pr employee	35.00%	17.36%	18.71%	22.66%	24.40%	24.30%	23.82%	23.34%	22.85%	23.05%	24.11%	24.20%	24.01%	24.20%	23.72%	**23.72%**
Lost Days To Total Days (flipped)	15.14%	16.30%	16.49%	18.32%	20.44%	22.18%	24.49%	25.17%	26.33%	27.58%	29.99%	30.18%	29.99%	28.06%	26.42%	**23.81%**
Tot. Lost Working Days (contractors+employees) per_emp	15.33%	16.49%	16.78%	18.80%	20.83%	22.95%	25.27%	25.46%	27.19%	28.64%	31.24%	31.53%	31.53%	29.99%	27.77%	**24.65%**
Trade Union Representation	11.96%	14.66%	16.59%	18.90%	21.50%	22.85%	24.01%	24.59%	26.90%	29.32%	32.88%	36.26%	35.87%	38.09%	38.38%	**26.18%**
Tot. Accidents (contractors+employees) per_emp	12.15%	14.08%	16.20%	19.86%	22.57%	25.07%	27.19%	28.74%	30.95%	33.37%	38.28%	40.79%	42.53%	43.01%	43.30%	**29.21%**
Injuries To Million Hours	14.46%	16.59%	18.42%	21.89%	24.30%	27.10%	29.22%	30.47%	31.82%	34.04%	39.34%	42.04%	43.59%	44.17%	44.46%	**30.79%**

Table A1.4: Bottom 25 metrics reported (availability %)

Return	N	min	5th	25th	median	75th	95th	max	mean	skew	kurtosis
fwd1mo	155666	0	0.849994	0.957345	1.008581	1.058918	1.161424	Inf	Inf	NA	NA
fwd3mo	52274	0.037958	0.726884	0.929915	1.025255	1.121008	1.312455	3.777778	1.026737	0.934287	13.06687
fwd6mo	26401	0.005312	0.630539	0.898708	1.04567	1.184014	1.468858	5.810811	1.049862	1.460028	16.20969
fwd12mo	12713	0	0.49945	0.8742	1.089985	1.320542	1.788026	16.9831	1.122996	5.316058	128.3626
fwd18mo	8566	0.000138	0.364163	0.829971	1.109637	1.408491	2.235651	Inf	Inf	NA	NA
fwd24mo	6542	3.17E-05	0.207532	0.762435	1.136753	1.548941	3.45581	37716	22.94191	45.93004	2361.406
fwd30mo	5005	1.60E-05	0.19083	0.798071	1.184272	1.648652	3.41944	26954.5	21.61516	38.95971	1751.012
fwd36mo	4252	0	0.088931	0.784866	1.246308	1.788711	4.854134	196326.6	81.68889	57.24617	3489.694

Table A1.5: Descriptive statistics of Forward Returns for (8) forwards (1,3,6,12,18,24,30,36)

A2 Descriptive statistics for main IV level and change

Total 2007-2021	**N**	**min**	**5th**	**25th**	**median**	**75th**	**95th**	**max**	**mean**	**skew**	**kurtosis**
EWI_0	11,721	-2.523	-0.696	-0.159	0.034	0.192	0.435	1.346	-0.0219	-1.3931	6.9409
EWI_win1	11,721	-1.529	-0.696	-0.159	0.034	0.192	0.435	0.687	-0.0213	-1.2353	5.3687
WFI_0	11,707	0.290	27.549	60.885	79.000	91.350	98.550	99.910	73.3220	-1.0573	3.5968
WFI_win1	11,707	2.186	27.549	60.885	79.000	91.350	98.550	99.786	73.3678	-1.0269	3.4676
Total 2008-2021											
EWI_0_CDF_change	10,785	-0.641	-0.085	-0.025	-0.003	0.028	0.111	0.607	0.0031	0.5195	11.0635
EWI_CDF_change_win1	10,785	-0.192	-0.085	-0.025	-0.003	0.028	0.111	0.258	0.0031	0.5696	5.2587
WFI_0_quant_change	10,771	-0.725	-0.180	-0.052	0.004	0.073	0.240	0.882	0.0145	0.5823	6.1536
WFI_quant_change_win1	10,771	-0.390	-0.180	-0.052	0.004	0.073	0.240	0.514	0.0141	0.4221	4.3221

Table A2.1: Descriptive statistics for levels and changes of EWI & WFI totals for sample period

EWI_0	N	min	5th	25th	median	75th	95th	max	mean	skew	kurtosis
2007	826	-1.342	-0.633	-0.145	0.029	0.189	0.431	1.058	-0.0182	-1.2369	5.7575
2008	775	-1.216	-0.781	-0.177	0.037	0.202	0.450	0.890	-0.0276	-1.0493	4.4279
2009	812	-1.304	-0.704	-0.160	0.032	0.203	0.453	0.796	-0.0197	-1.1940	5.0470
2010	856	-1.932	-0.583	-0.127	0.036	0.164	0.367	1.314	-0.0179	-2.2022	11.9143
2011	851	-2.073	-0.655	-0.131	0.039	0.186	0.432	0.843	-0.0156	-1.7567	8.4745
2012	802	-2.523	-0.433	-0.110	0.023	0.149	0.355	0.593	-0.0158	-3.3508	22.2277
2013	847	-2.253	-0.501	-0.119	0.031	0.166	0.348	0.757	-0.0161	-2.8167	16.6141
2014	864	-1.870	-0.615	-0.128	0.040	0.176	0.392	0.803	-0.0176	-2.0103	9.7703
2015	796	-1.229	-0.675	-0.180	0.032	0.211	0.474	1.002	-0.0230	-1.0264	4.6387
2016	704	-1.151	-0.789	-0.218	0.033	0.225	0.484	0.975	-0.0304	-0.7758	3.5683
2017	665	-0.807	-0.667	-0.246	0.020	0.229	0.462	1.346	-0.0156	-0.2459	2.8981
2018	683	-1.056	-0.800	-0.219	0.037	0.226	0.488	0.895	-0.0247	-0.6953	3.3265
2019	751	-1.153	-0.787	-0.186	0.037	0.210	0.459	1.234	-0.0303	-0.9604	3.9528
2020	760	-1.199	-0.761	-0.179	0.048	0.202	0.442	0.886	-0.0288	-1.0399	4.2676
2021	729	-1.183	-0.772	-0.187	0.037	0.207	0.457	0.872	-0.0303	-0.8642	3.9149
EWI_0_total	**11,721**	**-2.523**	**-0.696**	**-0.159**	**0.034**	**0.192**	**0.435**	**1.346**	**-0.0219**	**-1.3931**	**6.9409**

Table A2.2: EWI_0 descriptive statistics by year

EWI_win1	N	min	5th	25th	median	75th	95th	max	mean	skew	kurtosis
2007	826	-1.213	-0.633	-0.145	0.029	0.189	0.431	0.575	-0.0185	-1.2378	5.3803
2008	775	-1.173	-0.781	-0.177	0.037	0.202	0.450	0.639	-0.0282	-1.0748	4.3615
2009	812	-1.214	-0.704	-0.160	0.032	0.203	0.453	0.568	-0.0201	-1.1993	4.8869
2010	856	-1.481	-0.583	-0.127	0.036	0.164	0.367	0.574	-0.0163	-1.9658	9.2690
2011	851	-1.436	-0.655	-0.131	0.039	0.186	0.432	0.580	-0.0151	-1.6342	7.3433
2012	802	-1.318	-0.433	-0.110	0.023	0.149	0.355	0.486	-0.0086	-1.9310	9.5566
2013	847	-1.447	-0.501	-0.119	0.031	0.166	0.348	0.506	-0.0115	-1.9992	9.6090
2014	864	-1.529	-0.615	-0.128	0.040	0.176	0.392	0.543	-0.0172	-1.9195	8.9164
2015	796	-1.182	-0.675	-0.180	0.032	0.211	0.474	0.648	-0.0236	-1.0545	4.5249
2016	704	-1.079	-0.789	-0.218	0.033	0.225	0.484	0.678	-0.0311	-0.8076	3.5163
2017	665	-0.770	-0.667	-0.246	0.020	0.229	0.462	0.641	-0.0171	-0.3580	2.5428
2018	683	-0.998	-0.800	-0.219	0.037	0.226	0.488	0.687	-0.0252	-0.7208	3.2450
2019	751	-1.108	-0.787	-0.186	0.037	0.210	0.459	0.581	-0.0311	-1.0089	3.8152
2020	760	-1.160	-0.761	-0.179	0.048	0.202	0.442	0.596	-0.0296	-1.0704	4.1910
2021	729	-1.100	-0.772	-0.187	0.037	0.207	0.457	0.680	-0.0310	-0.8953	3.8491
EWI_win1_total	**11,721**	**-1.529**	**-0.696**	**-0.159**	**0.034**	**0.192**	**0.435**	**0.687**	**-0.0213**	**-1.2353**	**5.3687**

Table A2.3: EWI_win1 descriptive statistics by year

WFI_0	N	min	5th	25th	median	75th	95th	max	mean	skew	kurtosis
2007	826	1.070	35.070	65.790	80.550	92.108	98.638	99.910	75.6811	-1.1368	4.0331
2008	774	0.310	25.186	56.085	76.190	89.870	98.331	99.760	70.8436	-0.8740	3.0843
2009	812	0.590	28.383	61.100	79.045	91.368	98.425	99.790	73.3990	-1.0378	3.5338
2010	855	0.790	39.053	67.100	81.520	93.075	98.763	99.880	77.1292	-1.2200	4.4941
2011	851	0.300	40.055	67.750	81.840	92.350	98.775	99.840	77.3334	-1.3371	4.9167
2012	801	1.510	45.050	70.860	84.920	93.710	99.180	99.910	79.7500	-1.4253	5.3580
2013	845	0.920	40.974	68.310	83.260	93.010	98.940	99.900	78.0228	-1.2571	4.5948
2014	864	0.290	37.893	66.110	81.660	92.163	98.801	99.860	76.6863	-1.2272	4.5473
2015	796	0.370	23.683	55.830	75.840	89.620	98.283	99.750	70.4511	-0.8929	3.1848
2016	703	0.390	17.754	55.800	76.720	90.440	98.379	99.740	70.0211	-0.9325	3.0681
2017	661	1.180	19.410	49.170	72.810	87.650	97.760	99.710	67.0075	-0.6784	2.5342
2018	681	0.560	20.730	53.880	75.000	88.960	98.150	99.680	68.8255	-0.8323	2.8756
2019	750	0.600	21.420	55.710	76.915	89.670	98.470	99.820	70.3772	-0.8884	3.0597
2020	759	0.480	22.096	54.675	75.000	89.625	98.470	99.740	69.8455	-0.7953	2.8436
2021	729	0.630	22.920	56.510	76.420	90.130	98.184	99.820	70.4404	-0.9012	3.0918
WFI_0_total	**11,707**	**0.290**	**27.549**	**60.885**	**79.000**	**91.350**	**98.550**	**99.910**	**73.3220**	**-1.0573**	**3.5968**

Table A2.4: WFI_0 descriptive statistics by year

WFI_win1	N	min	5th	25th	median	75th	95th	max	mean	skew	kurtosis
2007	826	13.160	35.070	65.790	80.550	92.108	98.638	99.615	75.7579	-1.0606	3.6616
2008	774	5.965	25.186	56.085	76.190	89.870	98.331	99.503	70.8844	-0.8469	2.9741
2009	812	5.821	28.383	61.100	79.045	91.368	98.425	99.579	73.4272	-1.0160	3.4351
2010	855	11.930	39.053	67.100	81.520	93.075	98.763	99.695	77.2089	-1.1244	3.9931
2011	851	11.420	40.055	67.750	81.840	92.350	98.775	99.655	77.4087	-1.2489	4.4486
2012	801	14.790	45.050	70.860	84.920	93.710	99.180	99.780	79.8354	-1.2970	4.6079
2013	845	16.315	40.974	68.310	83.260	93.010	98.940	99.786	78.1170	-1.1386	3.9586
2014	864	7.412	37.893	66.110	81.660	92.163	98.801	99.691	76.7324	-1.1703	4.2449
2015	796	5.050	23.683	55.830	75.840	89.620	98.283	99.531	70.4830	-0.8729	3.1053
2016	703	3.333	17.754	55.800	76.720	90.440	98.379	99.529	70.0390	-0.9240	3.0356
2017	661	5.102	19.410	49.170	72.810	87.650	97.760	99.346	67.0231	-0.6708	2.5078
2018	681	2.186	20.730	53.880	75.000	88.960	98.150	99.444	68.8355	-0.8269	2.8549
2019	750	4.132	21.420	55.710	76.915	89.670	98.470	99.585	70.3997	-0.8757	3.0096
2020	759	3.905	22.096	54.675	75.000	89.625	98.470	99.580	69.8652	-0.7831	2.7955
2021	729	3.892	22.920	56.510	76.420	90.130	98.184	99.477	70.4556	-0.8920	3.0543
WFI_win1_total	**11,707**	**2.186**	**27.549**	**60.885**	**79.000**	**91.350**	**98.550**	**99.786**	**73.3678**	**-1.0269**	**3.4676**

Table A2.5: WFI_win1 descriptive statistics by year

EWI_0_CDF_change	**N**	**min**	**5th**	**25th**	**median**	**75th**	**95th**	**max**	**mean**	**skew**	**kurtosis**
2008	772	-0.358	-0.090	-0.026	0.000	0.034	0.108	0.548	0.0043	0.5058	13.2306
2009	809	-0.416	-0.090	-0.021	0.000	0.032	0.109	0.355	0.0036	-0.0258	8.7655
2010	846	-0.363	-0.064	-0.024	-0.004	0.025	0.095	0.548	0.0033	1.2802	16.4425
2011	806	-0.641	-0.079	-0.029	-0.006	0.031	0.133	0.415	0.0064	0.3891	13.8720
2012	802	-0.288	-0.072	-0.024	-0.006	0.022	0.086	0.331	-0.0003	0.4611	9.4787
2013	845	-0.297	-0.077	-0.026	-0.007	0.019	0.104	0.404	-0.0001	0.9210	10.1580
2014	839	-0.388	-0.094	-0.022	-0.001	0.029	0.111	0.407	0.0035	0.2484	8.7835
2015	786	-0.298	-0.073	-0.024	-0.004	0.032	0.117	0.342	0.0051	0.7022	7.6446
2016	703	-0.420	-0.096	-0.026	-0.002	0.029	0.114	0.287	0.0021	-0.0474	7.5457
2017	656	-0.387	-0.103	-0.048	-0.002	0.049	0.136	0.355	0.0046	0.4764	5.6768
2018	687	-0.202	-0.084	-0.025	-0.006	0.030	0.108	0.385	0.0029	1.0719	7.7673
2019	744	-0.505	-0.087	-0.023	-0.002	0.029	0.106	0.362	0.0030	-0.7900	12.9116
2020	766	-0.210	-0.068	-0.019	-0.003	0.018	0.078	0.341	0.0010	1.5227	11.7444
2021	724	-0.377	-0.086	-0.025	-0.005	0.029	0.116	0.607	0.0040	1.2313	15.2187
EWI_0_CDF_change_total	**10,785**	**-0.641**	**-0.085**	**-0.025**	**-0.003**	**0.028**	**0.111**	**0.607**	**0.0031**	**0.5195**	**11.0635**

Table A2.6: EWI_0_CDF_change descriptive statistics by year

EWI_CDF_change_win1	**N**	**min**	**5th**	**25th**	**median**	**75th**	**95th**	**max**	**mean**	**skew**	**kurtosis**
2008	772	-0.164	-0.090	-0.026	0.000	0.034	0.108	0.187	0.0043	0.2294	4.6534
2009	809	-0.186	-0.090	-0.021	0.000	0.032	0.109	0.190	0.0036	0.0879	5.0025
2010	846	-0.130	-0.064	-0.024	-0.004	0.025	0.095	0.197	0.0032	0.8944	5.6331
2011	806	-0.152	-0.079	-0.029	-0.006	0.031	0.133	0.258	0.0068	1.2107	5.9668
2012	802	-0.146	-0.072	-0.024	-0.006	0.022	0.086	0.185	-0.0001	0.6310	5.7979
2013	845	-0.146	-0.077	-0.026	-0.007	0.019	0.104	0.183	-0.0002	0.8150	5.3116
2014	839	-0.176	-0.094	-0.022	-0.001	0.029	0.111	0.218	0.0035	0.1986	5.3401
2015	786	-0.172	-0.073	-0.024	-0.004	0.032	0.117	0.207	0.0050	0.6668	5.1989
2016	703	-0.170	-0.096	-0.026	-0.002	0.029	0.114	0.181	0.0022	0.2417	4.4059
2017	656	-0.151	-0.103	-0.048	-0.002	0.049	0.136	0.238	0.0048	0.6080	3.6143
2018	687	-0.142	-0.084	-0.025	-0.006	0.030	0.108	0.208	0.0024	0.6641	4.8143
2019	744	-0.192	-0.087	-0.023	-0.002	0.029	0.106	0.179	0.0035	-0.0285	4.9668
2020	766	-0.135	-0.068	-0.019	-0.003	0.018	0.078	0.196	0.0005	0.9651	7.2811
2021	724	-0.149	-0.086	-0.025	-0.005	0.029	0.116	0.194	0.0036	0.5055	4.4257
EWI_CDF_change_win1_total	**10,785**	**-0.192**	**-0.085**	**-0.025**	**-0.003**	**0.028**	**0.111**	**0.258**	**0.0031**	**0.5696**	**5.2587**

Table A2.7: EWI_CDF_change_win1 descriptive statistics by year

WFI_0_quant_change	N	min	5th	25th	median	75th	95th	max	mean	skew	kurtosis
2008	771	-0.468	-0.230	-0.070	0.001	0.063	0.218	0.717	0.0001	0.2931	5.5642
2009	809	-0.448	-0.163	-0.035	0.011	0.094	0.227	0.686	0.0255	0.5444	5.7517
2010	845	-0.409	-0.163	-0.056	0.001	0.061	0.221	0.605	0.0090	0.6996	5.4131
2011	806	-0.526	-0.169	-0.051	0.007	0.091	0.263	0.832	0.0249	0.9446	6.9409
2012	799	-0.364	-0.162	-0.047	0.007	0.080	0.243	0.629	0.0227	0.9408	5.9636
2013	843	-0.350	-0.173	-0.054	0.001	0.070	0.209	0.540	0.0103	0.5420	4.6178
2014	839	-0.441	-0.170	-0.068	-0.012	0.050	0.207	0.559	-0.0047	0.4728	5.4605
2015	786	-0.462	-0.161	-0.025	0.022	0.109	0.271	0.561	0.0410	0.2845	4.7649
2016	702	-0.524	-0.195	-0.060	0.002	0.060	0.213	0.610	0.0041	0.1833	5.4652
2017	654	-0.725	-0.243	-0.053	0.018	0.117	0.329	0.882	0.0356	0.4209	5.5468
2018	685	-0.457	-0.161	-0.040	0.011	0.083	0.241	0.821	0.0253	0.8205	7.6556
2019	743	-0.576	-0.228	-0.073	-0.003	0.051	0.230	0.616	-0.0058	0.3613	5.5335
2020	765	-0.428	-0.156	-0.041	0.003	0.062	0.177	0.712	0.0122	0.5794	6.9869
2021	724	-0.436	-0.172	-0.060	0.000	0.052	0.237	0.525	0.0062	0.6106	5.1159
WFI_0_quant_change_total	**10,771**	**-0.725**	**-0.180**	**-0.052**	**0.004**	**0.073**	**0.240**	**0.882**	**0.0145**	**0.5823**	**6.1536**

Table A2.8: WFI_0_quant_change descriptive statistics by year

WFI_quant_change_win1	N	min	5th	25th	median	75th	95th	max	mean	skew	kurtosis
2008	771	-0.367	-0.230	-0.070	0.001	0.063	0.218	0.400	-0.0004	0.1341	4.2062
2009	809	-0.283	-0.163	-0.035	0.011	0.094	0.227	0.370	0.0247	0.2796	3.9316
2010	845	-0.272	-0.163	-0.056	0.001	0.061	0.221	0.328	0.0082	0.4575	3.7843
2011	806	-0.283	-0.169	-0.051	0.007	0.091	0.263	0.451	0.0241	0.6641	4.3713
2012	799	-0.264	-0.162	-0.047	0.007	0.080	0.243	0.423	0.0220	0.7028	4.2937
2013	843	-0.252	-0.173	-0.054	0.001	0.070	0.209	0.362	0.0100	0.4440	3.7859
2014	839	-0.298	-0.170	-0.068	-0.012	0.050	0.207	0.325	-0.0050	0.3689	3.9729
2015	786	-0.310	-0.161	-0.025	0.022	0.109	0.271	0.426	0.0410	0.2991	4.0328
2016	702	-0.306	-0.195	-0.060	0.002	0.060	0.213	0.366	0.0042	0.1933	3.8950
2017	654	-0.390	-0.243	-0.053	0.018	0.117	0.329	0.514	0.0348	0.2741	3.7749
2018	685	-0.302	-0.161	-0.040	0.011	0.083	0.241	0.412	0.0245	0.4526	4.1557
2019	743	-0.333	-0.228	-0.073	-0.003	0.051	0.230	0.400	-0.0056	0.3797	4.3145
2020	765	-0.271	-0.156	-0.041	0.003	0.062	0.177	0.346	0.0116	0.2415	4.2436
2021	724	-0.289	-0.172	-0.060	0.000	0.052	0.237	0.378	0.0061	0.5622	4.2838
WFI_quant_change_win1_total	**10,771**	**-0.390**	**-0.180**	**-0.052**	**0.004**	**0.073**	**0.240**	**0.514**	**0.0141**	**0.4221**	**4.3221**

Table A2.9: WFI_quant_change_win1 descriptive statistics by year

A3 Distribution plots of unwinsorized changes in main_IV

Following the discussion from section 3.4 on page 14, figure A3.1 show the distribution of ΔEWI_CDF and figure A3.2 show the non-winsorized distribution of ΔWFI_quant over our sample period 2007 − 2021. We can note that both distributions are somewhat normally distributed, as seen in Appendix Tables A2.6 and A2.8. Their winsorized counterparts are seen in Tables A2.7 and A2.9.

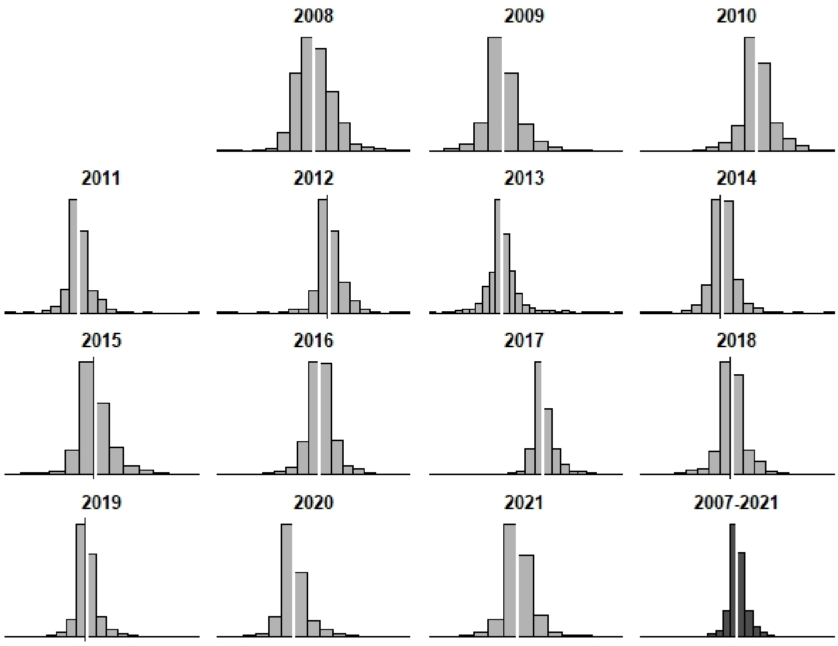

Figure A3.1: Plotted distribution of ΔEWI_CDF scores 2007-2021

Vertical marker: white = mean value, black = center (0)

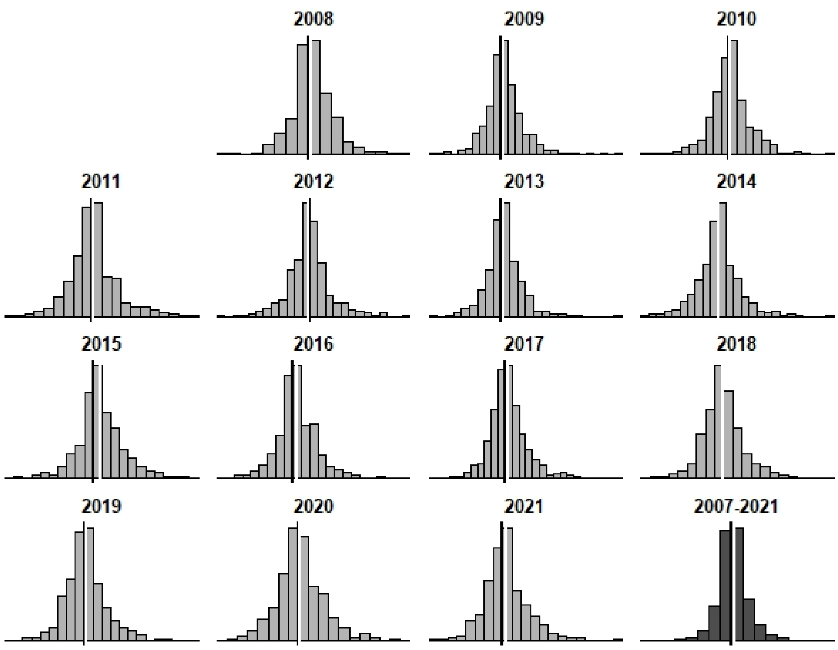

Figure A3.2: Plotted distribution of ΔWFI_quant scores 2007-2021

Vertical marker: white = mean value, black = center (0)

A4 Robustness check model outputs - Models 1-3, lag - 24mo

Robustness checks for models 1-3 with lag = 24 mo. and fwd $\in$ [12, 6, 3, 1] mo.

lag = 24mo	**fwd12**		**fwd6**		**fwd3**		**fwd1**	
Model 1	**1a**	**1b**	**1a**	**1b**	**1a**	**1b**	**1a**	**1b**
main_IV_chg	0.0569	0.0376	0.0302	0.0079	0.0178	0.0011	0.0058	0.0009
Adj. R^2	0.026609	0.026693	0.007944	0.007689	0.005933	0.005744	0.004381	0.004223
N =	8099	8090	17548	17529	35005	34967	104273	104157
Model 2	**2a**	**2b**	**2a**	**2b**	**2a**	**2b**	**2a**	**2b**
main_IV_chg	0.057	0.0378	0.0302	0.0079	0.0178	0.0011	0.0058	0.0009
HC_dum	-0.0134	-0.0127	-0.0054	-0.0047	-0.0026	-0.0022	-0.0011	-0.0009
Adj. R^2	0.026805	0.026855	0.007979	0.007701	0.005948	0.005746	0.004396	0.004232
N =	8099	8090	17548	17529	35005	34967	104273	104157
Model 3	**3a**	**3b**	**3a**	**3b**	**3a**	**3b**	**3a**	**3b**
main_IV_chg	0.0785	0.0368	0.0474	0.006	0.0347	0.0043	0.0137	0.002
HC_dum	-0.0133	-0.0127	-0.0053	-0.0047	-0.0025	-0.0021	-0.001	-0.0009
IV x HC	-0.037	0.0018	-0.0298	0.0037	-0.0291	-0.006	-0.0136	-0.002
Adj. R^2	0.026693	0.026734	0.007931	0.007645	0.005939	0.005721	0.004401	0.004224
N =	8099	8090	17548	17529	35005	34967	104273	104157

Table A4.1: Summary outputs for Models 1-3 Robustness - lag = 24mo