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# THE INFLUENCE OF COVID-19 PANDEMIC ON CONSIDERATION OF CORPORATE SOCIAL IRRESPONSIBILITY BY SOVEREIGN WEALTH FUNDS


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**Abstract**

Sovereign wealth funds (SWFs) have a significant influence on global financial markets, with assets exceeding USD 11.2 trillion and accounting for 40% of the world's largest 100 asset owners' total assets. Understanding the drivers behind SWFs' investment decisions is crucial. This study examines the impact of the COVID-19 pandemic related to corporate social responsibility (CSR) and irresponsibility (CSI) compared to financial data on SWFs' investment decisions, analysing 72% of their total public equity holdings from 2019 to 2023. Findings reveal that SWFs prioritize company self-reported environmental, social and governance (ESG) metrics over public CSI information when making investment decisions. Furthermore, public equity holding CSI data have a more pronounced influence on the investment decision of SWFs in countries with higher transparency of sustainability. The study underscores the necessity for greater ESG integration into SWFs' investment strategies to demonstrate a commitment to sustainable investing practices. This research illuminates the path towards a more responsible and sustainable approach for SWFs on global financial markets.

**Implications for Central European audience:** Our conclusions could help encourage greater ESG integration into investment strategies and promote sustainable investing practices more broadly, not limited to liquid assets, to showcase a sustainable “walk the talk”. A special focus should be put on CSI's development of target investments. Future research might also consider whether the investment behaviour of SWFs is equivalent to that of other major investors, such as insurance companies and public pension schemes.



**Keywords:** Corporate social irresponsibility; corporate social responsibility; ESG; reputation risk; sovereign wealth funds

**JEL Classification:** D81, F64, G11, G32, M14, Q01

## Introduction

Climate change, social cleavages, corruption and other factors of unsustainable development impose immense pressure on the resilience of countries and their local regions (Andersson et al., 2016). There is no doubt that almost every institutional investor cares about reputation risk elements. Reputation risk awareness means the reduction or even complete avoidance of reputation risk matters that are related to one's own risk behaviour (Bromley, 1993).

The ability to manage these risks is strongly dependent on the structure of the entrepreneurial business environment, which is shaped by key performers as the owners of capital (Carpantier & Vermeulen, 2018; Cuervo-Cazurra et al., 2021; Blažková & Chmelíková, 2015). Capital owners or decisionmakers of capital allocation processes are important actors in strengthening the resilience of economies (Ciarlone and Miceli, 2014). However, little is known about the factors influencing this dependency, as previous studies have used subjective measures for environmental, social and governance (ESG) performance.

In recent years, there has been a notable surge in attention towards the triad of social, economic and environmental sustainability, garnering interest from scholars and practitioners alike. Extensive research conducted by Bautista-Puig et al. (2021), Chmelíková and Redlichová (2020) and Kölbel et al. (2020) underscores the significance of each pillar. Social sustainability concerns itself with the holistic well-being and welfare of individuals and communities. Economic sustainability revolves around the establishment of economic frameworks that foster enduring growth and stability. Meanwhile, environmental sustainability is centred on the preservation of natural resources and mitigation of the adverse impacts of human activities on ecosystems.

In addressing the challenge posed by potentially biased information sourced from firms' annual reports, an alternative approach involves using reputation metrics disseminated by the media, as proposed by Kölbel et al. (2017). This concept stems from the differentiation made in numerous studies, such as those by Chava (2014), Goss and Roberts (2011) and Oikonomou et al. (2014), between corporate social responsibility (CSR) – typically reported in a favourable light by companies in their annual reports – and its negative counterpart, corporate social irresponsibility (CSI), which tends to be uncovered by media outlets and social networks.

According to research by Adonu (2020) and Chmelíková and Redlichová (2013), sovereign wealth funds (SWFs) play a pivotal role in advancing sustainable economic growth through strategic investments in cutting-edge technologies and sustainable business models.

SWFs are state-owned investment funds managed by government entities, distinguishing them from pension funds and insurance companies (Heaney et al., 2011). These funds, such as those from Norway, Kuwait and Abu Dhabi, are often financed through the sale of commodities such as oil and gas (Heaney et al., 2011). SWFs wield significant financial power and influence due to their massive assets under management, exceeding USD 11.2 trillion. They are governed by bodies that shape their objectives and are accountable for their performance (Blundell-Wignall et al., 2008).

SWFs diversify their investments across various sectors, spanning renewable energy, clean technology, sustainable agriculture and beyond, reflecting their typically expansive investment portfolios. Such diversified investments are poised to foster the emergence of


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a sustainable economy while contributing to the mitigation of carbon emissions. Despite previous examinations of their investment behaviour (Amar et al., 2019; Liang & Renneboog, 2020; Dai et al., 2022), the precise decision-making processes guiding their focused investments across multiple asset classes remain largely veiled (Aggarwal & Goodell, 2018; Stone & Truman, 2016).

In response to the imperative for transparency and accountability, SWFs are increasingly embracing regular reporting practices, including ESG disclosures, to communicate their sustainability initiatives and performance. Such efforts are exemplified by initiatives such as the One Planet Sovereign Wealth Funds initiative (One Planet SWFs, 2023), as well as the integration of ESG and Sustainable Development Goals (SDG) reporting into their communication strategies, as observed in the works of Klein (2021), Chmelíková and Somerlíková (2018) and Maslova (2020). By adopting transparent reporting practices, SWFs aim to enhance stakeholder trust, foster alignment with broader sustainable development objectives and navigate the complexities inherent in ESG integration into investment decision-making.

This study investigates the impact of ESG reputation risk, primarily generated by external evaluators and disseminated through media and social networks. Utilising two ESG performance measures, including CSR and CSI, we analyse SWFs' investment decisions in public equity holdings. CSI serves as the central control variable, allowing us to examine SWFs' ESG behaviour. This analysis endeavours to bridge the existing research gap by examining the relationship between SWF ownership and the ESG reputation risk of target firms with a focus on the COVID-19 pandemic environment, drawing insights from studies conducted by Klein et al. (2023), Nobanee et al. (2021), Blažková and Chmelíková (2022) and Heil (2018). The research question to be analysed is:

*RQ: Do public equity holding CSI data have a more pronounced influence on the investment decision of SWFs in countries with higher transparency of sustainability matters?*

This study adds to the existing body of literature concerning the influence of CSI factors on the investment strategies of SWFs, with a specific focus on their investments in publicly traded equity holdings. Our research methodology involves the utilization of an objective metric to gauge the level of CSI attributed to individual firms. We rely on the RepRisk dataset, renowned for its comprehensive monitoring of media reports on incidents affecting the ESG performance of companies. The dataset employs a dynamic risk assessment methodology to provide real-time insights into the reputational risks associated with firms' activities.

Our utilization of the RepRisk dataset represents a methodological advancement in studying the impact of CSI on SWF investment decision-making processes. By incorporating real-time media coverage of ESG incidents, we offer a dynamic perspective on the evolving risk landscape faced by companies, thus facilitating a more informed evaluation of their suitability for SWF investment. Through this research approach, we contribute to a deeper understanding of the factors influencing SWF investment strategies and underscore the importance of considering reputational risks in the investment decision-making process.

# 1 Theoretical Background and Hypothesis

SWFs have incentives to prioritize ESG- and SDG-related practices among portfolio companies. They represent future generations' interests and align with societal preferences driven by rising awareness. Empirical studies link CSR initiatives with enhanced financial performance (Malik et al., 2023; Dyck et al., 2019; Jo & Harjoto, 2011).

Recent research by Ding et al. (2019), Liang and Renneboog (2020) and Dai et al. (2022) highlights SWFs' growing interest in integrating ESG factors into investment decisions. They explore SWFs' consideration of companies' ESG ratings, indicating a shift towards sustainable investing practices. Findings suggest that SWFs consider not only companies' historical ESG performance but also their recent advancements in ESG metrics when making investment decisions, as illustrated by Liang and Renneboog (2020). This underscores SWFs' approach evolving towards incorporating sustainability criteria into their investment strategies.

Ding et al. (2019) found a correlation between a company's CSR efforts and the socio-economic environment of its headquarters, urging governments to promote responsible behaviour in SWFs. However, SWFs exhibit diverse responses to ESG changes in firms, prompting increased scholarly attention to their integration of ESG factors into investment decisions. Additionally, empirical studies have explored the impact of SWF ownership on firm ESG scores.

Liang and Renneboog (2020) examined 24 SWFs, representing 84% of total SWF public equity assets under management (AuM) from 2009 to 2018, revealing the consideration of historical and recent ESG performance in ownership decisions. They highlighted SWFs' ESG policies and transparency as key drivers, with origin influencing sensitivity to ESG factors. Firms with higher ESG ratings are preferred by SWFs for ownership, aligning with the belief that proficient ESG management enhances investment returns. ESG scores were sourced from Thomson Reuters' Asset4 ratings. This study underscores the growing acknowledgement of the ESG finance nexus, emphasising its relevance in SWF investment strategies and decision-making processes.

The reliability of ESG ratings is crucial for informed decision-making in sustainable investment. However, reliance on ratings from a single source can undermine accuracy. Berg et al. (2019) asserted significant discrepancies among ESG ratings from diverse providers, with multiple factors contributing to this variance. Their analysis identified measurement methodology as the largest contributor (56%) to discrepancies, followed by the scope of ratios (38%) and their respective weights (6%). To address this limitation, the authors proposed a solution: incorporating multiple sources for the control variable of a firm's ESG engagement. This approach aims to enhance the robustness and credibility of ESG assessments, thus facilitating more reliable evaluations of corporate sustainability performance and guiding responsible investment strategies.

Dai et al. (2022) examined the relevance of a firm's ESG involvement in the investment strategies of SWFs, elucidating the shifting landscape of ESG influence on SWF investments. Analysing SWF investments in US publicly traded firms from 2003 to 2018, their results underscored the significance of ESG in SWFs decision-making, indicating that SWF ownership amplifies interest in firms with heightened ESG engagement.


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Hentov and Petrov (2017) found that SWFs were optimistic about the long-term performance of firms with higher ESG scores. Their results were based on a survey of 28 SWFs conducted in 2016. Nevertheless, their research also revealed that SWFs were relatively less inclined to adopt specific investment themes, including ESG, in their decision-making. Instead, the SWFs tended to concentrate their implementation of ESG considerations using more rudimentary methods, such as exclusionary screening, as highlighted by Dai et al. (2022).

Klein et al. (2023) investigated the dependence of the investment behaviour of SWFs on the ESG performance of their underlying investments in public equity holdings from 2007 to 2022. Their findings suggest that SWFs still consider self-reported CSR information more than public CSI data in their investment decisions. Furthermore, a change in past ESG data of underlying public equity holdings – both CSR and CSI – does not seem to have a significant effect on the investment in underlying public equity holdings.

We hypothesize a negative correlation between irresponsible behaviour in public equity holdings and SWFs' investment behaviour. This approach diverges from past research by employing an ESG indicator focusing on target firms' irresponsible behaviour rather than traditional ESG ratings. As suggested by Kölbel et al. (2017), this contrasts with CSR evaluations, which are third-party assessed, unlike traditional ESG ratings, which rely on company-biased CSR information and are distributed in CSR reports (Amran et al., 2021; Bischoff and Wood, 2019).

This leads us to the following hypothesis based on underlying rationales from existing literature:

*Raising CSI scores has a more pronounced influence on the investment decision of SWFs in countries with higher transparency of sustainability matters.*

This hypothesis is going to be tested and either accepted or rejected.

# 2 Methods, Data and Model

## 2.1 Methodology

This research delves into the correlation between fluctuations in ESG CSI data of equity holdings and the subsequent investment and disinvestment behaviour of SWFs, particularly when the ESG CSI indicator experiences an increase. Employing an econometric methodology, this study aims to measure the extent of influence exerted by various independent variables on SWFs' investment decisions.

While traditional ESG scores informing on CSR performance are based on self-reported information, the ESG indicator derived from reputation risk reflects the real behaviour of firms related to CRI. This analysis endeavours to bridge the existing research gap by examining the relationship between SWF ownership and the ESG reputation risk of target firms, drawing insights from studies conducted by Nobanee et al. (2021) and Heil (2018), who performed a bibliometric analysis of relevant literature related to reputation risk and sustainability as well as an international encyclopaedia of strategic communication related to reputation risk. We aim to investigate to what extent the change in ESG CSI of an underlying equity holding is linked to additional investment or disinvestment by SWFs in this holding. Our empirical

strategy for testing our hypothesis is based on an estimation of the logit model. We take the change in investor holdings and estimate the model with a binary dependent variable (1 for investment and disinvestment, 0 for no change in the public equity holding position). An econometric approach is used to quantify the impact of independent variables on the investment decision of SWFs.

## 2.2 Sample size

We take the biggest SWFs as investors, ranked by total assets under management (AuM) (SWF Institute, 2023), and define a minimum level of relevance at AuM ≥ USD 25bn as of 31 December 2021. Filtering out the biggest SWFs by the highest total number of public equity holdings during 2007–2023 brings us to a set of eleven SWFs in focus of this analysis: Abu Dhabi Investment Authority (ADIA, United Arab Emirates), Alberta Investment Management Corporation (Alberta, Canada), China Investment Corporation (CIC, China), GIC Private Limited (Government of Singapore Investment Corporation) (GIC, Singapore), Government Pension Fund Global / Norges Bank Investment Management (GPFG, Norway), Kuwait Investment Authority (KIA, Kuwait), Korea Investment Corporation (KIC, Korea), National Social Security Fund (NSSF, China), (Texas) Permanent School Fund (PSF, USA), SAMA Foreign Holdings (SAMA, Saudi Arabia) and Temasek Holdings (Temasek, Singapore).

These eleven SWFs stand for 64% of global SWFs' AuM and 72% of global SWFs' public equity holding investments. Figure 1 shows the geographical distribution of SWFs in the scope of our analysis.

**Figure 1 | Global map of SWFs for analysis of CSI awareness**


Source: Own illustration based on SWF Institute (2023)

## 2.3 Consideration of externalities

Externalities could, e.g., influence the performance of underlying private equity holdings or the market expectation of investors, as well as their risk-return expectations. This could consequently influence the investment decision-making of SWFs. This study will focus on the

COVID-19 pandemic as one outstanding socio-economic external event that has influenced capital markets in recent years. The global outbreak of the COVID-19 pandemic in 2020 led to widespread economic disruptions. Stock markets experienced sharp declines in the early months of 2020 and governments and central banks implemented various measures to stabilize economies and financial markets (Gompers et al., 2022). As we will also consider backwards-looking data in our analysis, the timeframe of importance is 2018–2023.

## 2.4 Definition of control groups

The idea of defining control groups is to compare at least two homogeneous groups of SWFs: one group of SWFs, linked with countries that have the most transparency on ESG matters and pay the most attention to CSR and CSI (Group A), and another group of SWFs from the opposite side of the spectrum that do not pay so much attention to CSR and CSI (Group B).

The categorization of SWFs into Group A and Group B is based on an "ESG evaluation matrix" per SWF as outlined in Table 1. The ESG evaluation matrix consists of:

- criteria related to ESG consideration;
- evaluation of each criterion (from 1 (less important) to 5 (high importance));
- weight for each criterion (in %); all sub-weights sum up to 1;
- weighted score per criterion (as a product of evaluation of each criterion and weight for each criterion);
- total weighted score.

Criteria related to ESG consideration have the following expressions:

- Homepage: Information on the homepage about the consideration of CSR [yes=1; no=0].
- ESG report: ESG report available [yes=1; no=0].
- SDG report: SDG report available [yes=1; no=0].
- One Planet SWF: Member of One Planet SWF initiative [yes=1; no=0].
- IFSWF: Member of International Forum of SWF (IFSWF) (e.g., Santiago Principles 2009) [yes=1; no=0].
- LMTI: Linaburg-Maduell Transparency Index (LMTI) [1–10].

The weights per criterion reflect our understanding of the importance of each criterion related to ESG and SDG matter alignment and SWF transparency. We follow an objective approach. Weights are defined independently of a single SWF disclosure or investment behaviour, and all weights per criterion are the same.

**Table 1 | ESG evaluation matrix**

| SWF | Country | Criterion | Weight | Evaluation | Weighted score |
|---|---|---|---|---|---|
| **GPFG** | Norway | Homepage | 0.37 | 1 | 0.37 |
| | | ESG report | 0.3 | 1 | 0.3 |
| | | SDG report | 0.1 | 1 | 0.1 |
| | | One Planet SWF | 0.1 | 1 | 0.1 |
| | | IFSWF | 0.1 | 0 | 0 |
| | | LMTI | 0.03 | 10 | 0.3 |
| | | **Total** | **1** | | **1.17** |
| **CIC** | China | Homepage | 0.37 | 1 | 0.37 |
| | | ESG report | 0.3 | 1 | 0.3 |
| | | SDG report | 0.1 | 1 | 0.1 |
| | | One Planet SWF | 0.1 | 1 | 0.1 |
| | | IFSWF | 0.1 | 0 | 0 |
| | | LMTI | 0.03 | 7 | 0.21 |
| | | **Total** | **1** | | **1.08** |
| **ADIA** | United Arab Emirates | Homepage | 0.37 | 0 | 0 |
| | | ESG report | 0.3 | 1 | 0.3 |
| | | SDG report | 0.1 | 0 | 0 |
| | | One Planet SWF | 0.1 | 1 | 0.1 |
| | | IFSWF | 0.1 | 1 | 0.1 |
| | | LMTI | 0.03 | 6 | 0.18 |
| | | Total | **1** | | **0.68** |
| **KIA** | Kuwait | Homepage | 0.37 | | 0 |
| | | ESG report | 0.3 | 1 | 0.3 |
| | | SDG report | 0.1 | 1 | 0.1 |
| | | One Planet SWF | 0.1 | 1 | 0.1 |
| | | IFSWF | 0.1 | 1 | 0.1 |
| | | LMTI | 0.03 | 6 | 0.18 |
| | | **Total** | **1** | | **0.78** |
| **SAMA** | Saudi Arabia | Homepage | 0.37 | 0 | 0 |
| | | ESG report | 0.3 | 1 | 0.3 |
| | | SDG report | 0.1 | 1 | 0.1 |
| | | One Planet SWF | 0.1 | 0 | 0 |
| | | IFSWF | 0.1 | 0 | 0 |
| | | LMTI | 0.03 | 4 | 0.12 |


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| | | | | | |
|---|---|---|---|---|---|
| | | **Total** | **1** | | **0.52** |
| **GIC** | Singapore | Homepage | 0.37 | 1 | 0.37 |
| | | ESG report | 0.3 | 1 | 0.3 |
| | | SDG report | 0.1 | 1 | 0.1 |
| | | One Planet SWF | 0.1 | 0 | 0 |
| | | IFSWF | 0.1 | 1 | 0.1 |
| | | LMTI | 0.03 | 7 | 0.21 |
| | | **Total** | **1** | | **1.08** |
| **Temasek** | Singapore | Homepage | 0.37 | 1 | 0.37 |
| | | ESG report | 0.3 | 1 | 0.3 |
| | | SDG report | 0.1 | 1 | 0.1 |
| | | One Planet SWF | 0.1 | 0 | 0 |
| | | IFSWF | 0.1 | 0 | 0 |
| | | LMTI | 0.03 | 10 | 0.3 |
| | | **Total** | **1** | | **1.07** |
| **NSSF** | China | Homepage | 0.37 | 0 | 0 |
| | | ESG report | 0.3 | 0 | 0 |
| | | SDG report | 0.1 | 0 | 0 |
| | | One Planet SWF | 0.1 | 0 | 0 |
| | | IFSWF | 0.1 | 0 | 0 |
| | | LMTI | 0.03 | 5 | 0.15 |
| | | **Total** | **1** | | **0.15** |
| **KIC** | Korea | Homepage | 0.37 | 1 | 0.37 |
| | | ESG report | 0.3 | 1 | 0.3 |
| | | SDG report | 0.1 | 1 | 0.1 |
| | | One Planet SWF | 0.1 | 1 | 0.1 |
| | | IFSWF | 0.1 | 1 | 0.1 |
| | | LMTI | 0.03 | 8 | 0.24 |
| | | **Total** | **1** | | **1.21** |
| **Alberta** | Canada | Homepage | 0.37 | 1 | 0.37 |
| | | ESG report | 0.3 | 1 | 0.3 |
| | | SDG report | 0.1 | 1 | 0.1 |
| | | One Planet SWF | 0.1 | 0 | 0 |
| | | IFSWF | 0.1 | 0 | 0 |
| | | LMTI | 0.03 | 10 | 0.3 |

| | | | | | |
|---|---|---|---|---|---|
| | | **Total** | **1** | | **1.07** |
| **PSF** | USA | Homepage | 0.37 | 1 | 0.37 |
| | | ESG report | 0.3 | 1 | 0.3 |
| | | SDG report | 0.1 | 0 | 0 |
| | | One Planet SWF | 0.1 | 0 | 0 |
| | | IFSWF | 0.1 | 0 | 0 |
| | | LMTI | 0.03 | 8 | 0.24 |
| | | **Total** | **1** | | **0.91** |

Source: Own evaluation of various sources

For the definition of control Groups A and B, the separation of Group A and B is set at a total weighted score of 1.00. SWFs with a higher or equal score fall into Group A and SWFs with a lower score fall into Group B. Table 2 shows the final set of SWFs related to Groups A and B.

**Table 2 | SWFs clustered into control groups A and B**

| Control group | SWF | Country | Weighted score |
|---|---|---|---|
| **A** | KIC | Korea | 1.21 |
| **A** | GPFG | Norway | 1.17 |
| **A** | CIC | China | 1.08 |
| **A** | GIC | Singapore | 1.08 |
| **A** | Temasek | Singapore | 1.07 |
| **A** | Alberta | Canada | 1.07 |
| **B** | PSF | USA | 0.91 |
| **B** | KIA | Kuwait | 0.78 |
| **B** | ADIA | United Arab Emirates | 0.68 |
| **B** | SAMA | Saudi Arabia | 0.52 |
| **B** | NSSF | China | 0.15 |

Source: Own evaluation of various sources

Based on this evaluation and separation, six SWFs fall into Group A and five SWFs fall into Group B.

## 2.6 Collected data

There are two main data sources that support our analysis:

Public equity holding and self-reported ESG data of SWFs in the focus of our analysis were taken from the LSEG database (former Refinitiv). According to LSEG, the main sources of information are annual reports, company websites, stock exchange filings, CSR reports, NGO websites and news sources (LSEG/Refinitiv, 2023). The score measures three categories: environmental, social and governance, all of which are intended to generate long-term shareholder value.


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The central contribution of this work lies in the deployment of a control variable, which monitors the CSI of target companies and is based on a third-party evaluation. Objective ESG information based on external evaluation of target firms – especially the reputational risk indicator – was taken from RepRisk.

Both Refinitiv and RepRisk together have a dataset of 49,000 entries spanning a time frame from 2019 to 2023.

## 2.7 Statistical methods

The relationship between stock purchase and explanatory factors was investigated by applying a logit regression model. The regression analysis was based on Equations (1)–(3).

The model was optimized using a stepwise backward elimination method, whereas the initial model included all the variables. The least significant variable was consequently eliminated in each next step. The results interpreted here include the conclusion of the backward elimination with significant variables only.

Model parameters were estimated using the Fisher scoring method, which is equivalent to iteratively reweighted least squares. To obtain robust estimates and reduce possible bias, bias-reducing penalized maximum likelihood fit was used. The percentage of concordant predictions and the ROC curve were used to evaluate the goodness of fit.

## 2.8 Software

We utilize the SAS Studio 3.81 software, which is an integrated development environment (IDE) offered by the SAS Institute for managing data, conducting analysis and programming.

## 2.9 Model

**Variables and descriptive statistics**

The relationship between stock investment and our explanatory factors is investigated by applying a logit model. Our binary dependent variable *Y* (1 for investment and disinvestment, 0 for no change in the public equity holding position) is represented by the change in the number of stocks in the underlying public equity holding. All the variables exhibit a consistent one-year lag.

The general form of the model is

$$ln\left(\frac{P_i}{1-P_i}\right) = BX_i + u_i \quad (1)$$

where

- $P_i$ is the probability of investment
- $B$ is the vector of model parameters
- $X_i$ is the vector of explanatory variables
- $u_i$ is the random error term

Our research employs quantitative metrics to assess corporations' ESG performance, drawing upon external assessments of these factors. Specifically, we utilize the RepRisk

dataset, which monitors media reports of events affecting firms' ESG standing. The primary control variable in our study is denoted as ESG corporate social irresponsibility lagged by one period ($ESGI_{t-1}$), serving as an objective gauge of CSR performance. This metric is sourced from RepRisk, focusing particularly on the RepRisk Index (RRI). Following the ESGI, we include a series of supplementary independent variables that characterize the financial performance of individual firms.

The ESGI operates as a metric, evaluating the degree of attention directed by both media outlets and stakeholders towards ESG concerns. In its computation, the ESGI considers various elements, such as the extent of information dissemination from diverse sources, the timing of ESG risk occurrences and the characteristics of these incidents. These elements undergo analysis to ascertain and measure the hurdles encountered by a company in accordance with its ESG performance and influence.

The $ESGR_{t-1}$, representing the lagged overall ESG corporate social responsibility, provides insights into ESG ratings predominantly derived from company-provided CSR data disclosed in CSR reports. The LSEG database (former Refinitiv) defines the ESGR score as an overall company evaluation based on publicly available, company-biased information. According to LSEG, the main sources of information are annual reports, company websites, stock exchange filings, CSR reports, NGO websites and news sources (LSEG/Refinitiv, 2023). The scoring system encompasses three key categories: environmental, social and governance, all strategically aimed at fostering enduring shareholder value. Our focus is on utilising ESGR as a benchmark for assessing a company's sustainability endeavours. Liang and Renneboog (2020) presented compelling findings that SWFs factor ESGR considerations into their investment decisions, considering both historical ESGR performance and recent score improvements. Additionally, their study revealed a positive correlation between SWFs' ESGR considerations and the sustainability performance of targeted firms, suggesting that the incorporation of ESGR factors could lead to enhanced sustainability outcomes.

The lagged company market capitalization ($CAP_{t-1}$) denotes the market value of a company's outstanding shares, serving as a pivotal gauge for SWF investments in publicly traded equities. Given that many SWFs invest in market indices, it is impractical to systematically exclude companies listed in these indices from their portfolios. Liang and Renneboog's (2020) research provided inconclusive evidence regarding a consistent positive correlation between market capitalization and SWF ownership. While some instances exhibited a positive relationship, others depicted a negative association, contingent upon the chosen econometric model.

The lagged dividend yield ($DIV_{t-1}$) characterizes the dividend per share divided by the stock price per share, a pivotal metric in investment decision-making. DIV embodies the fraction of a company's stock price allocated to shareholders as dividends. Stocks offering dividends are frequently favoured for long-term investment strategies owing to the stability and predictability of dividend disbursements, which instil confidence and security among investors. The annual dividend per share paid has a signalling effect on the capital strength of a company, especially for those investors who have a broad and diversified equity portfolio. According to Liang and Renneboog (2020), there is evidence indicating that elevated levels of dividend payments influence SWFs' ownership stakes in these companies.


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The lagged return on assets ($ROA_{t-1}$), derived by dividing a company's net income by its total assets, holds significant importance as a key metric in evaluating potential investments in public equity holdings. Widely recognized as a critical indicator (e.g., Zdráhal et al., 2020), ROA aids in making well-informed investment decisions by providing valuable insights into a company's profitability efficiency relative to its asset base. This metric often serves as an indicator of managerial competence. Liang and Renneboog (2020) presented affirmative evidence supporting the influence of ROA on SWF ownership. This assertion is bolstered by the empirical findings of Bortolotti et al. (2015), who observed that the median ROA of SWF equity investments surpasses that of a benchmark sample, further affirming the significance of ROA in investment decisions.

Lastly, the lagged market-to-book ratio ($MTB_{t-1}$) serves as a crucial metric guiding investment decisions in publicly traded companies. This ratio compares a company's market value to its book value, reflecting the worth of its assets after subtracting liabilities. Evaluating the MTB ratio aids in discerning whether a company is undervalued or overvalued. A lower MTB ratio indicates undervaluation, presenting an attractive investment opportunity, while a higher MTB ratio suggests overvaluation, which may not be favourable for investment. Contrary to expectations, Liang and Renneboog (2020) indicated a lack of evidence supporting any correlation between SWFs' ownership of public equity holdings and the MTB ratio. Interestingly, depending on the model employed, this relationship may exhibit varied tendencies. However, Bortolotti et al. (2015) found that the median MTB of SWF equity investments was higher than that of a benchmark sample.

Tables 3 and 4 provide a description of the variables and summary statistics.

**Table 3 | Description of variables and summary statistics (mean, median, maximum, minimum)**

| Variable | Code | Description | Mean | Median | Maximum | Minimum | Number of observations |
|---|---|---|---|---|---|---|---|
| **Investor's holdings*** | Y | Number of shares held as of the report date (split adjusted as of feed date) | 7,653,573.99 | 0.00 | 1,987,000,000.0 | 0.00 | 5,873 |
| **ESG corporate social irresponsibility**** | $ESGI_{t-1}$ | Company's risk exposure (lagged by one period) | 10.19 | 1.00 | 82.00 | 0.00 | 5,872 |
| **Overall ESG corporate social responsibility*** | $ESGR_{t-1}$ | Overall company ESG score based on company-biased CSR information in the environment | 31.42 | 29.4 | 95.41 | 0.00 | 5,873 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Company market capitalisation*** | $CAP_{t-1}$ | (lagged by one period) Value of company's market capitalization (lagged by one period) | 8.72 | 9.21 | 11.82 | 0.00 | 5,873 |
| **Dividend yield*** | $DIV_{t-1}$ | Annual dividend per share divided by stock price per share (lagged by one period) | 1.35 | 0.83 | 156.76 | 0.00 | 5,871 |
| **Return on assets*** | $ROA_{t-1}$ | Net income divided by total assets (lagged by one period) | 3.65 | 3.69 | 2,564.23 | -1,287.48 | 5,873 |
| **Market-to-book ratio*** | $MTB_{t-1}$ | Market capitalization divided by total book value (lagged by one period) | 2.13 | 1.85 | 865.92 | -1,087.27 | 5,872 |

Source: SAS output on *LSEG/Refinitiv (2023) and **RepRisk (2023)

**Table 4 | Description of variables and summary statistics (skewness, kurtosis, standard deviation)**

| Variable | Code | Description | Skewness | Kurtosis | Standard deviation | Number of observations |
|---|---|---|---|---|---|---|
| **Investor's holdings*** | Y | Number of shares held as of the report date (split adjusted as of feed date) | 15.43 | 352.48 | 69,654,287.87 | 5,873 |
| **ESG corporate social irresponsibility**** | $ESGI_{t-1}$ | Company's risk exposure (lagged by one period) | 1.2 | 1.76 | 15.98 | 5,872 |
| **Overall ESG corporate social responsibility*** | $ESGR_{t-1}$ | Overall company ESG score based on company-biased CSR information in the environment (lagged by one period) | 0.26 | -1.76 | 27.84 | 5,873 |


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| | | | | | | |
|---|---|---|---|---|---|---|
| **Company market capitalisation*** | $CAP_{t-1}$ | Value of company's market capitalization (lagged by one period) | -1.87 | 4.54 | 2.65 | 5,873 |
| **Dividend yield*** | $DIV_{t-1}$ | Annual dividend per share divided by stock price per share (lagged by one period) | 24.35 | 1,278.44 | 2.16 | 5,871 |
| **Return on assets*** | $ROA_{t-1}$ | Net income divided by total assets (lagged by one period) | 35.22 | 3,912.87 | 30.47 | 5,873 |
| **Market-to-book ratio*** | $MTB_{t-1}$ | Market capitalization divided by total book value (lagged by one period) | -21.75 | 996.76 | 26.81 | 5,872 |

Source: SAS output on *LSEG/Refinitiv (2023) and **RepRisk (2023)

Following the results of Klein et al. (2023), the other variables were eliminated from the model as insignificant, i.e., not significantly affecting the probability of stock investment. Therefore, we also exclude them from the analysis:

- *$DESGI_{(t-2,t-1)}$*: the change in ESG CSI represented by the difference in ESG CSI calculated as the difference between the lagged values *t-1* and *t-2*. It tells us about the annual change in the company's ESGI.
- *$DESGR_{(t-2,t-1)}$*: the change in ESG CSR represented by the difference in ESG CSR calculated as the difference between the lagged values *t-1* and *t-2*. It tells us about the annual change in the company's ESGR.
- *$SG_{t-1}$*: the sales growth lagged by one period refers to the ratio of dividend per share to the stock price per share. It serves as an indicator of a company's revenue generation capability.
- *$ROE_{t-1}$*: the return on equity lagged by one period is a financial metric of a company's net income in relation to its shareholder equity; it is a vital predictor used by SWFs to evaluate the potential gains of investing in public equity holdings.

**Model specification**

The relationship between stock purchase and explanatory factors was investigated by applying a logit model as follows.

$$Ln\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 ESGI_{t-1} + \beta_2 ESGR_{t-1} + \beta_3 CAP_{t-1} + \beta_4 DIV_{t-1} + \beta_5 ROA_{t-1} + \beta_6 MTB_{t-1} \quad (2)$$

The model was estimated with the binary dependent variable *Y*=1 when an investment or disinvestment took place or *Y*=0 for no change in the equity holding position. Explanatory variables used in the model are described in Table 3. The model was optimized using a stepwise backward elimination method, whereas the initial model included all the variables. The advantage of using the backward elimination method is considering the effects of all explanatory variables simultaneously. This is important for avoiding possible collinearity bias. Backward elimination also evaluates the influence of potentially collinear variables, whereas forward elimination would not enter any of them into the model. The least significant variable was consequently eliminated in each next step. The results interpreted in this paper include the conclusion of the backward elimination with significant variables only. Model parameters were estimated using the Fisher scoring method, which is equivalent to iteratively reweighted least squares. To obtain robust estimates and reduce possible bias, a bias-reducing penalized maximum likelihood fit was applied. Pre-analysis included a diagnostic test to check for the correlation across explanatory variables (Table 4), but no significant correlations were found.

**Table 5 | Pearson correlation coefficients**

| | $ESGI_{t-1}$ | $ESGR_{t-1}$ | $CAP_{t-1}$ | $DIV_{t-1}$ | $ROA_{t-1}$ | $MTB_{t-1}$ |
|---|---|---|---|---|---|---|
| $ESGI_{t-1}$ | 1.00000<br><br>5,872 | 0.52178<br><0.0001<br>5,872 | 0.23778<br><0.0001<br>5,872 | 0.15524<br><0.0001<br>5,871 | 0.00672<br>0.2564<br>5,872 | -0.03996<br>0.0005<br>5,872 |
| $ESGR_{t-1}$ | 0.52765<br><0.0001<br>5,872 | 1.00000<br><br>5,873 | 0.47854<br><0.0001<br>5,873 | 0.21874<br><0.0001<br>5,871 | 0.03887<br>0.0009<br>5,873 | -0.01463<br>0.0322<br>5,872 |
| $CAP_{t-1}$ | 0.27223<br><0.0001<br>5,872 | 0.43876<br><0.0001<br>5,872 | 1.00000<br><br>5,873 | 0.18423<br><0.0001<br>5,871 | 0.06265<br><0.0001<br>5,872 | 0.03453<br>0.0065<br>5,872 |
| $DIV_{t-1}$ | 0.19276<br><0.0001<br>5,871 | 0.25556<br><0.0001<br>5,871 | 0.19442<br><0.0001<br>5,871 | 1.00000<br><br>5,871 | 0.03487<br><0.0001<br>5,871 | -0.00452<br>0.6548<br>5,871 |
| $ROA_{t-1}$ | 0.00765<br>0.2678<br>5,872 | 0.03559<br>0.0011<br>5,873 | 0.08287<br><0.0001<br>5,873 | 0.04487<br><0.0001<br>5,871 | 1.00000<br><br>5,873 | -0.00359<br>0.7522<br>5,872 |
| $MTB_{t-1}$ | -0.02645<br>0.0012<br>5,872 | -0.02387<br>0.0333<br>5,872 | 0.03276<br>0.0067<br>5,872 | -0.00423<br>0.6945<br>5,871 | -0.00428<br>0.7977<br>5,872 | 1.00000<br><br>5,872 |

Sources: SAS output on LSEG/Refinitiv (2023) and RepRisk (2023)

The relationship between the estimated coefficients and probability of investment was not linear and was obtained using the following equation:

$$onenep_i = \frac{1}{1+e^{-(\beta_0+\beta_1 ESGI_{t-1}+\beta_2 ESGR_{t-1}+\beta_3 CAP_{t-1}+\beta_4 DIV_{t-1}+\beta_5 ROA_{t-1}+\beta_6 MTB_{t-1}}} \quad (3)$$


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The estimated probability was utilized to assess the predictive capacity of the model. Predicted probabilities lower than 0.5 were categorized as predicted 0, while those equal to or greater than 0.5 were categorized as predicted 1. The explanatory efficacy of the model was gauged by comparing the number of concordant and discordant predictions with real-world data. The global hypothesis regarding the overall significance of the model was tested using both the likelihood ratio and Wald criteria.

In the results section, odds ratios were employed for interpretation instead of the estimated model parameters. This decision was based on their linear relationship with odds, derived from the model parameters as follows.

$$Odds\ ratio = \frac{odds(x_j+1)}{odds\ (x_j)} = e^{\beta_j} \quad (4)$$

The interpretation is that odds in favour of investment multiply by $e^{\beta_j}$ with each unit increase of $x_j$. The interval estimate for the odds ratio was based on the Wald confidence limits.

## 2.10 Limitations

This study recognizes multiple constraints. Firstly, our analysis was confined to SWFs with substantial public equity holdings, thus disregarding their undisclosed and non-transparent liquid or illiquid/private market investments. Secondly, alternative modelling strategies, such as sample size reduction to manage missing values for independent variables, were not investigated. While such approaches might enhance the strength of the results, they could also compromise the robustness of the findings due to diminished observations. Thirdly, our analysis lacked dynamic models, neglecting lagged values of the endogenous variable. Incorporating such dynamics could have provided deeper insights into the temporal evolution of SWFs' investment behaviour.

# 3 Results and Discussion

## 3.1 Clustered results for Group A and Group B SWFs

**Group A SWF results related to COVID-19 pandemic**

The model suggests that the purchase of stocks is significantly influenced by the variables $ESG_{t-1}$, $ESGR_{t-1}$, $CAP_{t-1}$, $DIV_{t-1}$, $ROA_{t-1}$ and $MTB_{t-1}$ (Table 6). The overall significance of the logit model was verified by the likelihood ratio and the Wald test, both with a p-value < 0.0001, which means that the model is significant. The explanatory power of the model was evaluated by the number of concordant predictions, which were equal to 62.4%. The results suggest that the variable that most influences the purchase of a stock is $CAP_{t-1}$: for every unit increase in $CAP_{t-1}$, the odds in favour of stock purchase rise by 12.6%. The estimated influence of $CAP_{t-1}$ on odds is between 11.0% and 14.2%. The second most influential variable, according to the odds ratio estimates, is $DIV_{t-1}$, which for each unit increases the odds in favour of stock purchase by 2.9%. Its estimated influence on odds is between 1.6% and 4.2%. The third most influential variable, according to the odds ratio estimates, is $ESGR_{t-1}$, which for each unit increases the odds in favour of stock purchase by 2.7%. Its estimated influence on odds is between 2.2% and 3.2%. The influence of other variables on the purchase of a stock is

smaller: $ESGI_{t-1}$ by 2.1%, $ROA_{t-1}$ by 0.7% and $MTB_{t-1}$ by 0.3%. The estimated odds ratios and their confidence limits are compared in Table 6 below.

**Table 6 | Model results – Group A SWFs related to COVID-19 pandemic**

| Variable | Coefficient | Standard error | Wald chi-square | Pr > chi-square | Odds ratio point estimate | 95% Wald confidence limits | |
|---|---|---|---|---|---|---|---|
| **Intercept** | -1.988*** | 0.055 | 1,306.49 | <0.0001 | - | | |
| ***ESGI$_{t-1}$*** | 0.021*** | 0.0039 | 28.99 | <0.0001 | 1.021 | 1.013 | 1.029 |
| ***ESGR$_{t-1}$*** | 0.027*** | 0.0026 | 107.84 | <0.0001 | 1.027 | 1.022 | 1.032 |
| ***CAP$_{t-1}$*** | 0.126*** | 0.0078 | 260.95 | <0.0001 | 1.126 | 1.110 | 1.142 |
| ***DIV$_{t-1}$*** | 0.029*** | 0.0064 | 20.53 | <0.0001 | 1.029 | 1.016 | 1.042 |
| ***ROA$_{t-1}$*** | 0.0065** | 0.0031 | 4.40 | 0.0213 | 1.007 | 1.000 | 1.013 |
| ***MTB$_{t-1}$*** | 0.0032** | 0.0015 | 4.55 | 0.0122 | 1.003 | 1.000 | 1.006 |

Note: *** statistical significance at $\alpha$ = 0.001% level, ** $\alpha$ = 0.05, * $\alpha$ = 0.1
Sources: SAS output on LSEG/Refinitiv (2023) and RepRisk (2023)

According to the logit regression applied to create a predictive model, Table 7 provides information on the post-hoc test of the final model in terms of, e.g., predictive accuracy, sensitivity and specificity.

**Table 7 | Association of predicted probabilities and observed responses – Group A SWFs related to COVID-19 pandemic**

| | | | |
|---|---|---|---|
| **Percent concordant** | 62.4 | Somers' D | 0.345 |
| **Percent discordant** | 37.6 | Gamma | 0.345 |
| **Percent tied** | 0.0 | Tau-a | 0.198 |
| **Pairs** | 7,446,976 | c | 0.694 |

Sources: SAS output on LSEG/Refinitiv (2023) and RepRisk (2023)

### Group B SWF results related to COVID-19 pandemic

The model suggests that the purchase of stocks is significantly influenced by the variables $ESG_{t-1}$, $ESGR_{t-1}$, $CAP_{t-1}$, $DIV_{t-1}$, $ROA_{t-1}$ and $MTB_{t-1}$ (Table 8). The overall significance of the logit model was verified by the likelihood ratio and the Wald test, both with a p-value < 0.0001, which means that the model is significant. The explanatory power of the model was evaluated by the number of concordant predictions, which were equal to 63.8%. The results suggest that the variable that most influences the purchase of a stock is $CAP_{t-1}$: for every unit increase in $CAP_{t-1}$, the odds in favour of stock purchase rise by 16.6%. The estimated influence of $CAP_{t-1}$ on odds is between 15.5% and 17.7%. The second most influential variable, according to the odds ratio estimates, is $DIV_{t-1}$, which for each unit increases the odds in favour of stock purchase by 3.7%. Its estimated influence on odds is between 3.4% and 4.0%. The third most influential variable, according to the odds ratio estimates, is $ESGR_{t-1}$, which for each unit increases the odds in favour of stock purchase by 2.2%. Its estimated influence on odds is between 1.9% and 2.5%. The influence of other variables on the purchase of a stock is smaller: $ESGI_{t-1}$ by 1.4%, $ROA_{t-1}$ by 0.7% and $MTB_{t-1}$ by 0.4%. The estimated odds ratios and their confidence limits are compared in Table 8 below.

**Table 8 | Model results – Group B SWFs related to COVID-19 pandemic**

| Variable | Coefficient | Standard error | Wald chi-square | Pr > chi -square | Odds ratio point estimate | 95% Wald confidence limits | |
|---|---|---|---|---|---|---|---|
| **Intercept** | -2.012*** | 0.073 | 759.64 | <0.0001 | - | | |
| $ESGI_{t-1}$ | 0.014*** | 0.0013 | 115.98 | <0.0001 | 1.014 | 1.011 | 1.017 |
| $ESGR_{t-1}$ | 0.022*** | 0.0017 | 167.47 | <0.0001 | 1.022 | 1.019 | 1.025 |
| $CAP_{t-1}$ | 0.166*** | 0.0056 | 878.70 | <0.0001 | 1.166 | 1.155 | 1.177 |
| $DIV_{t-1}$ | 0.037*** | 0.0017 | 473.70 | <0.0001 | 1.037 | 1.034 | 1.040 |
| $ROA_{t-1}$ | 0.0071** | 0.0032 | 4.92 | 0.0276 | 1.007 | 1.001 | 1.014 |
| $MTB_{t-1}$ | 0.0035** | 0.0014 | 6.25 | 0.0186 | 1.004 | 1.001 | 1.006 |

Note: *** statistical significance at $\alpha = 0.001\%$ level, ** $\alpha = 0.05$, * $\alpha = 0.1$
Sources: SAS output on LSEG/Refinitiv (2023) and RepRisk (2023)

According to applied logit regression to create a predictive model, Table 8 provides information on the post-hoc test of the final model in terms of, e.g., predictive accuracy, sensitivity and specificity.

**Table 9 | Association of predicted probabilities and observed responses - Group B SWFs related to COVID-19 pandemic**

| | | | |
|---|---|---|---|
| **Percent concordant** | 63.8 | Somers' D | 0.375 |
| **Percent discordant** | 36.2 | Gamma | 0.375 |
| **Percent tied** | 0.0 | Tau-a | 0.172 |
| **Pairs** | 8,964,534 | c | 0.627 |

Sources: SAS output on LSEG/Refinitiv (2023) and RepRisk (2023)

## 3.2 Summary of empirical analysis

### Company financial data

In our dataset, company market capitalization always plays the most important role in the investment decision-making of SWFs in public equity holdings. This holds true for separated Group A and Group B model results related to the COVID-19 pandemic. The influence on public equity holding investments and disinvestments is higher for SWFs belonging to Group B (lower transparency on ESG matters and not paying much attention to CSR and CSI).

### Company ESG data

Our findings related to CSR align with and corroborate earlier research, indicating a prevailing trend among SWFs to consider ESG practices of their portfolio companies when making investment decisions, using ESG data that is self-reported (Liang and Renneboog, 2020). In each of our models, $ESGR_{t-1}$ is statistically significant on an $\alpha = 0.001\%$ level. The coefficients for $ESGR_{t-1}$ under the COVID-19 pandemic are higher for SWFs belonging to Group A (higher transparency on ESG matters and not paying much attention to CSR and CSI) compared to Group B SWFs.

This result is very similar to the CSI data. For both groups of SWFs, $ESGI_{t-1}$ has a statistically significant impact on the investment and disinvestment decisions by the SWFs related to our evaluation. Here again, the impact is higher for SWFs belonging to Group A compared to Group B SWFs. However, within each group of SWFs, the coefficient of $ESGI_{t-1}$ is lower than the coefficient of $ESGR_{t-1}$, which means that company self-reported ESG CSR data have more influence on the investment and disinvestment decision of public equity holdings than ESG CSI data derived from independent sources.

During the COVID-19 pandemic, ESG CSR and CSI data had a less significant effect on the investment and disinvestment decisions than company market capitalization and dividend yield, but the effect of ESG CSR and CSI data is more significant than that of return on assets and market-to-book ratio regardless of the SWF categorization into Group A and B.

**Results of hypothesis testing**

Based on the summary of empirical analysis, the hypothesis (Raising CSI scores have a more pronounced influence on the investment decision of SWFs in countries with higher transparency of sustainability matters) can be accepted.

Hence, the research question (Do public equity holding CSI data have a more pronounced influence on the investment decision of SWFs in countries with higher transparency of sustainability matters?) can be affirmed. SWFs from Group A (higher ESG score) are more sensitive to CSI than SWFs from Group B (lower ESG score).

## 3.3 Discussion and recommendations

Are company financial data still a predominant reason for the investment decision of SWFs into public equity holdings, or is it more about SWFs not fully committing to ESG principles?

Consistent with previous research into CSR, our study highlights an increasing trend among SWFs to consider the ESG initiatives undertaken by their portfolio companies when making investment decisions. Notably, this trend is reflected in the utilization of ESG data, which predominantly originate from company sources (Liang and Renneboog, 2020).

Our analysis of the model shows that the previous ESG variable ($ESGR_{t-1}$) holds importance. Yet, it is important to mention that the coefficient linked to $ESGR_{t-1}$ is relatively lower in comparison to $CAP_{t-1}$ and $DIV_{t-1}$. Company financial data $CAP_{t-1}$ and $DIV_{t-1}$ stand out as the most influential variables related to investments from SWFs in public equity holdings, as seen in our findings.

In relation to $ESGI_{t-1}$, our findings indicate its statistical significance. However, it is noteworthy that the coefficient associated with $ESGI_{t-1}$ is lower compared to $ESGR_{t-1}$. This suggests that SWFs place a greater emphasis on company-derived ESG CSR data when making investment decisions regarding public equity holdings, as opposed to relying solely on externally sourced ESG CSI data capturing negative reputation risks.

These results underscore SWFs' prioritization of company-specific CSR details (ESGR) over broader CSI data (ESGI) when assessing their investments in publicly traded stocks. Nevertheless, it is important to recognize that this preference may represent a prevailing trend. Historically, SWFs have gradually incorporated ESG information obtained from company sources into their investment strategies, often driven by sustainability-related considerations.


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The overall results for $CAP_{t-1}$ are in line with results of a previous analysis by Klein et al. (2023) over the timeline from 2007 to 2022 without any clustering of SWFs. However, this differs from the findings of Liang and Renneboog (2020), who did not clearly establish a correlation between $CAP_{t-1}$ and ownership. In their analysis, they observed a mix of negative relationships depending on the model used.

Furthermore, our results are consistent with the findings of Liang and Renneboog (2020) for the dividend yield. They found that a higher $DIV_{t-1}$ of public equity holdings influences the ownership decisions of SWFs. In our dataset, $DIV_{t-1}$ plays an important role in the investment decision, whereby the influence on the investment and disinvestment decision is higher for SWFs belonging to Group B compared to Group A SWFs.

During times of crisis, it seems that SWFs still have a higher focus on the company's financial data of the underlying assets than ESG data, especially those related to ESG CSI. We did not find this result in any of the former studies. This behaviour might be interpreted as a "survival pattern".

In addition, Liang and Renneboog (2020) found positive evidence that return on assets influences SWF ownership decisions. This theory is supported by the empirical findings of Bortolotti et al. (2015), who found that the median ROA of SWF equity investments was higher than the ROA of a benchmark sample. The results of our sample show that the purchase of stocks is influenced by $ROA_{t-1}$. However, the effect is constantly very low and almost the same for SWFs belonging to Group A and Group B SWFs.

Liang and Renneboog (2020) found no clear evidence for a positive relationship between market-to-book ratio and ownership. In some cases, this relation is positive, but it is also negative in others, again depending on the econometric model chosen. Bortolotti et al. (2015) found that the median MTB of SWF equity investments was higher than the MTB of a benchmark sample. Our results show that there is a positive relationship between $MTB_{t-1}$ and stock ownership. However, the effect is again constantly very low and almost the same for SWFs belonging to Group A and Group B SWFs.

In contrast to the findings of Liang and Renneboog (2020) for SG and ROE, as well as Bortolotti, Fotak and Megginson (2015) for SG, the variables SG and ROE were eliminated from the model as the results were insignificant and did not greatly affect the probability of stock purchase. This may be a result of the different scope and focus of the analysis.

Our findings are in line with Dai et al. (2022), who conducted a study investigating the significance of a firm's ESG engagement in the investment decision-making process of SWFs, shedding light on the evolving considerations and dynamics surrounding ESG factors affecting SWF investments. Their sample covered all selected SWFs' investments in publicly traded US firms over the period 2003–2018. Their findings confirmed that ESG is a crucial factor for SWFs when making investment decisions and showed that SWF ownership in the target firm increased the probability that higher ESG engagement and a higher CSR score, respectively, would attract more SWFs to invest. The authors used a control variable of ESG engagement that was more comprehensive than that of Liang and Renneboog (2020). The data regarding ESG performance was sourced from the Kinder Lydenburg and Domini (KLD) database, a common platform for assessing CSR practices. This database deploys

information from financial statements, annual reports, media, governmental reports and employee surveys.

Hentov and Petrov (2017) came to less distinctive conclusions about the relationship between SWFs and the ESG performance of their underlying firms. According to Hentov and Petrov (2017), the main expectation from ESG investments in SWFs comes from long-term alpha, followed by downside protection, medium-term alpha and lower volatility. The authors found that this is based on a long-term investment mindset and beliefs in senior management as the main reasons for ESG adoption. They also found that SWFs are different from other institutions, in both thematic focus and method of ESG adoption. Compared to all other asset owners, SWFs are less likely to adopt specific themes, including ESG, in their investment approach. The top themes in the investment process of SWFs are said to be global political tensions and resource scarcity, followed by climate change, and the major methods of ESG implementation are exclusionary screening – a more basic form of implementation – followed by impact investing.

Additionally, one key consideration is that some SWFs might overlook CSI information because of the lack of transparency in how industries report data. Without trustworthy data, it becomes a challenge for SWFs to gauge the level of irresponsibility present in companies accurately. This issue is closely linked with the scarcity of data. CSI data may not be easily accessible or standardized across industries and regions, posing a hurdle for SWFs to integrate these data into their investment decision-making processes. We believe that utilising CSI data such as those from RepRisk could serve as an initial step.

Moreover, SWFs might prioritize gains over environmental concerns. While there is an increasing interest in ESG factors, some SWFs may still concentrate mainly on enhancing returns for their stakeholders without considering the impact of their investments. Some SWFs may simply aim to generate profits and optimize their investment returns. This ties back to the notion that SWFs could see the inclusion of CSI data as introducing complexity to their investment strategies. Instead, they might opt to focus on metrics and risk assessment methods when evaluating investment prospects.

SWFs are frequently owned by governments and their investment choices could be swayed by elements other than just social responsibility concerns. Consequently, the inclusion of CSI data in their decision-making process may not be a priority. This aspect is commonly associated with regulatory limitations. In some regions, the legal and regulatory frameworks might not enforce the requirement to factor in CSI data when making investment choices. In the absence of mandates, SWFs may not perceive the necessity to integrate data into their strategies. Some SWFs have started to deal with ESG criteria in their investments in private equity holdings earlier than others. This applies to some SWFs that were assigned to control group A, such as GPFG from Norway, KIC from Korea or Temasek from Singapore. These are the SWFs that have now deposited CSI criteria in their investment guidelines. The topic of ESG and sustainability is therefore more important for this group of SWFs than for SWFs assigned to control group B, such as ADIA from the UAE, SAMA from Saudi Arabia or NSSF from China, which have the lowest weighted ESG/CSR score of Group B SWFs.

The value creation of ESG measures can also be derived from the transparency behaviour of SWFs. This concerns, among other things, the ESG evaluation matrix criteria as described in Table 1. This includes publication in ESG and SDG reporting, membership in the One Plant


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SWF initiative, membership in the International Forum of SWF (IFSWF) initiative, or the Linaburg-Maduell Transparency Index (LMTI).

There appear to be no SWFs in the scope of our analysis that have implemented CSI measures before ESG measures. CSI measures appear to be a second stage of ESG measures. However, this may simply be a matter of timing. In previous years, SWFs began incorporating ESG data derived from self-reported information into their investment decision-making process due to sustainability considerations. On the other hand, there may always be SWFs that take sustainability considerations more seriously than others. Additionally, it is related to investments of Group A (higher weighted own ESG/CSR score) during the COVID-19 pandemic.

However, there is one surprising exception: GPFG from Norway. The Norwegian sovereign wealth fund has the second highest transparency score in this analysis and is otherwise a model student when it comes to dealing with ESG measures. However, GPFG finds itself disproportionately involved as an investor in financial market scandal cases. Another effect comes into play here: the size effect. As the world's largest SWF in size of AuM, and as a liability-driven investor taking care of the savings of Norway's future pension scheme, GPFG simply must invest broadly all over the world to diversify its equity book of business. This can also be seen as a measure of risk reduction. However, the downside is that investors often find themselves entangled in scandal cases. Hence, it is a matter of enhancing the ESG CSR & CSI adjustment over time to exclude scandal cases upfront or to find the right time to disinvest.

Other SWFs with a lower weighted ESG/CSR score (e.g., Group B SWFs) are often just equity investors to make money and maximize the return on their investments.

As the COVID-19 pandemic is the most recent global event with significant influence on financial markets, it remains to be seen whether this effect is constant or only an exception.

In broadening their corporate governance framework, SWFs may consider delving deeper into reputation risk metrics derived from media coverage of events affecting firms' ESG performance. We propose that SWFs, alongside other investors, integrate external CSI indicators as an initial step in evaluating both current and prospective investments.

We also advocate for more standardized ESG reporting frameworks. In today's changing world of governance and sustainability, pushing for reporting guidelines on ESG has become increasingly important. Standardized frameworks can provide a transparent way for companies to share their sustainability efforts. Having standardization in place makes it easier for investors, stakeholders and regulators to make decisions based on data that can be compared across different companies. It encourages accountability and pushes companies to improve their performance by aligning their operations with sustainability targets. Moreover, having standardized ESG reporting helps reduce the risk of misleading claims about sustainability practices such as greenwashing and builds trust with stakeholders. This call for action emphasizes the need for collaboration and government backing to create ESG standards that cater to various industry requirements and regional differences.

Merging ESG reporting frameworks with improved oversight plays a crucial role in establishing a transparent, responsible and sustainable business environment. Consistent ESG reporting guidelines are becoming more important for strengthening supervision. The connection between standardization and supervision is influenced by certain factors. Initially, consistent frameworks ensure uniformity and comparability in ESG data allowing regulators to effectively evaluate and monitor performance. Improved transparency and responsibility are encouraged as companies must follow the reporting rules, reducing the chances of misrepresentation.

This methodology should extend beyond publicly traded equity holdings to encompass a wider spectrum of assets, including liquid investments such as fixed-income securities, as well as illiquid investments such as private equity and infrastructure. It is noteworthy that these investment categories often lack disclosure and transparency, yet are increasingly incorporating sustainability components and designations. Consequently, the incorporation of external CSI indicators assumes heightened significance in these contexts.

## Conclusions and Outlook

Studying how SWFs invest in ESG assets gives valuable insights into the way they make investment choices. Our research indicates that SWFs are starting to factor in ESG considerations when deciding on investments, but there is still room for enhancement. Policymakers and stakeholders could utilize these findings to push for more extensive incorporation of ESG principles in SWF investment approaches and advance sustainable investment practices on a larger scale.

It seems clear that SWFs still attach more importance to company-biased CSR details rather than relying on impartial CSI data when making investment choices related to publicly traded stocks. If this is accurate, there is a growing need for a stronger integration of ESG factors into SWF investment strategies and a push for the adoption of sustainable investment practices beyond just liquid assets to demonstrate a commitment to sustainability in action. However, this could simply be a matter of timing. In the past, SWFs started including ESG data obtained from company-biased sources in their decision-making processes due to concerns about sustainability.

We propose that SWFs and other investors consider incorporating external sustainability indicators as an initial step for both current and future investment decisions. This recommendation specifically involves utilizing historical changes in ESG sustainability data to assess reputation risk. This strategy should not be limited to publicly traded stocks but should also encompass other liquid assets such as bonds, as well as illiquid investments such as private equity and infrastructure projects. It is worth noting that these types of investments are often undisclosed and lack transparency, yet they increasingly incorporate sustainability aspects and designations, underscoring the significance of integrating external sustainability indicators into the decision-making process. This holds especially true for all investments related to the big investment theme of energy transition.

Our research aimed to build upon existing knowledge by introducing a fresh perspective, incorporating CSI factors as key factors influencing SWF investment decisions regarding public equity holdings. Based on our findings, we can propose potential directions for future studies and enhancements. It would be beneficial to conduct in-depth research into how the socio-economic landscape and financial market events affect the ESG CSI behaviour of

SWFs. Our analysis solely utilized static models. However, we recommend incorporating the dependent variable as an independent variable with a one period lag in future research to assess whether past SWF holdings influence model outcomes. This approach would involve employing dynamic models such as generalized method of moments (GMM) or maximum likelihood (ML) estimators on dynamic panel datasets.

By looking more closely at the reputation signals shared through various media outlets, scholars and professionals could uncover valuable information about how businesses behave that might not be completely revealed in standard CSR reports. This strategy recognizes the constraints of depending solely on internally reported CSR data and aims to supplement them with external evaluations of corporate practices. By examining reputation metrics from media sources, a comprehensive view of a company's societal and environmental influence can be achieved, aiding investors, regulators and other interested parties in making well-informed decisions.

Utilizing reputation metrics from various media outlets allows a holistic assessment of a company's actions, encompassing both their commendable and concerning behaviour. By looking beyond the positive coverage of CSR initiatives and acknowledging any criticism or controversies highlighted in the media and online platforms, stakeholders can obtain a well-rounded understanding of a company's impact on society and identify potential vulnerabilities. This comprehensive evaluation method enhances the integrity of sustainability evaluations, promotes transparency and encourages accountability in corporate reporting standards.

Investors still rely heavily on common data, especially ESG data that favour companies when making investment choices. Being aware of changes in reputation risks, both positive and negative, can serve as an early indicator for decisionmakers to improve the sustainability of their investment portfolios. It is crucial to avoid reputation risks within a portfolio to avoid negative impacts on prices. Therefore, in the case of a bad reputation risk situation, it is best not to invest at all or consider divesting earlier than others on the market to safeguard the reputational value of the portfolio. To completely understand the effects of reputation risk, it is essential to conduct long-term studies that bridge the gap between academic research and the strategies followed by individual SWFs and organizations such as the One Planet Initiative, International Forum of Sovereign Wealth Funds and Sovereign Wealth Fund Institute.

In addition, it would be beneficial for studies to explore how investments are made and the factors included when considering CSI in connection with profit and loss calculations and forecasting balance sheet management. This area could also be explored further to compare the investment patterns of SWFs with those of significant investors such as insurance companies and public pension funds. This analysis should not focus on public stock holdings only. It should also encompass liquid asset classes such as bonds and publicly traded real estate, along with private market investments such as infrastructure equity, debt instruments and real estate.

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**Author statement:**

- Marty-Jörn Klein: conceptualization, methodology, investigation, writing – original draft, supervision, project administration, visualization
- Gabriela Chmelíková: conceptualization, writing – review and editing, funding acquisition
- Jozef Palkovič: methodology, formal analysis

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