

The Effects of Mandatory ESG Disclosure Around the World

Finance Working Paper N° 754/2021

February 2026

Philipp Krueger

University of Geneva, GFRI, SFI and ECGI

Zacharias Sautner

University of Zurich, Swiss Finance Institute and ECGI

Dragon Yongjun Tang

The University of Hong Kong

Rui Zhong

University of Western Australia

© Philipp Krueger, Zacharias Sautner, Dragon Yongjun Tang and Rui Zhong 2026. All rights reserved. Short sections of text, not to exceed two paragraphs, may be quoted without explicit permission provided that full credit, including © notice, is given to the source.

This paper can be downloaded without charge from:
http://ssrn.com/abstract_id=3832745

www.ecgi.global/content/working-papers

ECGI Working Paper Series in Finance

The Effects of Mandatory ESG Disclosure Around the World

Working Paper N° 754/2021

February 2026

Philipp Krueger
Zacharias Sautner
Dragon Yongjun Tang
Rui Zhong

We thank an anonymous referee, Ulrich Atz, Rui Dai, Caroline Flammer, Mingyi Hung, Hao Liang, Chenyu Shan, Andrei Simonov, Yao Wang, Yichen Shi, Fei Xie, Jian Zhang, Bohui Zhang, and seminar participants at the 2021 GRASFI conference, the 2019 Sustainable Finance Forum, the 2019 FMA Asia Annual Conference, the HKU-CBI Conference on the Real Effects of Green Bonds and ESG, UNPRI Academic Seminar, University of Western Australia, Shanghai University of Finance and Economics, Curtin University, Lingnan University, and ACPR - Banque de France. We acknowledge financial support from INSPIRE at the ClimateWorks Foundation, which supports the agenda of the Network for Greening the Financial System (NGFS). Zhong acknowledges research funding from the Research Collaboration Awards at the University of Western Australia, the National Social Science Fund of China (Key Project No. 18AZD013), and the International Institute of Green Finance at the Central University of Finance and Economics. An Online Appendix to this paper can be downloaded at <https://www.chicagobooth.edu/jar-online-supplements>.

© Philipp Krueger, Zacharias Sautner, Dragon Yongjun Tang and Rui Zhong 2026. All rights reserved. Short sections of text, not to exceed two paragraphs, may be quoted without explicit permission provided that full credit, including © notice, is given to the source.

Abstract

We compile a novel dataset on mandatory environmental, social, and governance (ESG) disclosure around the world to analyze the stock liquidity effects of such disclosure mandates. We document a positive effect of ESG disclosure mandates on firm-level stock liquidity. The effects are strongest if the disclosure requirements are implemented by government institutions, not on a comply-or-explain basis, and coupled with strong enforcement by informal institutions. Firms with weaker information environments benefit more from ESG disclosure mandates. Our results support the view that ESG disclosure regulation improves the information environment and has beneficial capital market effects.

Keywords: Sustainability reports, ESG reporting, Nonfinancial information, ESG incidents

JEL Classifications: G14, G15, G18, G32, G38

Philipp Krueger

Professor of Responsible Finance
University of Geneva
40, Bd du Pont-d'Arve
1211 Geneva 4, Switzerland
phone: +41 223 798 569
e-mail: philipp.krueger@unige.ch

Zacharias Sautner*

Professor of Sustainable Finance
University of Zurich
Plattenstrasse 14
CH-8032 Zurich, Switzerland
e-mail: zacharias.sautner@bf.uzh.ch

Dragon Yongjun Tang

Professor of Finance
Hong Kong University Business School
KKL 1004 Pokfulam Road
Pokfulam, Hong Kong
phone: +852 2219 4321
e-mail: yjtang@hku.hk

Rui Zhong

Associate Professor
University of Western Australia
35 Stirling Highway
Perth WA 6009, Australia
phone: +61 8 6488 3867
e-mail: rui.zhong@uwa.edu.au

*Corresponding Author

Swiss Finance Institute

Research Paper Series

N°21-44

The Effects of Mandatory ESG Disclosure
around the World



Philipp Krueger

University of Geneva, Swiss Finance Institute, and ECGI

Zacharias Sautner

University of Zurich, Swiss Finance Institute, and ECGI

Dragon Yongjun Tang

The University of Hong Kong

Rui Zhong

University of Western Australia

The Effects of Mandatory ESG Disclosure around the World*

Philipp Krueger

Zacharias Sautner

Dragon Yongjun Tang

Rui Zhong

Journal of Accounting Research

October 2024

ABSTRACT

We compile a novel dataset on mandatory environmental, social, and governance (ESG) disclosure around the world to analyze the stock liquidity effects of such disclosure mandates. We document a positive effect of ESG disclosure mandates on firm-level stock liquidity. The effects are strongest if the disclosure requirements are implemented by government institutions, not on a comply-or-explain basis, and coupled with strong enforcement by informal institutions. Firms with weaker information environments benefit more from ESG disclosure mandates. Our results support the view that ESG disclosure regulation improves the information environment and has beneficial capital market effects.

Keywords: Sustainability reporting; ESG reporting; Nonfinancial information; Stock liquidity

JEL Classification: G14; G15; G18; G32; G38

* Accepted by Regina Wittenberg Moerman. The ESG mandatory disclosure data described in this paper are publicly available at <https://osf.io/syn8t/>. Krueger is from the University of Geneva (GFRI, GSEM), Swiss Finance Institute, and ECGI. He is also Managing Director of Greenium SARL. Email: philipp.krueger@unige.ch. Sautner is from the University of Zurich, Swiss Finance Institute, and ECGI. He is also a Regular Research Visitor at the European Central Bank and on the Sustainability Council of Lampe Asset Management. Email: Zacharias.sautner@bf.uzh.ch. Tang is from the Faculty of Business and Economics, The University of Hong Kong. He is also affiliated with Hong Kong Centre for Green and Sustainable Finance. Email: yjtang@hku.hk. Zhong is from UWA Business School, University of Western Australia. Email: rui.zhong@uwa.edu.au. We thank an anonymous referee, Ulrich Atz, Rui Dai, Caroline Flammer, Mingyi Hung, Hao Liang, Chenyu Shan, Andrei Simonov, Yao Wang, Yichen Shi, Fei Xie, Jian Zhang, Bohui Zhang, and seminar participants at the 2021 GRASFI conference, the 2019 Sustainable Finance Forum, the 2019 FMA Asia Annual Conference, the HKU-CBI Conference on the Real Effects of Green Bonds and ESG, UNPRI Academic Seminar, University of Western Australia, Shanghai University of Finance and Economics, Curtin University, Lingnan University, and ACPR - Banque de France. We acknowledge financial support from INSPIRE at the ClimateWorks Foundation, which supports the agenda of the Network for Greening the Financial System (NGFS). Zhong acknowledges research funding from the Research Collaboration Awards at the University of Western Australia, the National Social Science Fund of China (Key Project No. 18AZD013), and the International Institute of Green Finance at the Central University of Finance and Economics. An Online Appendix to this paper can be downloaded at <https://www.chicagobooth.edu/jar-online-supplements>.

1. Introduction

Environmental, social, and governance (ESG) considerations have become increasingly important for investment decisions. Yet investors frequently complain that the availability and quality of firm-level ESG disclosures are insufficient to make informed investment decisions (Ilhan et al. [2023]). In response to the gap between the demand for ESG information by investors and the supply of such information by firms, several countries have initiated *mandatory* ESG disclosure regulations to force firms to disclose high-quality information on ESG issues either jointly with traditional financial disclosures or in specialized standalone reports. In addition to these country-level initiatives, there are significant efforts at the global level to design, harmonize, and eventually mandate international ESG disclosure standards.¹

In this paper, we compile a novel dataset on mandatory ESG disclosure regulations around the world and analyze whether and how such disclosure rules affect firm-level stock liquidity. ESG disclosure rules may affect many firm-level outcomes, but our focus on stock liquidity is motivated by two primary considerations. First, liquidity is a first-order stock characteristic that is of importance for investors, firms, and regulators because it affects real and financial outcomes (e.g., Amihud and Levi [2023] for recent evidence). Second, as stressed by Christensen, Hail, and Leuz [2021] in their review of the ESG disclosure literature, “[the] relatively low number of studies on liquidity effects is surprising considering that market liquidity has been shown to be very

¹ For instance, the International Sustainability Standards Board (ISSB) launched a first set of proposals on ESG reporting standards with a focus on broad sustainability issues and climate disclosures in June 2023. Emanuel Faber, chair of the ISSB, motivated the proposals by stating that “[the] problem in today’s market is that companies can make claims that nobody can verify.” He concluded that this “makes it extremely difficult for people making capital allocation decisions” (Pavoni [2022]).

responsive to corporate disclosures and it is probably one of the capital-market outcomes that we understand the best (see Leuz and Wysocki [2016]).”

The effect of mandatory ESG disclosure on stock liquidity is unclear *ex ante*. One view holds that the introduction of such rules reduces information asymmetry about the “value” and “values” consequences of firms’ ESG activities. As explained by Starks [2023], investors may incorporate ESG information into their investment decisions because of the consequences that firms’ ESG activities have on firm risks and cash flows (“value”) or because such information—even if value-irrelevant—allows them to better align investment choices with their values-based investment preferences or mandates (“values”). In both cases, by reducing information asymmetry, more ESG disclosure should mitigate adverse selection and improve secondary market liquidity.

A contrasting view holds that disclosure mandates covering ESG topics do not have such effects, either because nonfinancial information is too complex, broad, unstructured, and qualitative, or because it is not financially material and values-based information demand is small. In addition, there may be a lack of standardized reporting structures and little guidance on the ESG information that firms need to disclose. Firms may take advantage of this vacuum by adopting minimum disclosure criteria to meet regulatory requirements only superficially. Moreover, some firms may have voluntarily reported ESG information prior to the mandate introduction, so additional disclosure rules should not have large effects.

Our empirical analysis to explore these contrasting views is built on a panel of 136,269 firm-year observations covering 17,680 unique firms across 65 countries between 2002 and 2020. We identify 38 countries that introduced ESG disclosure mandates during the sample period. Twenty-

five countries implemented comprehensive mandatory ESG disclosure all at once, while the remaining 13 countries introduced E, S, and G disclosure one by one.²

Our estimations deliver consistent evidence that the introduction of ESG disclosure mandates *does* have beneficial liquidity effects, with estimated magnitudes that are economically sizeable. For example, bid-ask spreads decrease by 8.4% once a country requires ESG disclosure. This number compares to an improvement in bid-ask spreads by around 17% after IFRS is adopted in European Union (EU) countries (Christensen, Hail, and Leuz [2013]). Amihud's [2002] illiquidity measure improves by 16%, and the fraction of zero-return days declines by around four trading days per year (13% of the standard deviation) after the inception of ESG disclosure mandates. These effects also translate into a significant effect for the summary liquidity measure. Among many robustness tests, we document that the results are unaffected if we exclude countries that never passed ESG disclosure rules, if we exclude countries that passed E, S, and G regulations at different points in time, or if we address concerns related to heterogeneous treatment effects or variation in treatment timing.

When we examine the dynamics of this effect in an event-time analysis, we observe some liquidity improvements leading up to the introduction of the disclosure rules. This pre-trend may be caused by some countries introducing *voluntary* disclosure initiatives prior to the disclosure mandates or by anticipation effects, whereby market participants anticipate some of the liquidity improvements. Several tests help us shed light on the role of these two factors in potentially causing the pre-trend. To understand the effects of voluntary disclosure initiatives, we i) exclude countries that introduced voluntary ESG disclosure initiatives prior to ESG disclosure rules, and

² We assume that mandatory ESG disclosure has been introduced once disclosure encompassing all three topics is required. This assumption implies that there is some complementarity in E, S, and G disclosure to fully obtain the effects of the ESG disclosure mandate (see, e.g., Dyck et al. [2023] for supporting evidence).

ii) allow the liquidity effects of the disclosure mandates to vary dependent on whether firms are from voluntary ESG disclosure countries. The aforementioned pre-trend becomes statistically indistinguishable from zero when we exclude countries with voluntary disclosure initiatives and use a covariate-balanced synthetic control group. Moreover, we observe smaller post-mandate liquidity improvements in countries with voluntary disclosure initiatives. We inspect anticipation effects by excluding firm-years just prior to the disclosure mandates, and by measuring the effects of the mandates from *one year prior* to the adoption dates. In these tests, we find little evidence of anticipated liquidity improvements (the estimates in these refined estimations hardly change relative to the benchmark estimates).³

Another concern with our analysis is that ESG mandates were implemented either because of public debates surrounding ESG topics or in response to major ESG incidents. The liquidity improvements that we document may in turn be confounded by these economic or societal developments, with the ESG disclosure rules being a symptom or corollary outcome of these underlying forces. To address this concern, we follow Christensen, Hail, and Leuz [2016] and perform a two-step falsification test. In the first step, we re-estimate our regression model *without* the disclosure mandate variable. Instead, we add country-level proxies for local factors that may explain the introduction of the mandates and may be correlated with liquidity (we use variables that capture public interest in ESG topics and ESG scandals, and macro variables possibly related to ESG disclosures). In the second step, we use the predicted liquidity value from the first step as the dependent variable in the main regression model. Under the alternative explanation that ESG-related shocks or macro conditions induce our results, we should find coefficient estimates similar

³ This finding aligns with Daske et al. [2008], who find only little evidence for anticipation effects when examining the effects of IFRS on liquidity outcomes, while demonstrating some anticipation effects for the cost of capital or firm valuations. Our empirical approach to examining the role of anticipation effects follows Daske et al. [2008].

to those in the baseline estimation. However, this is not the case: the estimated effects are small in magnitude and statistically insignificant. Hence, selection on unobservables would have to be large and unrelated to the proxies in this falsification if it were to explain our results.

Turning to our cross-sectional analysis, we reveal substantial heterogeneity across countries in how ESG disclosure rules affect liquidity. First, we examine variation in how countries implement the disclosure mandates, namely: i) whether the mandates are issued by a government institution or a stock exchange, and ii) whether they are implemented on a full-compliance or a comply-or-explain basis. We expect larger liquidity benefits if the mandates are issued by government institutions rather than stock exchanges, because governments tend to have more credible implementation mandates, are less affected by regulatory capture, and have more resources to implement and enforce the rules effectively. Likewise, we expect stronger effects in countries requiring full compliance without the option to deviate from a default case, because disclosure rules are stricter if firms cannot opt out of compliance by providing explanations for why they choose not to disclose.

In line with these predictions, ESG disclosure mandates improve liquidity almost three times more strongly when implemented by governments rather than stock exchanges. Moreover, the liquidity improvements are around 50% stronger in countries where firms cannot evade full compliance through a comply-or-explain option. That said, our estimates still suggest that it is better to have some form of ESG disclosure mandates—even if issued by stock exchanges or implemented on a comply-or-explain basis—rather than not requiring such disclosures at all.

Second, we examine cross-country heterogeneity related to formal and informal disclosure enforcement; ESG disclosure mandates are unlikely to have a meaningful effect if they are not enforced properly. A large body of research in accounting and finance demonstrates that

enforcement by *formal* institutions is critical to reap any real or capital market benefits of financial disclosure mandates (Leuz and Wysocki [2016]). Applied to our ESG setting, this implies that countries with better formal institutions—as reflected by better legal environments, stricter rules of law, or more effective governments—should experience stronger liquidity improvements after mandatory ESG disclosure is introduced.

Next to formal institutions, *informal* institutions—as captured by societal norms or values—should also be important for the enforcement of ESG disclosure rules (Wysocki [2011]). Given that the mandates in part cover topics related to societal externalities (e.g., carbon emissions), social and environmental norms in particular can affect how strictly firms apply the mandates. Relatedly, Christensen, Hail, and Leuz [2021] argue that nonfinancial preferences of investors are important determinants of the capital market effects of ESG disclosures. These arguments imply that the liquidity benefits of ESG disclosure rules may be strengthened if enforcement pressure related to a country’s informal institutions is stricter.

We document that stricter *informal* enforcement increases the liquidity benefits of ESG disclosure mandates, while there is weaker evidence for *formal* enforcement mechanisms. We explain that this divergence in results may be related to the nature of ESG information, and a lack of experience and expertise in countries when it comes to auditing and enforcing ESG disclosures.

Finally, we explore variation across firms with respect to the voluntary firm supply of, and investor demand for, ESG information. For the supply dimension, we build on Diamond and Verrecchia’s [1991] prediction that the benefits of reducing information asymmetry are smaller if the initial level of asymmetric information is lower. To test this idea, we exploit firm-level heterogeneity in information levels based on *voluntary* disclosures that some firms provide to investors in the form of sustainability reports or earnings guidance. We expect weaker liquidity

improvements among firms that provide such forms of voluntary disclosures. Voluntary disclosures in the form of sustainability reports can directly reduce information asymmetry about a firm's ESG activities. Apart from estimates of key accounting numbers, earnings guidance often also includes qualitative discussions about a firm's risks and opportunities, potentially incorporating information on material ESG issues. Indeed, liquidity increases less strongly among firms issuing sustainability reports prior to the disclosure mandates and among firms providing earnings guidance. As firm-level voluntary disclosure choices may reflect selection effects that can correlate with liquidity, we interpret these results cautiously.

For the information demand dimension, we exploit that some investors have a stronger need for ESG information than others, as documented, for example, in Heath et al. [2023]. This implies that liquidity effects should be stronger if such investors constitute a larger part of the investor base. We find evidence consistent with this prediction when we proxy for ESG information demand based on whether ownership by Principles for Responsible Investment (PRI) signatories is higher. PRI signatories commit publicly to incorporate ESG issues into their investment decisions.

Our analysis contributes most directly to studies that examines the effects of mandatory ESG disclosure rules on either the information environment or on other firm outcomes. Using also a global sample, Gibbons [2023] shows that improved E and S disclosure requirements affect investment and financing outcomes. Fiechter, Hitz, and Lehmann [2022] find that mandatory corporate social responsibility (CSR) disclosure in the EU increases CSR reporting and CSR activities, with firms starting to react *before* the entry-into-force of the directive. Ioannou and Serafeim [2019] study ESG disclosure mandates in four countries and document that increases in sustainability disclosure increase valuations, and Christensen, Serafeim, and Sikochi [2022] show

effects of disclosure mandates on ESG rating disagreement. We add to these papers by showing that mandatory ESG disclosure has beneficial stock liquidity effects, but also that the effects of such mandates depend on the specific implementation and enforcement, and the voluntary supply of (and investor demand for) ESG information.

Two papers also link nonfinancial disclosures to liquidity, but with a focus on a single country. Early evidence by Barth et al. [2017] from South Africa, where ESG disclosures (“integrated reporting”) became mandatory in 2010, indicates that more ESG-related information improves liquidity. Roy, Rao, and Zhu [2022] find that liquidity improves after Indian firms were forced to increase CSR spending; they argue that these effects arise as mandatory CSR expenditures reduce information asymmetry. We complement these papers by using a global sample, which substantially mitigates concerns related to the endogeneity of disclosure mandate when examined for a single country (in our setting, the parallel trends assumption would need to be violated in multiple countries, not just in one). Most importantly, only a global sample allows the examination of cross-country heterogeneity in the implementation and enforcement of disclosure mandates.⁴

2. Hypotheses Development

2.1 MANDATORY ESG DISCLOSURE AND LIQUIDITY

ESG investing can be motivated by “value” or “values” considerations (Starks [2023]). These two dimensions also feature in the ESG disclosure model by Friedman, Heinle, and Luneva [2021], which contains investors interested in the value (“cash flow-minded investors”) or values (“ESG-

⁴ Other research teams have started to use the data we compiled (Lu et al. [2022], Zhang et al. [2023], Mbanyele et al. [2022]). The primary sources underlying our disclosure data, the Carrots & Sticks (C&S) project, are also used by Schiller [2020] and Wang [2023]. Less related work examines the effects of the disclosure of specific ESG items (Krueger [2015], Jouvenot and Krueger [2021], Tomar [2023], Christensen et al. [2017], Bonetti, Leuz, and Michelon [2022]), or the effects of single nonfinancial reporting regulations (Chen, Hung, and Wang [2018], Grewal, Riedl, and Serafeim [2019], She [2022]).

minded investors”) dimensions of ESG reporting.⁵ ESG reporting can be “cash flow congruent,” that is, providing information on how ESG efforts affect firm cash flows, or “ESG congruent,” with disclosures focusing on ESG activities (without the cash flow implications). Reporting on cash flow congruency leads to higher cash flows, while ESG-congruent reporting leads to more ESG activities. A firm owned by both types of investor mixes both reporting dimensions (with weights depending on the investor fractions), and the cash flow and ESG effects then arise as in the separate reporting cases. Though the model’s focus is not on liquidity *per se*, a broad implication is that there can be demand for value- and values-based ESG disclosures, with both disclosure types possibly occurring jointly and affecting cash flows as well as ESG activities. As we explain next, mandatory ESG reporting related to value *and* values can affect stock liquidity by reducing information asymmetries (between the firm and its investors and among investors). These liquidity effects should be similar to those modelled by Kyle [1985] and Glosten and Milgrom [1985] for (non-ESG) fundamentals-driven trading.

On the *value* side, ESG disclosure mandates can reduce information asymmetry related to how ESG activities affect financial fundamentals, by providing, for example, details on how investments in environmentally or socially friendly projects affect stock prices through their effects on discount rates (risks) and cash flows. Likewise, disclosure on the externalities of the firm’s business activities, such as the carbon or biodiversity footprint, allows investors to better assess the risk and cash flow effects of current and future ESG-related regulations.

⁵ The values and value classifications are also consistent with the double materiality philosophy of the European Sustainability Reporting Standards (ESRS), which features an impact materiality dimension (“values”) as well as a financial materiality dimension (“value”). A similar taxonomy is employed in the model by Pedersen, Fitzgibbons, and Pomorski [2021], which includes “ESG-aware” and “ESG-motivated” investors. ESG-aware investors use ESG information to assess a stock’s financial risk and expected return, while ESG-motivated investors use ESG information because they have a preference for stocks with high-ESG quality.

The reduced information asymmetry can improve stock liquidity through different channels.⁶ First, revealing ESG information publicly reduces problems of adverse selection among investors and improves liquidity because more investors will demand a stock when the playing field with respect to ESG-related risks and cash flows is leveled (e.g., Diamond and Verrecchia [1991]). Second, mandatory ESG disclosure can lower search and information processing costs related to the risk and cash flow effects of ESG activities, which are often more scattered and harder to quantify than other business activities. For example, many of the recently developed ESG disclosure standards focus specifically on the disclosure of financially material ESG information (e.g., the IFRS standards issued by the International Sustainability Standards Board (ISSB) in June 2023). Third, disclosure theory predicts that *voluntary* disclosures about a firm's fundamental can be informative even in the absence of disclosure verification and regulatory oversight (Gigler [1994], Stocken [2000]). However, with widespread greenwashing concerns, *mandatory* disclosure rules may still be beneficial and increase trustworthiness of corporate disclosures. Fourth, mandatorily required disclosures can be more detailed and easier to compare across firms. The improved information environment associated with these channels should enable investors to trade more and eventually improve liquidity.

Turning specifically to the *values* side, even if the disclosed information does not have direct financial implications, information related to the ESG impact of the firm can improve liquidity (the reduced search and information cost arguments should apply for values-based investors as well, as it becomes easier and cheaper for the values-oriented investors to implement their mandates). Some investors need to invest funds according to values-based ESG mandates, for

⁶ Christensen, Hail, and Leuz [2021] provide detailed explanations of the economic effects of ESG disclosure, including how disclosure affects liquidity. They highlight that mandatory disclosure can have beneficial information transfer and spillover effects. Such peer effect can motivate other firms to voluntarily disclose ESG information (e.g., Bochkay, Choi, and Hales [2022]). This implies that there may be liquidity effects beyond the disclosing firm.

example by screening out firms with objectionable ESG practices. For example, ESG funds select firms based on ESG information, such as carbon emissions, toxic releases, board diversity, and employee well-being (Heath et al. [2023]).⁷ For such investors, more and better ESG disclosure mitigates ESG rating divergence that might deter responsible investments (Berg, Kölbel and Rigobon [2022]), reduces the risk of violating sustainable investments mandates, and eventually increases the probability of finding the right stocks to invest in. More ESG information can also make it easier for such investors to observe and monitor the impact of managerial decisions on the environment and societies. This should make it more likely for managers to take actions that align with their investors' values-based mandates, which in turn should increase trading and improve liquidity in financial markets.

One may also argue that ESG disclosure rules do *not* improve liquidity. In contrast to financial information, ESG information is more complex, is often industry-specific, covers a wider range of topics, and is often unstructured and only partly quantifiable (Christensen, Hail, and Leuz [2021]). These factors make it difficult to create standardized reporting structures. As a result, countries may not provide clear guidance on the ESG metrics and information that firms must disclose. Firms may exploit the lack of guidance and adopt minimum disclosure criteria to cosmetically meet regulatory requirements without disclosing much quality information (Leuz, Nanda, and Wysocki [2003], Burgstahler, Hail, and Leuz [2006], Christensen, Hail, and Leuz [2021]). Further, some firms may have already reported ESG information voluntarily prior to the introduction of ESG disclosure rules; thus, additional disclosure requirements may not have effects.⁸

⁷ Relatedly, a regulatory reform in France, which asked institutional investors to report on climate risks, increased the demand for climate information by French investors (Ilhan et al. [2023]).

⁸ More public disclosures could even have negative information effects. Balakrishnan, Ertan, and Lee [2022] argue that if public disclosure incentivizes only sophisticated investors to produce private information, this could exacerbate the information asymmetry among investors and lower stock liquidity. Hence, it is theoretically possible for mandatory

Diamond and Verrecchia [1991] argue that the benefits of reducing information asymmetry are smaller if the initial level of information asymmetry is lower. This implies that any liquidity effects from ESG disclosure rules should depend on a firm's information environment, which can vary because some firms voluntarily supply information beyond what is required by ESG or financial disclosure mandates. Such information can be supplied voluntarily through sustainability reports or through broader earnings guidance. Dhaliwal et al. [2011] provide evidence on the information effects of sustainability reports by showing that the issuance of such reports is associated with lower analyst forecast errors. While sustainability reports are specifically about a firm's ESG activities, earnings guidance can reduce uncertainty about whether and how financially material ESG incidents impact future earnings.⁹ We expect weaker liquidity increases after the adoption of ESG disclosure rules if the voluntary ESG information supply is stronger.

Liquidity effects may also vary because of differences in information demand. As explained above, some firms are owned by many investors with explicit ESG mandates (or ESG preferences), who in turn demand ESG information more strongly than others (Friedman, Heinle, and Luneva [2021]). Hence, there should be stronger liquidity improvements after ESG disclosure mandates if the ESG information demand is stronger.

2.2 DISCLOSURE IMPLEMENTATION MECHANISMS

The liquidity effect of mandatory ESG disclosures likely varies across countries because of differences in the implementation or enforcement of the mandates. It is important to consider such

ESG disclosure to hurt liquidity. In our context, Xue [2023] argues that ESG-motivated investors can also use information in a different way from traditional investors. More accurate ESG disclosures can therefore reduce investment efficiency and potentially also liquidity.

⁹ For example, a major unexpected pollution incident likely affects future earnings because of regulatory fines or negative customer reactions, and the extent of the earnings hit can be disclosed through earnings guidance (see Derrien et al. [2022] for evidence on how ESG incidents affect earnings).

heterogeneity to understand the economic and legal channels underlying any potential disclosure effects. We consider two forms of cross-country variations. The first heterogeneity exploits that ESG disclosure mandates are implemented by different institutions around the world. Government institutions, such as ministries and securities regulators, implement the rules in some countries, while local stock exchanges take the lead in others. Governments should have more credible implementation mandates, be less affected by regulatory capture, and have more resources to implement (and eventually enforce) the rules effectively. Thus, we expect larger liquidity benefits if the mandates are issued by governments rather than exchanges.

The second heterogeneity exploits the practice of some countries to adopt “comply-or-explain” rules under which firms can provide the ESG disclosures or explain why they do not. The rationale is that a one-size-fits-all approach may not be suitable for all firms, because of high information production or proprietary disclosure costs. Other countries require full compliance without the option to deviate from a uniform default case; thus, the rules are more rigid as firms cannot opt out. Liquidity should improve more if mandatory ESG disclosure is introduced on a binding, rather than comply-or-explain, basis, because more information is released to all market participants.

2.3 ENFORCEMENT BY FORMAL AND INFORMAL INSTITUTIONS

Mandatory ESG disclosure is unlikely to have a meaningful effect if the disclosure requirements are not properly enforced. If a country’s institutions only weakly enforce newly introduced disclosure mandates, this may hamper the improvement of the information environment, which in turn would imply that liquidity is not improving. We consider enforcement channels originating from both formal and informal institutions in a country.

In countries with stronger enforcement by formal institutions—as captured by a better legal environment, stricter rule of law, or more effective governments—disclosure rules likely lead to stronger improvements in the information environment. Such effects are plausible because prior literature has established the importance of formal enforcement mechanisms for various disclosure rules (see Leuz and Wysocki [2016] for a review). In the context of IFRS reporting, Christensen, Hail, and Leuz [2013] document that strict reporting enforcement by a country’s formal institutions is critical to achieve any liquidity benefits from IFRS mandates. These findings may translate to the enforcement of nonfinancial disclosure rules, suggesting that the liquidity effects are larger if mandatory ESG disclosure is introduced in countries with stronger formal institutions.

Societal norms—so-called “informal institutions”—can also play an important role in the enforcement of rules. In Williamson’s [2000] framework on how business activity is affected by institutional influences, the most fundamental are social norms and cultural influences. North [1994] argues that informal institutions can fill the void when formal institutions are ineffective or nonexistent, and evidence demonstrates that informal institutions are central for rule enforcement in various societal contexts (Fisman and Miguel [2007]). Wysocki [2011] provides a review of the role of informal institutions for accounting research. When legal enforcement is weak, informal institutions can emerge as important mechanisms (e.g., Guiso, Sapienza, and Zingales [2006]). Aghion et al. [2010] and Guan et al. [2020] find results suggesting that societal trust—a type of social norm and an informal institution—can act as a substitute mechanism for a formal institution. Social and environmental norms may affect how strictly firms abide by ESG disclosure rules. Christensen, Hail, and Leuz [2021] argue that nonfinancial investor preferences can be another channel through which norms affect how capital markets react to ESG disclosures. There is also evidence that public pressure affects disclosure behavior, as demonstrated by Dyreng, Hoopes, and

Wilde [2016] in relation to the disclosure of subsidiary locations. In our context, She [2022] finds that the effects of mandatory ESG disclosures for supply chain transparency are stronger when firms face greater pressure from nongovernmental organizations. Hence, the effect of ESG disclosure rules should be strengthened if the rules are introduced in countries with stronger informal institutions.

3. Data

3.1 SAMPLE

To create our sample, we start with all publicly listed firms in Datastream's constituent list between 2002 and 2020 and apply the screening procedure by Ince and Porter [2006] and Griffin, Kelly, and Nardari [2010] (details are reported in Online Appendix (OA) A). We extract stock price and trading data from Eikon, firm fundamental data from Worldscope, and analyst and earnings guidance data from I/B/E/S. We compile data on ESG disclosure mandates using the Carrots & Sticks (C&S) project as the primary source, which we complement with data from the Global Reporting Initiative (GRI) and the Sustainable Stock Exchanges (SSE). After matching our data sources and applying the screening protocol, we obtain a panel of 136,269 firm-year observations covering 17,680 firms from 65 countries for our main tests.

3.2 DATA ON MANDATORY ESG DISCLOSURE REGULATIONS

3.2.1. Data Collection. We build a dataset of ESG disclosure mandates by collecting information on countries' ESG regulations. The C&S project collects data on countries' policies relating to the voluntary or mandatory reporting of ESG-related information. We complement these data with information from the SSE and the GRI. We use information from governments, stock exchanges, and the media to cross-check the accuracy of the information. Based on these

sources, we compile a dataset of country-level regulations related to mandatory ESG reporting. OA table B1 provides an overview of the regulations.

3.2.2. *Main Measure.* Table 1, panel A, lists the countries that introduced mandatory ESG disclosures (“treatment countries”) together with the year of each regulation’s introduction. By 2022, 38 sample countries required some form of mandatory disclosure of ESG information.¹⁰ Twenty-five countries implemented mandatory ESG disclosure all at once, while the remaining 13 countries introduced E, S, and G disclosures one by one. For our main tests, we create the variable *Mandatory ESG Disclosure*, which equals one starting from the first year in which a country introduced mandatory ESG disclosure, and zero otherwise. This variable equals zero for all years in countries that never introduced ESG disclosure mandates during the sample period.

[Insert table 1 about here]

Figure 1 displays the years in which the specific E, S, and G disclosure mandates were introduced. Countries that required disclosure along all three ESG dimensions at the same time (“all at once”) are shaded grey.¹¹ There are no obvious patterns in terms of which ESG topic was introduced first or last. We assume that mandatory ESG disclosure was introduced once disclosure encompassing *all three* topics was required. Hence, for countries introducing ESG disclosure gradually, *Mandatory ESG Disclosure* equals one starting in the year in which disclosure on the third and last topic was required. This coding assumes that there is some complementarity in E, S,

¹⁰ In some ambiguous cases, we make judgement calls on how to code the data. Slovakia and Estonia introduced mandatory ESG disclosure in 2015 and 2017 respectively, but firms from these countries are not included in the sample because of missing data on the liquidity and control variables (especially on analyst coverage).

¹¹ Country names in brackets indicate countries that did not implement mandatory ESG disclosure for all three topics during the sample period, and country names with an asterisk indicate when regulation for the last of the three disclosure topics was introduced. In the case of India, the Securities and Exchange Board of India introduced ESG disclosure for the top 100 listed firms in 2012. This was extended in 2015 to the top 500 listed firms. Because our data contain a broad sample of firms, we use the year 2015 as the year in which ESG disclosure mandates were introduced.

and G disclosure to fully obtain the effects of the disclosure mandates. Dyck et al. [2023] provide evidence for such a complementarity outside the disclosure environment by demonstrating that high environmental performance usually requires the existence of good governance. We show that our results are robust to excluding countries that introduced ESG disclosure mandates one by one.

[Insert figure 1 about here]

3.2.3. Implementation Mechanisms. Table 1, panel A, shows that ESG disclosure rules vary significantly across countries. We exploit such heterogeneity to understand the relative importance of different regulatory implementations. The first dimension hinges on whether disclosure regulation is issued by a government institution or a stock exchange. To test for the role of the body issuing the regulation, we partition *Mandatory ESG Disclosure* into two nonoverlapping subsets using binary indicators: i) $Mandatory\ ESG\ Disclosure^{Gov.\ Inst}$ equals one starting from the first year in which a government institution in a country introduces mandatory ESG disclosure, and zero otherwise; and ii) $Mandatory\ ESG\ Disclosure^{Stock\ Exch}$ equals one starting from the first year in which a stock exchange introduces mandatory ESG disclosure, and zero otherwise. ESG disclosure rules are issued in 30 countries by government institutions and in eight by exchanges.

The second dimension exploits that 19 treatment countries have comply-or-explain regulations, while the remaining 19 countries require full compliance without the option to deviate from a default case. To compare the effects of full-compliance mandates with a comply-or-explain approach, we again partition *Mandatory ESG Disclosure* into two nonoverlapping subsets: i) $Mandatory\ ESG\ Disclosure^{Comply}$ equals one starting from the first year in which a country introduces mandatory full-compliance ESG disclosure, and zero otherwise; and ii) $Mandatory\ ESG\ Disclosure^{Comply-or-Explain}$ equals one starting from the first year in which a country introduces

mandatory comply-or-explain ESG disclosure, and zero otherwise. Our baseline average treatment effects consider comply-or-explain regulations as “mandatory ESG disclosure.” This follows Ioannou and Serafeim [2019]. While offering firms the option to withhold information, the requirement to explain why a firm does not disclose information still provides incentives to firms to provide some information.

3.2.4. Voluntary ESG Disclosure Initiatives. We complement these data with information on country-level voluntary ESG disclosure initiatives, which reflect regulations or guidelines that encourage—but do not mandate—firms to disclose ESG information in a country. If there are multiple voluntary disclosure initiatives in a country, we identify the publication year of the first guideline during our sample period. As voluntary initiatives are more difficult to identify compared to mandatory ones, we employed multiple sources, including Generative AI, the C&S database, a regulation database maintained by PRI, and a web search. We first asked ChatGPT-4 to “*list the details of all voluntary environmental, social and governance disclosure regulations or instruments in country XXX*”. We cross checked the list provided by ChatGPT with the C&S and PRI regulation databases. If we observed differences, we did a web search to explore the reasons and made a final judgement.

3.2.5. Firm-Year Distribution across Countries. Table 1, panel A, lists the number of firm-years across treatment countries. Most observations originate from the United Kingdom (12.7%), India (9.6%), and Taiwan (China) (8.8%). Panel B in table 1 lists the sampled nontreatment countries. Within this set of countries, most observations come from the United States (53.4%), Japan (18.7%), and South Korea (14.2%). Results are robust to excluding the largest countries.

3.3 DATA ON LIQUIDITY MEASURES

We use three proxies for stock liquidity that vary at the firm-year level. *Bid-Ask Spread* is the yearly median value of the daily bid-ask spreads (difference between the daily closing bid and ask prices divided by the midpoint). *Price Impact* is the yearly median value of the daily Amihud [2002] illiquidity measure, calculated as the daily absolute stock return (in %) divided by the daily trading volume (in USD). *Zero Return* is the number of trading days with zero daily returns out of the total number of potential trading days in a year. We measure liquidity over the [+1; +12]-month period after the end of the fiscal year (i.e., for the year $t+1$). Following Daske et al. [2008], we aggregate the three proxies into a single factor, *Illiquidity Factor*, by employing factor analysis with one oblique rotation. Higher (lower) values of the factor indicate less (more) liquidity.

Descriptive statistics for the liquidity measures are reported in table 2. The measures are available for firms in all 65 countries, albeit to varying degrees because of missing data. The mean (median) *Bid-Ask Spread* is 0.008 (0.003) and the mean (median) *Price Impact* is 0.370 (0.011). With respect to *Zero Return*, 8% of daily stock returns in a year are zero as a result of nontrading. The mean and median values of *Bid-Ask Spread*, *Price Impact*, and *Zero Return* are smaller than the corresponding values in Daske et al. [2008]. One potential reason is that our sample focuses on firms followed by financial analysts, which improves information transparency and leads to better liquidity.

[Insert table 2 about here]

3.4 DATA ON FORMAL AND INFORMAL INSTITUTIONS

3.4.1. Formal Institutions. We create two measures to study heterogeneity in enforcement levels stemming from formal institutions in a country; both measures vary at the country-year level.

Rule of Law measures the quality of contract enforcement, property rights, or the legal system, and it in turn reflects the strength of a country’s legal institution with respect to the enforcement of regulations. *Govt. Effectiveness* measures enforcement originating from the quality of policy implementations or the credibility of a government’s commitment to its stated policies. Both measures range between -2.5 and 2.5 , and higher values indicate a stricter rule of law or higher government effectiveness. Table 1, panels A and B, report mean values by country.

3.4.2. Informal Institutions. Three proxies measure norms based on societal outcomes or expressed societal values (as in Dyck et al. [2019]). We use Yale’s Environmental Performance Index (EPI) to quantify norms based on observed *outcomes*. The EPI measures societal outcomes related to environmental health and ecosystem vitality (e.g., Dyck et al. [2019] or Ilhan et al. [2023]). The first measure, *EPI E Norms*, ranges between 0 and 100 and takes larger values in country-years with stronger environmental performance. Larger values capture a stronger common belief in the importance of environmental issues. The next two measures reflect expressed societal values or beliefs. *IVS E Norms* is a survey-based index of the environmental awareness in a country-year, while *IVS S Norms* is a proxy of social norms. Both indexes are obtained from the Integrated Values Survey (IVS) and are based on interviews with representative samples of individuals. Data Appendix A explains which questions are included in the index. The surveys are used in economics, accounting, and finance to measure environmental or social norms (e.g., Hayes, Jiang, and Pan [2021], Guiso, Sapienza, and Zingales [2006]). The indexes range between 0 and 1. Higher values for *IVS E Norms* (*IVS S Norms*) indicate a better environmental awareness (stronger social norms).

3.4.3. Residual Values of Measures. As pointed out by Daske et al. [2008], a concern about using country-level proxies is that these measures may be outcomes of more fundamental qualities

of countries' institutional environments. We follow their approach and orthogonalize the five measures with respect to more fundamental country characteristics (we regress the raw values on a country's legal origin, GDP per capita, and a globalization index). Our tests use the residuals from those regressions, which we label as *Rule of Law*^{Res}, *Govt. Effectiveness*^{Res}, *EPI E Norms*^{Res}, *IVS E Norms*^{Res}, and *IVS S Norms*^{Res}, respectively. The first three residual measures are available for 60 sample countries and the last two measures for 55 countries.¹²

3.5 DATA ON VOLUNTARY FIRM DISCLOSURES AND PRI INSTITUTIONAL OWNERSHIP

3.5.1. Voluntary Firm Disclosures. We create firm-level variables that act as proxies for voluntary disclosure choices. We first consider disclosures that are specifically about ESG activities. Two indicators identify whether, and how early, a firm produced a standalone or integrated sustainability report (measured relative to the year t in which a disclosure mandate is introduced). *Early Vol. Adopter* indicates whether a firm has issued a sustainability report already in $t-2$, and zero otherwise; and *Late Vol. Adopter* captures whether such a report has been issued in $t-1$ (but not already in $t-2$), and zero otherwise. The variables allow us to contrast effects of ESG disclosure mandates between the two types of voluntary adopters and “mandated” adopters (mandated adopters are firms that did not voluntarily issue sustainability reports before the mandates). Both variables are only available for firms included in the Asset4 database (now Refinitiv ESG), which covers about 9,000 firms globally by 2020 (fewer firms in earlier years).

We create another indicator that captures general disclosure policies by identifying whether a firm provides earnings guidance (e.g., Li and Yang [2016], Tsang, Xie, and Xin [2019]). Earnings

¹² *Rule of Law*^{Res} and *EPI E Norms*^{Res} are missing for Taiwan, Cyprus, Kazakhstan, Malta, and Mauritius as a result of missing data for the orthogonalizing variables. We additionally miss *IVS E Norms*^{Res} and *IVS S Norms*^{Res} for Bahrain, Kenya, Oman, Sri Lanka, and United Arab Emirates as a result of missing data on *IVS E Norms* and *IVS S Norms*.

guidance not only constitutes a release of a quantitative estimation of key accounting numbers, but it also often includes qualitative analyses about risks and opportunities, potentially incorporating information on material ESG issues. The data are obtained from I/B/E/S. *Vol. Earnings Guidance* equals one if a firm provides earnings guidance, and zero if it does not.

3.5.2. PRI Institutional Ownership. To reflect ESG-related information demand, we hand-collect data on ownership by PRI signatories from the [PRI signatory directory](#), which records when and which institutional investors around the world signed the PRI principles. PRI was launched in 2006, so the data starts in that year, and PRI signatories commit to incorporate ESG information into their investment decisions. We combine this information with data from FactSet on investor holdings, manually searching FactSet to find PRI signatories in the database based on the investor name. If we find similar but not identical names, we perform a web search and ask ChatGPT whether the names refer to the same investment company to make a final judgement. We can match 1,363 institutional investors. *PRI IO* is the percentage of shares held by institutional investors who are PRI signatories.¹³

3.6 DATA ON CONTROL VARIABLES

Our regressions control for other variables that may also affect liquidity. In terms of firm fundamentals, we account for *Log(Assets)*, *ROA*, *Leverage*, and *Market-to-Book Ratio*. Furthermore, we control for *Analyst Coverage* to account for equity market following by key

¹³ The average value of *PRI IO* is lower compared to other studies that use PRI institutional ownership (e.g., Ceccarelli et al [2021]). This deviation is likely due to different sample construction criteria. First, the sample of Ceccarelli et al [2021] starts in 2009, so given the growth in the PRI network, PRI ownership is mechanically higher in their sample. Secondly, Ceccarelli et al. [2021] restrict the sample to firms for which at least one ESG rating from three data providers is available, which tilts their sample towards larger firms with higher institutional ownership (see Dyck et al [2019]). Third, we classify PRI signatory ownership conservatively, that is, we do not assume that a subsidiary company is a PRI signatory if a parent company signed the principles, and vice versa (unless both appear in the PRI directory or have the same entity ID in FactSet).

market participants that may use ESG disclosures as information sources. Country-level controls related to liquidity include equity market returns (*Index Return*) and volatility (*Index Volatility*).

4. The Effect of Mandatory ESG Disclosure on Liquidity

4.1 BASELINE REGRESSIONS: AVERAGE TREATMENT EFFECTS

We employ a firm-year analysis to examine the effect of mandatory ESG disclosure on stock liquidity. Because the regulatory events occur in different countries and at different points in time, the estimation corresponds to a staggered difference-in-differences (DiD) model. We estimate variants of the following model for firm i in country c and year t :

$$Liquidity_{i,c,t+1} = \beta_1 Mandatory\ ESG\ Disclosure_{c,t} + \mathbf{X}_{i,c,t-1} \theta + \delta_i + \delta_j \times \delta_t + \varepsilon_{i,c,t+1}, \quad (1)$$

where $Liquidity_{i,c,t+1}$ denotes a measure of stock liquidity—that is, either an individual proxy (*Bid-Ask Spread*, *Price Impact*, or *Zero Return*) or the aggregate measure (*Illiquidity Factor*). We measure liquidity over $t+1$ because most disclosure mandates give firms a time buffer until they have to comply. Firms in some countries may not yet have provided additional ESG information to the market during year $t+1$. However, according to Fiechter, Hitz, and Lehmann [2022], firms in their sample often increase ESG disclosures before the formal entry-into-force dates of ESG disclosure mandates. Regressions using *Bid-Ask Spread* and *Price Impact* apply log-linear specifications. The variable of interest is *Mandatory ESG Disclosure*, which captures the introduction of mandatory ESG disclosure in country c during year t . The vector $\mathbf{X}$ includes control variables that vary at the firm or country level, δ_i denotes firm fixed effects, and $\delta_j \times \delta_t$ denotes industry-by-year fixed effects. The firm fixed effects imply that our identification is obtained from within-firm variation. Industry-by-year fixed effects account for the industry-specifics of ESG issues. Standard errors are clustered at the firm level. The level at which we cluster standard errors

follows Daske et al. [2008], whose setting is similar to ours because they examine how mandatory financial reporting due to IFRS affects liquidity. If mandatory ESG disclosure improves liquidity, we expect β_1 in equation (1) to be negative and statistically significant.

Table 3 reports estimation results from different specifications of equation (1). In columns 1–3, we find for all three individual liquidity proxies a consistent picture: the negative and significant β_1 estimates indicate that firms mandated to disclose ESG information experience an increase in stock liquidity. The magnitudes are economically meaningful. In column 1, the bid-ask spread decreases by 8.4% after a country introduces ESG disclosure mandates; in column 2, the Amihud [2002] measure improves by 16%; and in column 3, the fraction of zero-return days declines by 150 basis points (13% of the standard deviation) or approximately four trading days per year.

[Insert table 3 about here]

The effects in columns 1–3 translate into a negative and significant β_1 coefficient in column 4 for the *Illiquidity Factor*; we estimate a decrease in the summary measure by 0.085 (or 9%) of the standard deviation (0.905). The high explanatory power across all regressions, with adjusted *R*-squares of 0.8 and above, originates primarily from the firm fixed effects, which is consistent with prior literature. Across the regressions, the percentage of never-treated firms amounts to a substantial 44%. This large percentage reduces biases from heterogeneity in treatment effects (Baker, Larcker, and Wang [2022]). In column 5, the β_1 estimate is unaffected if we identify effects exclusively from within-firm variation (we omit industry-by-year fixed effects).

In columns 6–7, we separate the sample into a pre- and post-2010 period to examine how effects changed in calendar time. Consistent with a strengthening demand for ESG information in the investment process, β_1 in column 6 (post-2010 years) is about twice as large as the

corresponding estimate in column 7 (pre-2010 years). That we also obtain a meaningful and significant effect prior to 2010 mitigates the concern that most of the effects in column 4 originate from a wave of ESG disclosure mandates in EU countries introduced in 2016 (see figure 1).

Columns 8–10 address concerns related to the countries from which we obtain identification. In column 8, we restrict the estimation to treatment countries only. This sample identifies the liquidity effects of firms treated by ESG disclosure rules relative to firms that are not yet subject to such mandates. This comparison ensures that the effects do not originate from liquidity changes in nontreatment countries (with firms in treatment countries being unaffected). We continue to find negative and significant β_1 estimates. In column 9, we partition *Mandatory ESG Disclosure* into two nonoverlapping indicators based on whether a country introduced ESG disclosure all at once or one by one. Both types of implementations are associated with a decline in the illiquidity factor. In fact, the coefficient estimates are statistically indistinguishable. That is, the liquidity benefits from one-by-one disclosure requirements—assuming that all three ESG topics are eventually covered—are similar to those when disclosure for all three topics is mandated at once. In column 10, we exclude countries that passed E, S, and G regulations at different points in time because it may be more difficult to quantify the liquidity benefits of the disclosure mandate for those countries (effects may build up over time). We continue to find a significant increase in liquidity for countries where ESG disclosure mandates are implemented all at once.

Estimates for the control variables align with reasonable priors. Large firms, more profitable firms, firms with lower leverage, firms with higher valuations, and firms with higher analyst coverage have more liquid stocks. Liquidity is higher when a country's stock market has performed well. There is no consistent evidence on how index volatility relates to liquidity.

OA table B2 addresses further concerns with the results in table 3. In column 1, we replace the within-firm estimation with industry-by-country fixed effects to address that disclosure mandates may affect industries differently within a country—for example, because concerns related to E and S issues are more relevant for some industries than others. Column 2 adds time trends for each country to account for confounding trends in individual countries. In both columns we continue to find significantly negative estimates for β_1 . In column 3, we verify that the results are not driven by the four countries that make up the largest fractions of the firm-year sample. In columns 4–6, our inferences are unaffected if we cluster standard errors differently.¹⁴

4.2 VOLUNTARY DISCLOSURE INITIATIVES AND ANTICIPATION EFFECTS

4.2.1. Pre-Trends in Liquidity. Our results provide evidence that ESG disclosure rules improve liquidity. However, this evidence may in parts be confounded by effects from pre-mandate *voluntary* disclosures and anticipation. Both factors can lead to a pre-trend and violation of the parallel trend assumption. We start the evaluation of these factors in figure 2, which reports the event-time dynamics of the treatment effect by replacing *Mandatory ESG Disclosure* with six indicators, each marking one year around the introduction of a disclosure mandate. Year $t=-1$ is omitted so that the effects are estimated relative to this year, and years that are three or more years before ($t \leq -3$) or after ($t \geq +3$) the mandate introduction are grouped together. In panel A of figure 2, we estimate a version of the regression in table 3, column 4, using *Illiquidity Factor*.

[Insert figure 2 about here]

¹⁴ In columns 4 and 5, we cluster standard errors conservatively at the country-year or country level to allow observations within the same country-year or country to be affected similarly by ESG disclosure mandates. In column 6, we allow observations to be correlated within industry-by-year clusters to account for the possibility that firms in the same industry-year are similarly affected by ESG disclosure mandates.

In the figure, we observe that liquidity improves once ESG disclosure rules are introduced, with effects increasing over the subsequent years, especially from $t=+2$ onwards. This evidence is reassuring. At the same time, however, there is evidence of a pre-trend: liquidity improves already from $t=-2$ to the benchmark year just prior to the mandate introductions. In the years further away from the mandate adoptions (years $t \leq -3$), *Illiquidity Factor* is indistinguishable from zero.

The observed pre-trend prompts us to better understand what causes these dynamics *just prior* to the introduction of the mandates. We turn to this analysis in the next two subsections.

4.2.2. Voluntary Disclosure Initiatives. In table 4, columns 1–3, we test whether the pre-trend originates from countries with voluntary disclosure initiatives preceding the ESG disclosure rules. Such initiatives may lead to some firms voluntarily providing ESG information *prior to* the formal mandates, potentially creating liquidity changes before the adoption of the mandate. This is a concern because some countries introduced voluntary disclosure initiatives only few years before they switched to mandatory disclosures (see table 1, panel A). Voluntary disclosure initiatives may then also lead to lower liquidity improvements after formal mandates replace the voluntary initiatives. To reflect these possibilities, we exclude in columns 1–2 all firm-years from countries that introduced voluntary ESG disclosure initiatives prior to ESG disclosure mandates, and interact in column 3 *ESG Mandatory Disclosure* with *Vol. ESG Disc. Country* (equals one if a firm is from a country with a voluntary disclosure initiative). A trade-off that we face in columns 1 and 2 is that the refinement allows us to obtain a sample that more cleanly captures the causal effect of the ESG disclosure mandates, but at the cost of reducing the cross-country variation.

We use a country-level voluntary disclosure measure because firm-level disclosure choices are likely prone to selection effects. For example, investors may interpret voluntary disclosures by a firm as a general commitment to transparency, instead of reacting to an *ESG-related* decrease in

information asymmetry (Daske et al. [2008]). Moreover, firms responding to voluntary disclosure initiatives—or disclosing independent of them—may be fundamentally different from those not-responding, and these differences may correlate with liquidity changes. A country-wide measure instead exploits an increase in the *propensity* to disclose ESG information for all firms in the country. It may have direct liquidity effects on firms that respond to the initiative by voluntarily disclosing more, and indirect effects on the remaining firms because of spillovers (markets may infer information from voluntary disclosers). In addition, firm-level measures are only available for firms in the Asset4 database, which likely also introduces selection (see section 3.5).

[Insert table 4 about here]

In column 1 of table 4, the estimated β_1 coefficient increases in magnitude relative to that in column 4 of table 3, indicating that the sample inclusion of voluntary adopter countries reduces the baseline liquidity effects of mandatory ESG disclosures. This may reflect that firms from countries with voluntary initiatives experience liquidity increases already prior to the disclosure mandates, and smaller improvements in liquidity afterwards (as the incremental reduction in information asymmetry is smaller). In column 2, the coefficient estimate increases further once we re-estimate column 1 after using entropy balancing to create a covariate-balanced control group (Hainmueller [2012]).¹⁵ In column 3 of table 4, we obtain a positive coefficient on the interaction effect *ESG Mandatory Disclosure* $\times$ *Vol. ESG Disc. Country*, suggesting that the liquidity

¹⁵ Entropy balancing addresses the concern that firms from treatment and control countries are too different after excluding voluntary disclosure countries, which reduces the set of sample countries from 65 to 28. This method has been used frequently in the recent accounting literature (e.g., Carnes, Christensen, and Madsen [2023]). Entropy balancing is a special case of synthetic control methods in which the covariate weights yield exact balance. We balanced covariates on the first three moments.

improvements of ESG disclosure mandates are smaller in countries with prior voluntary disclosure initiative (*Vol. ESG Disc. Country* is absorbed by the fixed effects in the regression).

4.2.3. Anticipation Effects. Anticipation effects could be another explanation for the pre-trend, with market participants anticipating some of the effects of the mandates. For IFRS, Daske et al. [2008] document that firm valuations and the cost of capital change *prior to* the official adoption dates. At the same time, they also argue that liquidity outcomes may be less prone to such effects, because investors worry about adverse selection mainly when trading securities.¹⁶

In table 4, columns 4–5, we follow Daske et al. [2008] and evaluate anticipation effects in two ways. In column 4, we exclude firm-years immediately prior to the ESG disclosure mandates, and in column 5 we move *Mandatory ESG Disclosure* by one year backward (i.e., the indicator equals one already one year earlier). In both columns, the re-estimated coefficients are similar to those in the benchmark estimation in column 4 of table 3. In column 4, β_1 increases slightly in absolute size (−0.095) and, in column 5, it becomes moderately smaller (−0.070). These modest changes in the estimates relative to the baseline indicate that anticipation effects are probably small.¹⁷

4.2.4. Revisiting the Pre-Trend. If the decline in illiquidity from $t=-2$ to $t=-1$ in figure 2, panel A, is partially due to countries with voluntary disclosure initiatives, then we should see less of a pre-trend when excluding such countries. To reflect this possibility, we re-estimate the event-time analysis on the samples from table 4, column 2 (the estimation which uses entropy balancing).

¹⁶ Consistent with this argument, Daske et al. [2008] mention that they find some anticipation effects for liquidity measures, but these anticipation effects are smaller than those for firm valuations or the cost of capital. For ESG mandates, Fiechter, Hitz, and Lehmann [2022] show that firms started reporting on CSR issues before the entry-into-force of the EU directive on CSR reporting. In a similar spirit, analysis in Krueger [2015] also suggests anticipatory effects for the UK’s mandatory disclosure rules on greenhouse gas emissions.

¹⁷ Anticipation effects should lead to a larger, not smaller, coefficient estimate (in absolute terms) in column 5 of table 4 (relative to the benchmark estimate), as this estimate would then reflect the combination of the direct effect of the disclosure mandates and any indirect anticipation effect. If firms and markets do not change behavior in anticipation of the mandates, the indirect anticipation effect on liquidity should be (close to) zero.

Results are displayed in panel B of figure 2. In the figure, we continue to observe a decline in *Illiquidity Factor* after the disclosure mandates were introduced. Furthermore, while the figure is still suggestive of a slight downward pre-trend leading up to the mandate adoption, we observe that such pre-trend is not statistically different from zero, mitigating concerns about the validity of our DiD design. This indicates that the pre-trend originates—at least partially—from countries with voluntary disclosure initiatives; firms in such countries appear to experience liquidity improvements prior to the disclosure mandates. Finally, the post-mandate estimates in panel B are more negative compared to those in panel A. This suggests that liquidity improves more strongly among treated firms *not* located in countries with voluntary disclosure initiatives. In other words, firms in countries with voluntary disclosure initiatives achieve relatively smaller liquidity increases after voluntary initiatives are replaced by formal mandates.

4.3 DISCLOSURE IMPLEMENTATION MECHANISMS: HETEROGENEOUS TREATMENT EFFECTS

Mandatory ESG disclosure, on average, has a beneficial effect on stock liquidity. We next consider how the estimate of this average effect changes once we vary the regulatory mechanisms through which the disclosure mandates are implemented. We explore such heterogeneity by estimating the following variant of equation (1) for firm i in country c and year t :

$$Liquidity_{i,c,t+1} = \beta_1 Mandatory\ ESG\ Disclosure_{c,t}^X + \beta_2 Mandatory\ ESG\ Disclosure_{c,t}^{-X} + X_{i,c,t-1} \theta + \delta_i + \delta_j \times \delta_t + \varepsilon_{i,c,t+1}, \quad (2)$$

where $Liquidity_{i,c,t+1}$ is the *Illiquidity Factor* $_{i,c,t+1}$, and $Mandatory\ ESG\ Disclosure_{c,t}^X$ and $Mandatory\ ESG\ Disclosure_{c,t}^{-X}$ stand for the two different partitions of *Mandatory ESG Disclosure* into i) $Mandatory\ ESG\ Disclosure^{Gov.\ Ins}$ versus $Mandatory\ ESG\ Disclosure^{Stock\ Exch.}$, and ii) $Mandatory\ ESG\ Disclosure^{Comply}$ versus $Mandatory\ ESG\ Disclosure^{Comply-or-Explain}$. On top

of including *Mandatory ESG Disclosure*^x and *Mandatory ESG Disclosure*^{-x} jointly, we estimate regressions including the variables individually. We use the same set of control variables as in equation (1). We expect that ESG disclosure rules issued by a government institution (or on a full-compliance basis) improve liquidity more strongly than mandates issued by a stock exchange (or on a comply-or-explain basis). In this case, β_1 is expected to be more negative than β_2 .

[Insert table 5 about here]

Table 5 reports estimation results of equation (2). Columns 1–3 show that ESG disclosure mandates have more beneficial effects when implemented by government institutions rather than exchanges. In column 3, the β_1 estimate for *Mandatory ESG Disclosure*^{Gov. Inst} is almost three times larger in magnitude than the β_2 estimate for *Mandatory ESG Disclosure*^{Stock Exch}, and the difference in coefficients is highly statistically significant (*p*-value of 0.000).

Columns 4–6 contrast effects between countries with full-compliance rules and those with comply-or-explain mandates. Both implementations improve liquidity but effects are stronger when firms cannot evade compliance through a comply-or-explain option. In column 6, the β_1 estimate for *Mandatory ESG Disclosure*^{Comply} is about 50% larger in absolute terms than β_2 for *Mandatory ESG Disclosure*^{Comply-or-Explain} (the difference is statistically significant again).

4.4 FORMAL AND INFORMAL INSTITUTIONS: HETEROGENEOUS TREATMENT EFFECTS

To further gauge the role of country-level heterogeneity, we modify equation (1) by introducing interaction terms between *Mandatory ESG Disclosure* and proxies quantifying the enforcement strength of a country's formal or informal institutions:

$$\begin{aligned}
Liquidity_{i,c,t+1} = & \beta_1 Mandatory\ ESG\ Disclosure_{c,t} \times Conditional\ Variable_{c,t} + \beta_2 Mandatory \\
& ESG\ Disclosure_{c,t} + \beta_3 Conditional\ Variable_{c,t} + \mathbf{X}_{i,c,t-1} \theta + \delta_i + \delta_j \times \delta_t + \varepsilon_{i,c,t+1},
\end{aligned} \tag{3}$$

where $Liquidity_{i,c,t+1}$ is again the *Illiquidity Factor* $_{i,c,t+1}$, *Mandatory ESG Disclosure* $_{c,t}$ is the indicator for the introduction of ESG disclosure regulation, and *Conditional Variable* $_{c,t}$ is a proxy for formal or informal enforcement—that is, *Rule of Law* Res , *Govt. Effectiveness* Res , *EPI Norms* Res , *IVS E Norms* Res , or *IVS S Norms* Res , respectively. As before, we use control variables in line with equation (1). If the liquidity benefits increase with the stringency of a country’s formal or informal enforcement, then we expect negative β_1 coefficient estimates for the interaction term.

[Insert table 6 about here]

Table 6 provides estimation results of equation (3). In panel A (columns 1–2), the liquidity benefits of the disclosure mandates only vary depending on *Govt. Effectiveness* Res , and this effect is only marginally significant. In contrast, in panel B (columns 3–5), there is strong evidence that social and environmental norms matter strongly for the estimated liquidity effects: consistently across all three columns, we find negative and significant β_1 estimates. In terms of magnitudes, column 4 implies that a one-standard-deviation increase in *IVS E Norms* Res leads to an incremental decline in *Illiquidity Factor* that equals -0.033 (or 7%) relative to the mean.

Our estimates raise the question of why formal enforcement mechanisms matter only weakly for the liquidity effects of nonfinancial disclosure rules, and how this aligns with prior literature documenting the importance of formal mechanisms for liquidity effects of financial disclosure mandates (e.g., Christensen, Hail, and Leuz [2013]). We argue that the difference is due to the nature of ESG information. As laid out conceptually by Christensen, Hail, and Leuz [2021], effective formal enforcement of ESG reporting mandates faces challenges when compared to the

enforcement of financial disclosure rules. First, disclosed ESG information is harder to verify and audit by regulators, with disclosed metrics often being subjective and based on internal information that is difficult to compare across firms. Second, ESG information is often based on systems that are separate from, and outside of, the double-entry bookkeeping system and sometimes even from beyond the boundaries and responsibilities of the firm (e.g., supply chain information). Third, the enforcement of ESG disclosures frequently requires non-accounting expertise, including technical or scientific knowledge. Beyond these factors, in many countries the enforcement of IFRS has probably benefited from the regulator's prior experience from enforcing local accounting standards. There is typically no corresponding experience when it comes to ESG disclosure mandates. Moreover, most countries have so far focused their enforcement activities on financial disclosures.

That said, many of these factors may become less relevant over the coming years, with ESG information becoming increasingly standardized, "hardened" and verifiable, regulators increasingly focusing on greenwashing issues, and auditors and regulators building up ESG-related knowledge and experience. Formal enforcement mechanisms may in turn play a more important role for ESG disclosure mandates in the future, with effects becoming more similar to what prior evidence has documented for financial disclosure mandates.

4.5 VOLUNTARY FIRM DISCLOSURES AND PRI OWNERSHIP: HETEROGENEOUS TREATMENT EFFECTS

4.5.1. Voluntary Sustainability Reporting. We explore the role of cross-firm heterogeneity for the effects of ESG disclosure mandates by exploiting variation related to voluntary firm disclosures (information *supply*). We start by considering the effects of voluntary sustainability disclosures, and additionally allow these effects to depend on whether the voluntary disclosures were made early or late relative to the introduction of ESG disclosure rules. Thus, we interact *ESG Mandatory Disclosure* with indicators reflecting early or late voluntary ESG disclosure choices by firms:

$$\begin{aligned}
Liquidity_{i,c,t+1} = & \beta_1 Mandatory\ ESG\ Disclosure_{c,t} \times Late\ Vol.\ Adopter_{i,c,t} + \beta_2 Mandatory \\
& ESG\ Disclosure_{c,t} \times Early\ Vol.\ Adopter_{i,c,t} + \beta_3 Mandatory\ ESG\ Disclosure_{c,t} + \\
& \beta_4 Late\ Vol.\ Adopter_{i,c,t} + \beta_5 Early\ Vol.\ Adopter_{i,c,t} + X_{i,c,t-1} \theta + \delta_i + \delta_j \times \delta_t + \varepsilon_{i,c,t+1},
\end{aligned} \tag{4}$$

where $Liquidity_{i,c,t}$ and $Mandatory\ ESG\ Disclosure_{c,t}$ are defined as before, and $Early\ Vol.\ Adopter_{i,c,t}$ and $Late\ Vol.\ Adopter_{i,c,t}$ identify the two sets of firms that provide sustainability reports voluntarily (either early or late relative to the disclosure mandate). See section 3.5.1 for details. The interaction terms in equation (4) capture the liquidity effects of ESG disclosure mandates for these two sets of firms compared to “mandated” adopters that did not issue sustainability reports voluntarily. As indicated above, data to estimate equation (4) is available only for a subset of firms. ESG disclosure rules should improve liquidity less strongly among firms that disclose on ESG issues voluntarily. In this case, β_1 and β_2 should be positive (β_3 reflects the effect of the disclosure rules for mandated adopters). For the two sets of voluntary adopters, we expect larger liquidity improvements among late adopters (β_1 should be less positive than β_2). We interpret estimates of equation (4) more carefully as firm-level voluntary disclosure choices may reflect selection effects.

[Insert table 7 about here]

In Table 7, panel A, we report estimates for all countries (column 1) and for countries without voluntary disclosure initiatives (column 2). In column 1, as predicted, the estimates for the interaction terms (β_1 and β_2) are both positive and significant, while the estimate for β_3 —the baseline effect for mandated adopters—remains negative. Early adopters appear to experience virtually no improvements in liquidity, as the magnitude of β_2 almost exactly offsets that of β_3 . Further, β_1 is about half the size of β_3 , hence that late adopters still benefit from the disclosure mandates (half as much as mandated adopters). In column 2, where we consider countries where

firms' voluntary disclosure choices are unaffected by nudging through a voluntary disclosure initiative, effects are even stronger compared to column 1. Finally, note that the estimates of the interaction terms in columns 1–2 align with the evidence in section 4.2.2, which indicates that liquidity effects are smaller in countries with voluntary disclosure initiatives.

Overall, we conclude that liquidity improvements from mandatory ESG disclosure are weaker if treated firms voluntarily released sustainability reports prior to the disclosure rules.

4.5.2. Voluntary Earnings Guidance. Next, we broaden the perspective of the firm-level voluntary disclosure choice and examine the effects of earnings guidance. We estimate a modified version of equation (4):

$$\begin{aligned} Liquidity_{i,c,t+1} = & \beta_1 Mandatory\ ESG\ Disclosure_{c,t} \times Vol.\ Earnings\ Guidance_{i,c,t} + \\ & \beta_2 Mandatory\ ESG\ Disclosure_{c,t} + \beta_3 Vol.\ Earnings\ Guidance_{i,c,t} + \mathbf{X}_{i,c,t-1} \boldsymbol{\theta} + \delta_i + \delta_j \times \delta_t + \quad (5) \\ & \varepsilon_{i,c,t+1}, \end{aligned}$$

where *Vol. Earnings Guidance*_{*i,c,t*} now indicates whether or not a firm provided voluntary earnings guidance. We predict that ESG disclosure mandates improves liquidity less strongly among firms that provide earnings guidance. In this case, β_1 on the interaction term should be positive.

Table 7, panel A, reports in columns 3–4 estimates of equation (5). Column 3 shows that stock liquidity improves less strongly for firms that provide earnings guidance. In column 3, the coefficient estimate for the interaction term is 0.034, which implies that the decline in illiquidity around the introduction of mandatory ESG disclosure is around 4% of a standard deviation smaller if a treated firm provides earnings guidance. Results are unaffected in column 4 when focusing the estimation on countries without voluntary disclosure initiatives.

4.5.3. *PRI Institutional Ownership*. Finally, to examine the role of information *demand*, we turn to firm-level heterogeneity in institutional ownership by PRI signatories. We introduce an interaction term between *ESG Mandatory Disclosure* and ownership by PRI signatories:

$$\begin{aligned} Liquidity_{i,c,t+1} = & \beta_1 Mandatory\ ESG\ Disclosure_{c,t} \times PRI\ IO_{i,c,t-1} + \beta_2 Mandatory\ ESG \\ & Disclosure_{c,t} + \beta_3 PRI\ IO_{i,c,t-1} + X_{i,c,t-1} \theta + \delta_i + \delta_j \times \delta_t + \varepsilon_{i,c,t+1}, \end{aligned} \quad (6)$$

where $PRI\ IO_{i,c,t-1}$ reflects institutional ownership by PRI signatories. For these regressions, we follow our previous sample split in table 3 and compare effects for the years before 2010 (but since the start of PRI in 2006) with those in and after 2010. The sample split is also intended to reflect that the demand for ESG information by PRI signatories should have increased substantially over the recent years because of an upward trend in PRI signatories. Moreover, the Global Financial Crisis of 2007 and 2008, which immediately followed the PRI launch, likely caused signatories to prioritize demand for financial information over ESG information. Hence, ESG disclosure rules should improve liquidity more strongly among firms with higher PRI ownership, especially since 2010 (i.e., β_1 on the interaction term should be negative).

Indeed, Table 7, panel B, shows that liquidity improves more strongly among those firms that have higher ownership by PRI signatories. A comparison of the β_1 interaction term between columns 1 and 2 reveals that this effect is present only from 2010 onwards. For the years before, we find no statistically significant effect and a much smaller coefficient estimate. The interaction term in column 2 is -0.147 (statistically significant at the 5% level), so a one-standard-deviation increase in *PRI IO* leads to an incremental decline in *Illiquidity Factor* equal to -0.014 , or 2% relative to the mean. The effect is modest but it may get bigger in the future if the demand for ESG information by PRI signatories increases further.

5. Threats to Identification and Robustness

5.1 KEY RESEARCH DESIGN ASSUMPTIONS

Our research design makes assumptions to identify the effect of ESG disclosure mandates. First, we require that firms in treatment and control countries follow parallel trends. This assumes that—absent ESG disclosure mandates—the change in liquidity from the pre- to the post-mandate periods for firms from treatment countries is the same, on average, as the corresponding change for firms from nontreatment countries. A violation of this assumption is less likely in our multi-country staggered DiD design compared to a one-country setting. The reason is that, in our setting, the parallel trends assumption would need to be violated for many countries, not just one. That said, as shown in section 4.2, we observe the presence of some pre-trend, caused in part by voluntary disclosure initiatives that precede the mandates. Second, we require that there are no spillover effects from firms in treated countries to firms in nontreated countries (stable unit treatment value assumption). In our context, a violation may arise because of peer effects within global industries—for example, if firms from nontreatment countries choose to disclose on ESG topics because their peers from treatment countries are forced to do so. Such spillovers would lead to an underestimation of the treatment effect. We mitigate concerns about such spillover effects by obtaining identification primarily from within-firm changes and also within treatment countries. Third, we need to assume that the regulatory events in the 38 treatment countries are not endogenous—that is, driven by unobserved variables that also affect liquidity outcomes (event exogeneity assumption). Finally, firms from early-treated countries, which act as control countries for firms from later-treated countries, should not exhibit treatment effects that change over time (no dynamic treatment effects assumption). We assess the third and fourth assumption in detail the next subsections.

5.2 ENDOGENOUS NATURE OF MANDATORY ESG DISCLOSURES

A challenge is that ESG mandates may have been implemented by lawmakers or other institutions as a result of intense public debate surrounding ESG or CSR topics, or in response to a wave of ESG incidents in a country. The decline in liquidity may originate from these underlying economic or societal developments (or other related confounding regulations).

To address this challenge, we follow Christensen, Hail, and Leuz [2016] and perform in table 8 a two-step falsification in the spirit of Altonji, Todd, and Taber [2005]. In the first step, reported in column 1, we re-estimate our regression model in equation (1) but exclude *Mandatory ESG Disclosure*. Instead, we add country-level proxies for local factors that may explain the introduction of the disclosure mandates and may be correlated with liquidity. These proxies intend to capture public interest in ESG topics and the prevalence of ESG scandals, respectively. To reflect public ESG interest, we create for each country-year a measure of the Google search volume for the term “ESG.” ESG scandals are captured using a news-based measure on the number of ESG incidents based on data from RepRisk. The measures go back only to 2004 (ESG interest) and 2007 (ESG incidents), but this restriction is not overly problematic because most disclosure mandates were introduced after 2007. The term “ESG” started to be used popularly from 2004 onwards after the publication of a report by the International Finance Corporation and the UN Global Compact. We include values for $t-1$ and $t-2$ as regulations may not instantaneously react to such events (because of the drafting and lawmaking processes). Next to these proxies, we add macro variables that may be related to ESG disclosures (GDP per capita, an index for globalization, and carbon emissions per capita). This regression generates predicted values for the liquidity factor conditional on observable candidates for selection.

[Insert table 8 about here]

In the second step, reported in column 2, we use the predicted liquidity values from the first step as the dependent variable in our regression model (equation (1)). Under the alternative explanation that ESG-related shocks or local macro conditions induce our results, the coefficient on *Mandatory ESG Disclosure* should be similar to those in table 3. However, this is not the case. The coefficient estimate is statistically insignificant and small in magnitude. This implies that selection on unobservable variables would have to be large and unrelated to the observables included in the falsification exercise if it were to explain our results.

5.3 BIAS FROM THE STAGGERED RESEARCH DESIGN

When treatment is rolled out in a staggered way, estimates from staggered DiD regressions obtained through OLS can be biased because of heterogeneous treatment effects and variation in treatment timing (Baker, Larcker, and Wang [2022]). Following the advice of Baker, Larcker, and Wang [2022] on how to resolve this issue, we apply the Callaway and Sant’Anna [2021] estimator and conduct stacked regressions (Gormley and Matsa [2011], Cengiz et al. [2019]). These approaches allow us to estimate the static average treatment effect of the treated (ATT), both with and without controls. We use all observations from before and after treatment. In these estimations, the control groups are “clean” or “good” in the sense that the set of control firms are either not treated at all or not-yet-treated.

[Insert table 9 about here]

We report the corresponding estimation results in table 9. In columns 1–2, we report the ATT obtained using the Callaway and Sant’Anna [2021] estimator without and with control variables. We include year and firm fixed effects, implying that the coefficient estimate is best compared

with the estimate from table 3, column 5. In column 1, the coefficient estimate is smaller compared to the baseline effect from table 3, column 5, but remains significantly negative. When we add control variables, the magnitude of the effect increases and is closer to the baseline from table 3.

In columns 3–4, we use stacked regressions. We create for each treatment event an event-specific dataset in which a clean set of control firms is used (i.e., only not-yet and never-treated firms). These datasets are then “stacked” together and the DiD regression is estimated using the stacked dataset, including dataset-specific unit and time fixed effects. In our case, this amounts to adding firm-by-stack and year-by-stack fixed effects. The resulting ATTs are reported in columns 3 and 4. Again, the estimates are negative and significant and of a similar magnitude as in table 3.

6. Conclusion

We have compiled a novel and comprehensive dataset on mandatory ESG disclosure worldwide to analyze the stock liquidity effects of such disclosure requirements. We document a significant positive effect of mandatory ESG disclosure mandates on liquidity. The effects are stronger if the mandatory disclosure requirements are implemented by government institutions, not on a comply-or-explain basis, and coupled with enforcement by informal institutions. Moreover, firms with weaker information environments benefit more from the disclosure mandates. Our results provide support for the notion that mandatory ESG disclosure regulations improve the corporate information environment with beneficial capital market effects. These findings encourage and support regulatory changes for countries that have yet to adopt mandatory ESG disclosure requirements.

Data Appendix A: Variable Definitions

Variable Name	Definition	Sources
Panel A: Variables for Firm-Year Level Analysis		
<i>Mandatory ESG Disclosure Variables</i>		
<i>Mandatory ESG Disclosure_{c,t}</i>	Indicator that equals one starting from the first year in which a country introduced mandatory ESG disclosure, and zero otherwise. If ESG disclosure is not introduced all at once, we require that mandatory E, S, and G disclosure is present for the indicator to be one.	Hand-Collected, C&S, SSE, GRI
<i>Vol. ESG Disc. Country_c</i>	Indicator that equals one if a firm is from a country with a voluntary ESG disclosure initiative, and zero otherwise.	Hand-Collected, C&S
<i>Mandatory ESG Disclosure^{All-At-Once}_{c,t}</i>	Indicator that equals one starting from the first year in which a country with all-at-once implementation of ESG disclosure introduced mandatory ESG disclosure, and zero otherwise. The all-at-once implementation means that mandatory disclosure on E, S, and G was introduced at the same time.	Hand-Collected, C&S, SSE, GRI
<i>Mandatory ESG Disclosure^{One-by-One}_{c,t}</i>	Indicator that equals one starting from the first year in which a country with one-by-one implementation of ESG disclosure introduced mandatory disclosure on the last of the three E, S, and G topics, and zero otherwise. One-by-one implementation means that mandatory disclosure on E, S, and G was <i>not</i> introduced at the same time but gradually.	Hand-Collected, C&S, SSE, GRI
<i>Mandatory ESG Disclosure^{Gov. Inst.}_{c,t}</i>	Indicator that equals one starting from the first year in which a government institution in a country introduced mandatory ESG disclosure, and zero otherwise. A government institution can be a ministry, the parliament, a securities regulator, or a similar institution. If ESG disclosure is not introduced all at once, we require that mandatory E, S, and G disclosure is present for the indicator to be one.	Hand-Collected, C&S, SSE, GRI
<i>Mandatory ESG Disclosure^{Stock Exch.}_{c,t}</i>	Indicator that equals one starting from the first year in which a stock exchange in a country introduced mandatory ESG disclosure, and zero otherwise. If ESG disclosure is not introduced all at once, we require that mandatory E, S, and G disclosure is present for the indicator to be one.	Hand-Collected, C&S, SSE, GRI
<i>Mandatory ESG Disclosure^{Comply}_{c,t}</i>	Indicator that equals one starting from the first year in which a country introduced mandatory ESG disclosure if the disclosure is on a full-compliance basis (not on a comply-or-explain basis), and zero otherwise. If ESG disclosure is not introduced all at once, we require that mandatory E, S, and G disclosure is present for the indicator to be one.	Hand-Collected, C&S, SSE, GRI
<i>Mandatory ESG Disclosure^{Comply-or-Explain}_{c,t}</i>	Indicator that equals one starting from the first year in which a country introduced mandatory ESG disclosure if the disclosure is on a comply-or-explain basis (not on a full-compliance basis), and zero otherwise. If ESG disclosure is not introduced all at once, we require that mandatory E, S, and G disclosure is present for the indicator to be one.	Hand-Collected, C&S, SSE, GRI
<i>Liquidity Variables</i>		
<i>Bid-Ask Spread_{i,c,t+1}</i>	Yearly median value of the daily bid-ask spreads of a firm. The bid-ask spread is the difference between the daily closing bid and ask prices divided by the midpoint. We set the daily bid-ask spread as missing if the daily bid-ask spread is $\geq 100\%$ or less than zero. We set the variable as missing if there are ≤ 120 daily observations or if there is no price variation within 12 months. The measure is calculated over the 12-month period starting from the end of a fiscal year (i.e., over the year $t+1$). Winsorized at 1% and 99%.	Eikon
<i>Price Impact_{i,c,t+1}</i>	Yearly median value of the daily Amihud [2002] illiquidity measure, calculated as the daily absolute stock return (in %) divided by the daily USD trading volume (measured in thousands). We set the variable as missing if there are ≤ 120 daily observations or if there is no price variation within 12 months. The measure is calculated over the 12-month period starting from the end of a fiscal year (i.e., over the year $t+1$). The metric is multiplied by 1,000. Winsorized at 1% and 99%.	Eikon

$Zero\ Return_{i,c,t+1}$	Number of trading days with zero daily stock returns scaled by the number of potential trading days in the year. We set the price impact as missing if there are ≤ 120 daily observations. The measure is calculated over the 12-month period starting from the end of a fiscal year (i.e., over the year $t+1$).	Eikon
$Illiquidity\ Factor_{i,c,t+1}$	Aggregate illiquidity factor constructed as the score of a single factor extracted from $\text{Log}(\text{Bid-Ask Spread}_{i,c,t+1})$, $\text{Log}(\text{Price Impact}_{i,c,t+1})$, and $Zero\ Return_{i,c,t+1}$ using factor analysis.	Self-Constructed
<i>Formal and Informal Institutions Variables</i>		
$Rule\ of\ Law_{c,t}$	Index that captures perceptions of the extent to which agents in a country have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. The values of the index can range between -2.5 and 2.5 . Higher values indicate stronger rule of law in a country-year.	World Bank
$Rule\ of\ Law^{Res}_{c,t}$	Residual from a regression of $Rule\ of\ Law_{c,t}$ on countries' legal origins, gross domestic product (GDP) per capita, and an index reflecting the globalization in a country.	World Bank, KOF Swiss Economic Institute
$Govt.\ Effectiveness_{c,t}$	Index that captures the quality of public services, the quality of the civil service and its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to its stated policies in a country-year. The values of the index can range between -2.5 and 2.5 . Higher values indicate higher government effectiveness in a country-year.	World Bank
$Govt.\ Effectiveness^{Res}_{c,t}$	Residual from a regression of $Govt.\ Effectiveness_{c,t}$ on countries' legal origins, GDP per capita, and an index reflecting the globalization in a country.	World Bank, ETH KOF
$EPI\ E\ Norms_{c,t}$	Yale University's Environmental Performance Index (EPI). The index measures societal outcomes related to environmental health and ecosystem vitality. The values of the index can range between 0 and 100. Higher values indicate a stronger environmental performance in a country-year and, in turn, a stronger common belief in the importance of environmental issues.	Yale Center for Environmental Law
$EPI\ E\ Norms^{Res}_{c,t}$	Residual from a regression of $EPI\ E\ Norms_{c,t}$ on countries' legal origins, GDP per capita, and an index reflecting the globalization in a country.	Yale Center for Environmental Law, World Bank, KOF
$IVS\ E\ Norms_{c,t}$	Survey-based index of the environmental awareness in a country. The index is obtained from the Integrated Values Survey (IVS) and is based on interviews with representative samples of individuals. The values of the index range between 0 and 1. Higher values indicate better environmental awareness in a country-year. The index is built on five survey questions that capture: (1) voluntary work for unpaid work environment, conservation, and animal rights; (2) active/inactive membership of an environmental organization; (3) whether it is important to a person to look after the environment; (4) whether a person would give part of their income for the environment; and (5) whether protecting the environment has priority in contrast to economic growth. The index uses data from Wave 4–7 of the World Values Survey (WVS) and from Waves 4 and 5 of the European Value Survey (EVS). Responses to these questions are aggregated following the methodology of Welzel [2013]. The index changes values whenever new survey data become available for a country (i.e., not every year).	IVS
$IVS\ E\ Norms^{Res}_{c,t}$	Residual from a regression of $IVS\ E\ Norms_{c,t}$ on countries' legal origins, GDP per capita, and an index reflecting the globalization in a country.	IVS, World Bank, KOF
$IVS\ S\ Norms_{c,t}$	Survey-based index of the social norms in a country. The index is obtained from the IVS and is based on interviews with representative samples of individuals. The values of the index range between 0 and 1. Higher values indicate stronger social norms in a country-year. Following Welzel [2013], this index reflects four dimensions: (1) autonomy: whether independence and imagination are	IVS

important in child qualities; (2) gender equality: a) men should have more right to jobs than women; b) men make better political leaders than women do; c) university is more important for a boy than for a girl; d) men make better business executives than women do; (3) voice: assign first, second, or no priority to the goals of (a) protecting freedom of speech; (b) giving people more say in important government decisions; (c) giving people more say about how things are done at their jobs and in their communities; (4) freedom: how acceptable respondents find (a) divorce; (b) abortion; and (c) homosexuality. The index uses data from Wave 4–7 of the WVS and from Waves 4 and 5 of the EVS. Responses to these questions are aggregated following the methodology of Welzel [2013]. The index change values whenever new survey data become available for a country (i.e., not every year).

$IVS\ S\ Norms_{c,t}^{Res}$	Residual from a regression of $IVS\ S\ Norms_{c,t}$ on countries' legal origins, GDP per capita, and an index reflecting the globalization in a country.	IVS, World Bank, KOF
<i>Voluntary Disclosure and PRI Institutional Ownership Variables</i>		
$Late\ Vol.\ Adopter_{i,c,t}$	Indicator that equals one if a firm included in the Asset4 database has provided a sustainability report in firm-year $t-1$, and zero if a firm has not provided such a report.	Asset4
$Early\ Vol.\ Adopter_{i,c,t}$	Indicator that equals one if a firm included in the Asset4 database has provided a sustainability report in firm-year $t-2$, and zero if a firm has not provided such a report.	Asset4
$Vol.\ Earnings\ Guidance_{i,c,t}$	Indicator that equals one if a firm provides earnings guidance according to I/B/E/S, and zero if a firm does not provide guidance	I/B/E/S
$PRI\ IO_{i,c,t}$	Percentage of shares held by institutional investors who are PRI signatories in a firm-year. Available from 2006 onwards. Winsorized at 1% and 99%.	FactSet/PRI
<i>Control Variables</i>		
$Log(Assets)_{i,c,t}$	Logarithm of total assets (in USD) in a firm-year (Eikon data item: TR.TotalAssetsReported). Winsorized at 1% and 99%.	Eikon
$ROA_{i,c,t}$	Net income before extraordinary items (TR.NetIncomeBeforeExtraItems) scaled by the total assets in a firm-year. Winsorized at 1% and 99%.	Eikon
$Leverage_{i,c,t}$	Total debt (TR.TotalDebtOutstanding) scaled by the total assets (TR.TotalAssetsReported) in a firm-year. Winsorized at 1% and 99%.	Eikon
$Market\text{-}to\text{-}Book\ Ratio_{i,c,t}$	Market-to-book ratio in a firm-year, calculated as the market price (TR.PriceClose) divided by the book value of equity per share (TR.BVPSTotalEquity). Winsorized at 1% and 99%.	Eikon
$Analyst\ Coverage_{i,c,t}$	Number of analysts following a firm in a firm-year. Winsorized at 1% and 99%.	I/B/E/S
$Index\ Volatility_{c,t}$	Volatility of the monthly return of the MSCI equity market index in a country-year. Winsorized at 1% and 99%.	Datastream
$Index\ Return_{c,t}$	Annual return of the MSCI equity market index in a country-year. Winsorized at 1% and 99%.	Datastream
<i>Country-Level Variables</i>		
$Google\ ESG\ Search_{c,t}$	Google search volume for the term “ESG” in a country-year. The measure is calculated as the sum of the monthly values of the Google search index within the year. Available from 2004 to 2020. Winsorized at 1% and 99%.	Google Trends
$ESG\ Incidents_{c,t}$	Number of ESG incidents in a country-year documented by RepRisk. The variable includes the ESG incidents of both public and private firms. Available from 2007 to 2020. Winsorized at 1% and 99%.	RepRisk
$GDP\ per\ Capita_{c,t}$	GDP per capita in a country-year.	World Bank, IMF
$Globalization\ Index_{c,t}$	Index that measures the economic, social and political dimensions of globalization in a country-year. The values of the index can range between 0 and 100. Higher values indicate a more globalized country-year.	KOF
$Carbon\ Emissions\ per\ Capita_{c,t}$	Carbon emission (metric tons) per capita in a country-year.	World Bank

REFERENCES

- AGHION, P.; Y. ALGAN; P. CAHUC; and A. SHLEIFER. “Regulation and Distrust.” *Quarterly Journal of Economics* 125 (2010): 1015–1049.
- ALTONJI, J.G.; E. TODD; and C. TABER. “Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools.” *Journal of Political Economy* 1131 (2005): 151–184.
- AMIHUD, Y. “Illiquidity and Stock Returns: Cross-Section and Time Series Effects.” *Journal of Financial Markets* 5 (2002): 31–56.
- AMIHUD, Y., and S. LEVI. “The Effect of Stock Liquidity on the Firm’s Investment and Production.” *Review of Financial Studies* 36 (2023): 1094–1147.
- AMIHUD, Y; A. HAMEED; W. KANG; and H. ZHANG. “The Illiquidity Premium: International Evidence.” *Journal of Financial Economics* 117 (2015): 350–368.
- BAKER, A; D. LARCKER; and C. WANG. “How Much Should We Trust Staggered Difference-in-Differences Estimates?” *Journal of Financial Economics* 144 (2022): 370–395.
- BALAKRISHNAN, K.; A. ERTAN; and Y. LEE. “(When) Does Transparency Hurt Liquidity?” Working paper, Rice University, 2022. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3447412.
- BARTH, M; S. CAHAN; L. CHEN; and E. VENTER. “The Economic Consequences Associated with Integrated Report Quality: Capital Market and Real Effects. *Accounting, Organizations and Society* 62 (2017): 43–64.
- BERG, F.; J. KÖLBEL, AND R. RIGOBON. “Aggregate Confusion: The Divergence of ESG Ratings” *Review of Finance* 26 (2022): 1315–1344.
- BERTRAND, M.; E. DUFLO; and S. MULLAINATHAN. “How Much Should We Trust Difference-in-Differences Estimates?” *Quarterly Journal of Economics* 119 (2004): 249–275.
- BOCHKAY, K.; S. CHO, and J. HALES. “Credible Disclosure or Mere Puffery? Empirical Evidence on the Voluntary Use of Sustainability Disclosure Standards.” Working paper, University of Miami, 2023. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4167391.
- BONETTI, P.; C. LEUZ; and G. MICHELON. “Internalizing Externalities: Disclosure Regulation for Hydraulic Fracturing, Drilling Activity and Water Quality.” Working paper, University of Navarra, IESE Business School, 2022. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4171246.
- BURGSTÄHLER, D.; L. HAIL; and C. LEUZ. “The Importance of Reporting Incentives: Earnings Management in European Private and Public Firms.” *The Accounting Review* 81 (2006): 983–1016.
- CARNES, R.; D. CHRISTENSEN; and P. MADSEN. “Externalities of Financial Statement Fraud on the Incoming Accounting Labor Force.” *Journal of Accounting Research* 61 (2023): 1531–1589.
- CALLAWAY, B., and P. SANT’ANNA. “Difference-in-Differences with Multiple Time Periods.” *Journal of Econometrics* 225 (2021): 200–230.
- CECCARELLI, M; S. GLOSSNER.; M. HOMANEN; and D. SCHMIDT. “Which Institutional Investors Drive Corporate Sustainability? Working Paper 2021. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3988058
- CENGİZ, D.; A. DUBE; A. LINDNER; and B. ZIPPERER. “The Effect of Minimum Wages on Low-Wage Jobs.” *Quarterly Journal of Economics* 134 (2019): 1405–1454.

- CHEN, Y.; M. HUNG; and Y. WANG. "The Effect of Mandatory CSR Disclosure on Firm Profitability and Social Externalities: Evidence from China." *Journal of Accounting and Economics* 6 (2018): 169–190.
- CHRISTENSEN, D; G. SERAFEIM; and A. SIKOCHI. "Why is Corporate Virtue in the Eye of the Beholder? The Case of ESG ratings." *The Accounting Review* 97 (2022): 147–175.
- CHRISTENSEN, H.; L. HAIL; and C. LEUZ. "Mandatory IFRS Reporting and Changes in Enforcement." *Journal of Accounting and Economics* 56 (2013): 147–177.
- CHRISTENSEN, H.; L. HAIL; and C. LEUZ. "Capital-Market Effects of Securities Regulation: Prior Conditions, Implementation, and Enforcement." *Review of Financial Studies* 29 (2016): 2885–2924.
- CHRISTENSEN, H.; L. HAIL; and C. LEUZ. "Mandatory CSR and Sustainability Reporting: Economic Analysis and Literature Review." *Review of Accounting Studies* 26 (2021): 1176–1248.
- CHRISTENSEN, H., E. FLOYD, L. LIU, and M. MAFFETT. "The Real Effects of Mandated Information on Social Responsibility in Financial Reports: Evidence from Mine-Safety Records." *Journal of Accounting and Economics* 64 (2017): 284–304.
- DASKE, H.; L. HAIL; C. LEUZ; and R. VERDI. "Mandatory IFRS Reporting around the World: Early Evidence of the Economic Consequences." *Journal of Accounting Research* 46 (2008): 1085–1142.
- DASKE, H.; L. HAIL; C. LEUZ; and R. VERDI. "Adopting a Label: Heterogeneity in the Economic Consequences around IAS/IFRS Adoptions." *Journal of Accounting Research* 51 (2013): 495–547.
- DERRIEN F.; P. KRUEGER; A. LANDIER A.; and T. YAO. "ESG News, Future Cash Flows, and Firm Value". Working paper, HEC Paris, (2022). Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=3903274.
- DHALIWAL, D.; O. LI; A. TSANG; and Y. YANG. "Voluntary Non-Financial Disclosure and the Cost of Equity Capital: The Initiation of Corporate Social Responsibility Reporting." *The Accounting Review* 86 (2011): 59–100.
- DIAMOND, D., and E. VERRECCHIA. "Disclosure, Liquidity, and the Cost of Capital." *Journal of Finance* 46 (1991): 1325–1359.
- DYCK, A.; K. LINS; L. ROTH; and H. WAGNER. "Do Institutional Investors Transplant Social Norms? International Evidence on Corporate Social Responsibility." *Journal of Financial Economics* 131 (2019): 693–714.
- DYCK, A.; K. LINS; L. ROTH; M. TOWNER; and H. WAGNER. "Renewable Governance: Good for the Environment?" *Journal of Accounting Research* 61 (2023): 279–327.
- DYRENG, S.; J. HOOPES; and J. WILDE. "Public Pressure and Corporate Tax Behavior." *Journal of Accounting Research* 54 (2016): 147–186.
- FRIEDMAN, H.; M. HEINLE; AND I. LUNEVA. "A Theoretical Framework for ESG Reporting to Investors." Working paper, UCLA, 2021. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3932689
- FIECHTER, P.; J.-M. HITZ; and N. LEHMANN. "Real Effects of a Widespread CSR Reporting Mandate: Evidence from the European Union's CSR Directive." *Journal of Accounting Research* 60 (2022): 1499–1549.
- FISMAN, R., and E. MIGUEL. "Corruption, Norms, and Legal Enforcement: Evidence from Diplomatic Parking Tickets." *Journal of Political Economy* 115 (2007): 1020–1048.
- GIBBONS, B. "The Financially Material Effects of Mandatory Non-financial Disclosure." *Journal of Accounting Research* (2023): Forthcoming.

- GIBSON BRANDON, R.; S. GLOSSNER; P. KRUEGER; P. MATOS; AND T. STEFFEN. “Do Responsible Investors Invest Responsibly?” *Review of Finance* 26 (2023): 1389–1432.
- GIGLER, F. “Self-Enforcing Voluntary Disclosures.” *Journal of Accounting Research* 32 (1994): 224–240.
- GLOSTEN, L., and P. MILGROM. “Bid, Ask and Transaction Prices in a Specialist Market with Heterogeneously Informed Traders.” *Journal of Financial Economics* 14 (1985): 71–100.
- GORMLEY, T., and D. MATSA. “Growing out of Trouble? Corporate Responses to Liability Risk.” *Review of Financial Studies* 24 (2011): 2781–2821.
- GREWAL, J.; E. RIEDL; and G. SERAFEIM. “Market Reaction to Mandatory Nonfinancial Disclosure.” *Management Science* 65 (2019): 3061–3084.
- GRIFFIN, J.; P. KELLY; and F. NARDARI. “Do Market Efficiency Measures Yield Correct Inferences? A Comparison of Developed and Emerging Markets Get Access Arrow.” *Review of Financial Studies* 23 (2010): 3225–3277.
- GUAN, Y.; G. LOBO; A. TSANG; and X. XIN. “Societal Trust and Management Earnings Forecasts.” *The Accounting Review* 95 (2020): 149–184.
- GUIO, L.; P. SAPIENZA; and L. ZINGALES. “Does Culture Affect Economic Outcomes?” *Journal of Economic Perspectives* 20 (2006): 3–48.
- HAINMUELLER, J. “Entropy Balancing: A Multivariate Reweighting Method to Produce Balanced Samples in Observational Studies.” *Political Analysis* 20 (2012): 25–46.
- HEATH, D.; D. MACCIOCCHI; R. MICHAELY; and M. RINGGENBERG. “Does Socially Responsible Investing Change Firm Behavior?” *Review of Finance* 27 (2023): 2057–2083.
- HAYES, R.; F. JIANG; and Y. PAN. “Voice of the Customers: Local Trust Culture and Consumer Complaints to the CFPB.” *Journal of Accounting Research* 59 (2021): 1077–1121.
- ILHAN, E.; P. KRUEGER; Z. SAUTNER; and L. STARKS. “Climate Risk Disclosure and Institutional Investors.” *Review of Financial Studies* 36 (2023): 2617–2650.
- INCE, O., and B. PORTER. “Individual Equity Return Data from Thomson Datastream: Handle with Care!” *Journal of Financial Research* 29 (2006): 463–479.
- IOANNOU, I., and G. SERAFEIM. “The Consequences of Mandatory Corporate Sustainability Reporting,” in *Oxford Handbook of Corporate Social Responsibility: Psychological and Organizational Perspectives*, edited by Abigail McWilliams et al. Oxford: Oxford University Press, 2019: 452–489.
- JOUVENOT, V., and P. KRUEGER. “Mandatory Corporate Carbon Disclosure: evidence from a Natural Experiment.” Working paper, University of Geneva, 2021. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3434490.
- KRUEGER, P. “Climate change and firm valuation: Evidence from a quasi-natural experiment.” Working paper, University of Geneva, 2015. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2565523.
- KYLE, P. “Continuous Auctions and Insider Trading.” *Econometrica* 53 (1985): 1315–1335.
- LEUZ, C., and P. WYSOCKI. “The Economics of Disclosure and Financial Reporting Regulation: Evidence and Suggestions for Future Research.” *Journal of Accounting Research* 54 (2016): 525–622.
- LEUZ, C.; D. NANDA; and P. WYSOCKI. “Earning Management and Investor Protection: An International Comparison.” *Journal of Financial Economics* 69 (2003): 505–527.
- LI, X., and H. YANG. “Mandatory Financial Reporting and Voluntary Disclosure: The Effect of Mandatory IFRS Adoption on Management Forecasts.” *The Accounting Review* 91 (2016): 933–953.

- LU H.; Q. PENG; J.-E. SHIN; and L. YU. "Migration of Global Supply Chains: A Real Effect of Mandatory ESG Disclosure." Working paper, University of Toronto, 2022.
- MBANYELE, B.; H. HUANG; Y. LI; L. MUCHENJE; and F. WANG. "Corporate Social Responsibility and Green Innovation: Evidence from Mandatory CSR disclosure laws." *Economics Letters* 21 (2022): 110322.
- NORTH, D. "Economic Performance through Time." *American Economic Review* 84 (1994): 359–368.
- PAVONI, S. "ISSB Sets out to Tighten up Climate Reporting." *Financial Times* 2022: (May 5, 2022).
- PEDERSEN, L.; S. FITZGIBBONS; and L. POMORSKI. "Responsible Investing: The ESG-Efficient Frontier." *Journal of Financial Economics* 142 (2021): 572–597.
- ROY, P.; S. RAO; and M. ZHU. "Mandatory CSR Expenditure and Stock Market Liquidity." *Journal of Corporate Finance* 72 (2022): 102–158.
- SCHILLER, C. "Global Supply-Chain Networks and Corporate Social Responsibility." Working paper, Arizona State University, 2020. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3089311.
- SHE, G. "The Real Effects of Mandatory Nonfinancial Disclosure: Evidence from Supply Chain Transparency." *The Accounting Review* 97 (2022): 399–425.
- STARKS, L. "Presidential Address: Sustainable Finance and ESG Issues: *Value* versus *Values*." *Journal of Finance* 78 (2023): 1837–1872.
- STOCKEN, P.C. "Credibility of Voluntary Disclosures." *RAND Journal of Economics* 31 (2000): 359–374.
- TOMAR, S. "Greenhouse Gas Disclosure and Emissions Benchmarking." *Journal of Accounting Research* 61 (2023): 451–492.
- TSANG, A.; F. XIE; and X. XIN. "Foreign Institutional Investors and Corporate Voluntary Disclosure around the World." *The Accounting Review* 94 (2019): 319–348.
- WANG, L. "Transmission Effects of ESG Disclosure Regulations through Bank Lending Networks" *Journal of Accounting Research* 61 (2023): 935–978.
- WELZEL, C. *Freedom Rising: Human Empowerment and the Quest for Emancipation*. New York: Cambridge University Press, 2013.
- WILLIAMSON, O. "The New Institutional Economics: Taking Stock, Looking Ahead." *Journal of Economic Literature* 38 (2000): 595–613.
- WYSOCKI, P. "New Institutional Accounting and IFRS." *Accounting and Business Research* 41 (2011): 309–328.
- XUE, H. "ESG Disclosure, Market Forces, and Investment Efficiency." Working paper, Duke University, 2023. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4344253.
- ZHANG, Q.; R. DING; D. CHEN; and X. ZHANG. "The Effects of Mandatory ESG Disclosure on Price Discovery Efficiency around the World." *International Review of Financial Analysis* 89 (2023): 102811.

TABLE 1
Country-Level Descriptive Statistics

Panel A: Treatment countries												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Country/Region	Mand. ESG disc. year	All- at- once disc.?	Issued by govern. inst.?	No comply- or- explain disc.?	Vol. ESG disc. year	# Firm- years	%	Rule of <i>Law_{c,t}</i>	Govt. <i>Effect_{c,t}</i>	<i>EPI</i> <i>Norms_{c,t}</i>	<i>IVS E</i> <i>Norms_{c,t}</i>	<i>IVS S</i> <i>Norms_{c,t}</i>
Argentina	2008	1	1	1		195	0.3	-0.52	-0.08	49.12	0.47	0.49
Australia	2003	0	0	1		5003	6.6	1.75	1.66	70.10	0.54	0.57
Austria	2016	0	1	1	2003	484	0.6	1.85	1.64	77.23	0.43	0.54
Belgium	2009	0	1	1		1187	1.6	1.38	1.54	71.16	0.28	0.52
Bulgaria	2016	1	1	0		69	0.1	-0.10	0.04	57.28	0.43	0.43
Canada	2004	1	0	1		6472	8.6	1.77	1.77	68.74	0.54	0.56
Chile	2015	0	1	0	2012	16	0.0	1.23	1.06	51.55	0.52	0.49
China	2008	1	0	1		2666	3.5	-0.25	0.46	35.88	0.55	0.36
Cyprus	2016	1	1	0		6	0.0	0.66	0.94	63.14	0.47	0.38
Denmark	2016	1	1	0	2009	948	1.3	1.93	2.05	77.85	0.55	0.66
Finland	2016	1	1	0	2005	1577	2.1	1.99	2.08	76.02	0.51	0.55
France	2001	1	1	1		3673	4.9	1.43	1.49	75.38	0.45	0.53
Germany	2016	1	1	0	2013	4735	6.3	1.67	1.55	76.64	0.44	0.57
Greece	2006	1	1	1	2002	633	0.8	0.55	0.49	66.81	0.42	0.45
Hong Kong	2015	1	0	0	2012	3085	4.1	1.61	1.77	32.14	0.48	0.42
Hungary	2016	1	1	0		167	0.2	0.70	0.66	61.42	0.46	0.46
India	2015	1	1	1	2011	7246	9.6	-0.02	0.02	26.22	0.53	0.40
Indonesia	2012	0	1	1		672	0.9	-0.50	-0.16	34.05	0.57	0.35
Ireland	2016	1	1	0		364	0.5	1.62	1.47	71.52	0.26	0.52
Italy	2016	1	1	0	2002	2299	3.1	0.39	0.44	70.24	0.51	0.47
Malaysia	2007	0	0	0	2006	3349	4.4	0.43	1.03	45.03	0.55	0.38
Malta	2016	1	1	0		2	0.0	0.93	0.94	68.47	0.29	0.38
Netherlands	2016	0	1	0		1158	1.5	1.80	1.83	74.38	0.44	0.57
Norway	2013	0	1	1		1580	2.1	1.95	1.89	72.30	0.54	0.69
Pakistan	2009	1	1	1		553	0.7	-0.79	-0.67	30.97	0.37	0.26
Peru	2015	1	1	1	2013	93	0.1	-0.55	-0.29	42.70	0.50	0.41
Philippines	2011	1	1	1	2010	584	0.8	-0.49	0.10	39.90	0.54	0.38
Poland	2016	1	1	1		994	1.3	0.62	0.59	60.19	0.38	0.41
Portugal	2010	0	1	1	2002	83	0.1	1.09	1.05	63.67	0.48	0.43
Romania	2016	1	1	0	2009	87	0.1	0.29	-0.08	64.03	0.39	0.41
Singapore	2016	0	0	0	2011	1738	2.3	1.69	2.18	59.66	0.38	0.42
Slovenia	2017	1	1	0		91	0.1	1.01	1.04	69.49	0.49	0.55
South Africa	2010	1	0	0		1690	2.2	0.03	0.27	37.06	0.35	0.43
Spain	2012	0	1	0		1469	1.9	1.08	1.10	69.00	0.44	0.54
Sweden	2016	1	1	0		2801	3.7	1.89	1.82	76.00	0.54	0.69
Taiwan (China)	2019	1	0	1	2016	6642	8.8	1.05	1.26	55.57	0.54	0.42
Turkey	2014	0	1	1		1397	1.9	-0.09	0.19	39.49	0.47	0.39
United Kingdom	2013	0	1	1		9534	12.7	1.69	1.60	76.38	0.47	0.54

TABLE 1— *Continued*

Panel B: Non-treatment countries								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Country/Region	Vol. ESG discl. year	# Firm- Years	%	<i>Rule of Law_{c,t}</i>	<i>Govt. Effect_{c,t}</i>	<i>EPI Norms_{c,t}</i>	<i>IVS E Norms_{c,t}</i>	<i>IVS S Norms_{c,t}</i>
Bahrain	2016	34	0.1	0.41	0.43	36.25		
Brazil	2012	1084	1.8	-0.16	-0.23	47.14	0.55	0.43
Colombia	2014	7	0.0	-0.29	-0.06	50.98	0.60	0.41
Egypt	2016	473	0.8	-0.38	-0.47	39.33	0.39	0.25
Israel		458	0.8	0.97	1.27	61.11	0.35	0.45
Japan	2015	10607	17.4	1.48	1.63	75.11	0.40	0.49
Jordan	2009	69	0.1	0.31	0.17	47.31	0.49	0.25
Kazakhstan	2016	4	0.0	-0.47	0.13	44.67	0.41	0.35
Kenya	2015	156	0.3	-0.58	-0.44	31.08		
Korea (South)	2015	8857	14.5	1.03	1.09	64.87	0.43	0.42
Mauritius	2017	4	0.0	0.83	0.89	44.57		
Mexico	2011	727	1.2	-0.54	0.05	47.53	0.51	0.45
Morocco	2016	168	0.3	-0.23	-0.18	40.57	0.54	0.31
New Zealand		758	1.2	1.89	1.76	69.87	0.51	0.57
Nigeria	2018	113	0.2	-1.01	-1.07	33.34	0.42	0.28
Oman		216	0.4	0.50	0.25	34.52		
Qatar	2016	8	0.0	0.82	0.83	37.69	0.57	0.27
Russian Federati	2018	314	0.5	-0.81	-0.26	49.10	0.42	0.35
Saudi Arabia	2019	442	0.7	0.18	0.25	43.22	0.40	0.35
Sri Lanka	2018	207	0.3	-0.02	-0.09	39.78		
Switzerland	2016	281	0.5	1.83	1.95	73.89	0.58	0.57
Thailand	2012	1799	3.0	-0.08	0.25	43.25	0.52	0.38
Tunisia		205	0.3	0.08	-0.03	45.48	0.34	0.33
Ukraine		26	0.0	-0.82	-0.70	49.77	0.42	0.36
United Arab Emir	2019	254	0.4	0.66	1.27	50.93		
United States		33031	54.2	1.56	1.52	67.41	0.41	0.52
Vietnam	2013	625	1.0	-0.22	-0.03	32.58	0.55	0.39

Panel A reports for treatment countries, that is, countries that introduced mandatory ESG disclosure, summary statistics at the country level for i) a series of mandatory ESG disclosure variables (columns 1 to 4); ii) the year of introduction of voluntary ESG disclosures (column 5); iii) the number of firm-year observations (column 6); iv) the number of firm-years relative to the total number of firm-years in the panel (column 7); and v) measures of formal and informal institutions (columns 8 to 12). The statistics in columns 8 to 12 are calculated as country-level averages across country-year observations. The sample in the panel consists of 38 countries that introduced mandatory ESG disclosure between 2002 and 2020. Panel B reports for non-treatment countries, that is, countries that did not introduce mandatory ESG disclosure, summary statistics at the country level for i) the year of introduction of voluntary ESG disclosures (column 1); ii) the number of firm-year observations (column 2); ii) the number of firm-years relative to the total number of firm-years in the panel (column 3); iii) measures of formal and informal institutions (columns 4 to 8). The statistics in columns 4 to 8 are calculated as country-level averages across country-year observations. The sample in the panel consists of 27 countries. In both panels, the summary statistics are calculated for those countries and firm-years included in the regression sample in table 3, column 4. Data Appendix A defines all variables.

TABLE 2
Descriptive Statistics and Correlations

Panel A: Summary statistics (Firm-year level)						
	Mean	Std. Dev.	5%	Median	95%	# Obs.
ESG disclosure variables						
<i>Mandatory ESG Disclosure</i> _{c,t}	0.306					136269
<i>Mandatory ESG Disclosure</i> ^{All-At-Once} _{c,t}	0.187					136269
<i>Mandatory ESG Disclosure</i> ^{One-by-One} _{c,t}	0.127					136269
<i>Mandatory ESG Disclosure</i> ^{Comply} _{c,t}	0.075					136269
<i>Mandatory ESG Disclosure</i> ^{Comply-or-Explain} _{c,t}	0.231					136269
<i>Mandatory ESG Disclosure</i> ^{Gov. Inst.} _{c,t}	0.159					136269
<i>Mandatory ESG Disclosure</i> ^{Stock Exch.} _{c,t}	0.147					136269
Liquidity variables						
<i>Bid-Ask Spread</i> _{i,c,t+1}	0.008	0.014	0.000	0.003	0.034	136269
<i>Price Impact</i> _{i,c,t+1}	0.370	2.153	0.000	0.011	1.399	136269
<i>Zero Return</i> _{i,c,t+1}	0.080	0.112	0.000	0.038	0.306	136269
<i>Log(Bid-Ask Spread)</i> _{i,c,t+1}	-5.698	1.349	-8.010	-5.737	-3.384	136269
<i>Log(Price Impact)</i> _{i,c,t+1}	-4.356	2.704	-8.623	-4.532	0.336	136269
<i>Illiquidity Factor</i> _{i,c,t+1}	-0.504	0.905	-1.790	-0.628	1.170	136269
Formal and informal institutions variables						
<i>Rule of Law</i> _{c,t}	1.20	0.69	-0.23	1.53	1.88	136269
<i>Govt. Effectiveness</i> _{c,t}	1.27	0.62	-0.02	1.51	1.89	136269
<i>EPI Norms</i> _{c,t}	62.49	15.07	27.64	68.18	78.56	136269
<i>IVS E Norms</i> _{c,t}	0.46	0.07	0.35	0.46	0.56	135398
<i>IVS S Norms</i> _{c,t}	0.49	0.08	0.37	0.51	0.60	135398
Voluntary disclosure and PRI institutional ownership variables						
<i>Late Vol. Adopter</i> _{i,c,t}	0.06					35436
<i>Early Vol. Adopter</i> _{i,c,t}	0.50					35436
<i>Vol. Earnings Guidance</i> _{i,c,t}	0.14					136269
<i>PRI IO</i> _{i,c,t}	0.068	0.088	0.000	0.032	0.288	107013
Control variables						
<i>Log(Assets)</i> _{i,c,t-1}	20.55	2.04	17.42	20.42	24.29	136269
<i>ROA</i> _{i,c,t-1}	0.02	0.17	-0.18	0.04	0.17	136269
<i>Leverage</i> _{i,c,t-1}	0.20	0.18	0.00	0.17	0.54	136269
<i>Market-to-Book Ratio</i> _{i,c,t-1}	2.74	3.69	0.47	1.71	7.99	136269
<i>Analyst Coverage</i> _{i,c,t-1}	6.39	6.38	1.00	4.00	20.50	136269
<i>Index Volatility</i> _{c,t-1}	0.20	0.15	0.07	0.16	0.58	136269
<i>Index Return</i> _{c,t-1}	0.08	0.19	-0.29	0.09	0.31	136269

Panel B: Correlations of illiquidity variables (Firm-year level)			
	<i>Log(Bid-Ask Spread)</i> _{i,c,t}	<i>Log(Price Impact)</i> _{i,c,t}	<i>Zero Return</i> _{i,c,t}
<i>Log(Price Impact)</i> _{i,c,t}	0.79	1.00	
<i>Zero Return</i> _{i,c,t}	0.63	0.53	1.00
<i>Illiquidity Factor</i> _{i,c,t}	0.94	0.89	0.80

Panel A reports summary statistics at the firm-year level of the variables used in the firm-level analysis. Panel B reports firm-year level correlations of the liquidity measures. The sample consists of firm-year observations from 65 countries between 2002 and 2020. In both panels, the summary statistics are calculated for those countries and firm-years included in the regression sample in table 3, column 4. Data Appendix A defines all variables.

TABLE 3
Mandatory ESG Disclosure and Stock Liquidity: Average Treatment Effects

	Log(<i>Bid-Ask Spread</i>) _{<i>i,c,t+1</i>}	Log(<i>Price Impact</i>) _{<i>i,c,t+1</i>}	Zero Return _{<i>i,c,t+1</i>}	<i>Illiquidity Factor</i> _{<i>i,c,t+1</i>}						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Mandatory ESG Disclosure</i> _{<i>c,t</i>}	-0.084*** (0.011)	-0.161*** (0.019)	-0.015*** (0.001)	-0.085*** (0.007)	-0.085*** (0.007)	-0.045*** (0.017)	-0.088*** (0.007)	-0.121*** (0.008)		-0.094*** (0.008)
<i>Mandatory ESG Disclosure</i> ^{<i>All-at-Once</i>} _{<i>c,t</i>}									-0.064*** (0.008)	
<i>Mandatory ESG Disclosure</i> ^{<i>One-by-One</i>} _{<i>c,t</i>}									-0.070*** (0.012)	
Log(<i>Assets</i>) _{<i>i,c,t-1</i>}	-0.134*** (0.009)	-0.538*** (0.015)	-0.009*** (0.001)	-0.131*** (0.005)	-0.132*** (0.005)	-0.103*** (0.008)	-0.084*** (0.006)	-0.144*** (0.007)	-0.130*** (0.005)	-0.122*** (0.006)
<i>ROA</i> _{<i>i,c,t-1</i>}	-0.374*** (0.024)	-0.649*** (0.051)	-0.019*** (0.003)	-0.243*** (0.017)	-0.265*** (0.018)	-0.079*** (0.025)	-0.212*** (0.018)	-0.273*** (0.026)	-0.243*** (0.017)	-0.237*** (0.019)
<i>Leverage</i> _{<i>i,c,t-1</i>}	0.349*** (0.031)	1.149*** (0.055)	0.018*** (0.003)	0.292*** (0.019)	0.305*** (0.019)	0.305*** (0.031)	0.230*** (0.021)	0.353*** (0.027)	0.293*** (0.019)	0.259*** (0.020)
<i>Market-to-Book Ratio</i> _{<i>i,c,t-1</i>}	-0.025*** (0.001)	-0.069*** (0.002)	-0.002*** (0.000)	-0.020*** (0.001)	-0.021*** (0.001)	-0.013*** (0.001)	-0.016*** (0.001)	-0.025*** (0.001)	-0.020*** (0.001)	-0.017*** (0.001)
<i>Analyst Coverage</i> _{<i>i,c,t-1</i>}	-0.013*** (0.001)	-0.021*** (0.002)	0.000 (0.000)	-0.006*** (0.001)	-0.006*** (0.001)	-0.001* (0.001)	-0.003*** (0.001)	-0.007*** (0.001)	-0.006*** (0.001)	-0.006*** (0.001)
<i>Index Volatility</i> _{<i>c,t-1</i>}	-0.275*** (0.022)	0.058 (0.041)	0.000 (0.002)	-0.074*** (0.014)	-0.092*** (0.013)	-0.079 (0.054)	-0.024** (0.012)	-0.046** (0.022)	-0.070*** (0.014)	-0.123*** (0.013)
<i>Index Return</i> _{<i>c,t-1</i>}	-0.245*** (0.011)	-0.107*** (0.019)	-0.006*** (0.001)	-0.093*** (0.006)	-0.101*** (0.006)	-0.107*** (0.011)	-0.036*** (0.007)	-0.015** (0.007)	-0.092*** (0.006)	-0.095*** (0.007)
<i>F-test for difference across coefficients (p-value)</i> <i>Mand. ESG Disc.</i> ^{<i>All-at-Once</i>} = <i>Mand. ESG Disc.</i> ^{<i>One-by-One</i>}									0.6659	
Industry × year fixed effects	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	Yes	No	No	No	No	No
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	All countries	All countries	All countries	All countries	All countries	All countries before 2010	All countries in/after 2010	Mand. ESG disc. countries	All countries	Exclude mand. ESG disc. one-by-one countries
# Observations	136286	137673	137678	136269	136269	38579	95834	75329	136269	105514
# Unique firms	17683	17750	17751	17680	17680	8325	15031	9880	17680	13748
% Never-treated firms	44%	44%	44%	44%	44%	38%	46%	0%	44%	57%
# Countries	65	65	65	65	65	50	65	38	65	51
Adj. R-squared	0.871	0.902	0.805	0.897	0.893	0.919	0.916	0.889	0.897	0.888

TABLE 3— Continued

This table reports regressions at the firm-year level to investigate the impact of mandatory ESG disclosure on stock liquidity. We use four dependent variables: i) *Bid-Ask Spread*_{*i,c,t+1*} is the yearly median value of the daily bid-ask spread of a firm's stock; ii) *Price Impact*_{*i,c,t+1*} is the yearly median value of the daily Amihud [2002] illiquidity measure, calculated as the daily absolute stock return (in %) divided by the daily USD trading volume; iii) *Zero Return*_{*i,c,t+1*} is the number of trading days with zero daily stock returns scaled by the number of potential trading days in the year; and iv) *Illiquidity Factor*_{*i,c,t+1*} is an aggregate illiquidity factor constructed as the score of a single factor extracted from the three liquidity measures. We use the following key independent variables: i) *Mandatory ESG Disclosure*_{*c,t*} equals one starting from the first year in which a country introduced mandatory ESG disclosure, and zero otherwise (if ESG disclosure is not introduced all at once, we require that mandatory E, S, and G disclosure is present for the indicator to be one); ii) *Mandatory ESG Disclosure*^{*All-At-Once*}_{*c,t*} equals one starting from the first year in which a country with all-at-once implementation of ESG disclosure introduced mandatory ESG disclosure, and zero otherwise (all-at-once implementation means that mandatory disclosure on E, S, and G was introduced at the same time); iii) *Mandatory ESG Disclosure*^{*One-by-One*}_{*c,t*} equals one starting from the first year in which a country with one-by-one implementation of ESG disclosure introduced mandatory disclosure on the last of the three E, S, and G topics, and zero otherwise (one-by-one implementation means that mandatory disclosure on E, S, and G was not introduced at the same time but gradually). The sample consists of firm-year observations from 65 countries between 2002 and 2020 (unless indicated differently). Data Appendix A defines all variables. Standard errors, reported in parentheses, are clustered at the firm level. *, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.

TABLE 4

Mandatory ESG Disclosure and Liquidity: Voluntary Disclosure Countries and Anticipation Effects

	<i>Illiquidity Factor_{i,c,t+1}</i>				
	(1)	(2)	(3)	(4)	(5)
<i>Mandatory ESG Disclosure_{c,t}</i>	-0.107*** (0.012)	-0.137*** (0.012)	-0.125*** (0.012)	-0.095*** (0.008)	
<i>Mandatory ESG Disclosure_{c,t} × Vol. ESG Disc. Country_c</i>			0.075*** (0.014)		
<i>Mandatory ESG Disclosure_{c,t-1}</i>					-0.070*** (0.007)
<i>Log(Assets)_{i,c,t-1}</i>	-0.149*** (0.007)	-0.154*** (0.007)	-0.132*** (0.005)	-0.132*** (0.005)	-0.131*** (0.005)
<i>ROA_{i,c,t-1}</i>	-0.196*** (0.019)	-0.211*** (0.023)	-0.241*** (0.017)	-0.241*** (0.018)	-0.242*** (0.017)
<i>Leverage_{i,c,t-1}</i>	0.292*** (0.024)	0.297*** (0.026)	0.293*** (0.019)	0.289*** (0.019)	0.295*** (0.019)
<i>Market-to-Book Ratio_{i,c,t-1}</i>	-0.019*** (0.001)	-0.022*** (0.001)	-0.020*** (0.001)	-0.020*** (0.001)	-0.020*** (0.001)
<i>Analyst Coverage_{i,c,t-1}</i>	-0.010*** (0.001)	-0.011*** (0.001)	-0.006*** (0.001)	-0.006*** (0.001)	-0.006*** (0.001)
<i>Index Volatility_{c,t-1}</i>	-0.109*** (0.033)	-0.061** (0.030)	-0.073*** (0.014)	-0.085*** (0.013)	-0.077*** (0.014)
<i>Index Return_{c,t-1}</i>	-0.138*** (0.014)	-0.125*** (0.013)	-0.097*** (0.006)	-0.091*** (0.006)	-0.094*** (0.006)
Industry × year fixed effects	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Sample	Exclude Vol. ESG disc. countries	Exclude Vol. ESG disc. countries, Entropy balancing	All countries	All countries, exclude year <i>t-1</i>	All countries
# Observations	76437	76437	136269	132490	136269
# Unique firms	9148	9148	17680	17567	17680
# Never-treated firms	3630	3630	7800	7800	7800
% Never-treated firms	40%	40%	44%	44%	44%
# Countries	28	28	65	65	65
Adj. R-squared	0.912	0.915	0.897	0.897	0.897

This table reports regressions at the firm-year level to investigate the impact of mandatory ESG disclosure on stock liquidity. We use the following dependent variable: *Illiquidity Factor_{i,c,t+1}* is an aggregate illiquidity factor constructed as the score of a single factor extracted from the three liquidity measures *Bid-Ask Spread_{i,c,t+1}*, *Price Impact_{i,c,t+1}*, and *Zero Return_{i,c,t+1}*. We use the following key independent variables: i) *Mandatory ESG Disclosure_{c,t}* equals one starting from the first year in which a country introduced mandatory ESG disclosure, and zero otherwise (if ESG disclosure is not introduced all at once, we require that mandatory E, S, and G disclosure is present for the indicator to be one); ii) *Mandatory ESG Disclosure_{c,t-1}* is defined as *Mandatory ESG Disclosure_{c,t}* but moves the mandatory disclosure year forward by one year (i.e., the variable equals one already one year earlier); and iii) *Vol. ESG Disc. Country_c* equals one for firms from countries with voluntary disclosure initiatives. The sample consists of firm-year observations from 65 countries between 2002 and 2020 (unless indicated differently). In Column 2, we re-estimate Column 1 after using entropy balancing on the first three moments to create a covariate-balanced synthetic control group. Data Appendix A defines all variables. Standard errors, reported in parentheses, are clustered at the firm level. *, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.

TABLE 5
Mandatory ESG Disclosure and Liquidity: Implementation Mechanisms

	<i>Illiquidity Factor</i> _{<i>i,c,t+1</i>}			<i>Illiquidity Factor</i> _{<i>i,c,t+1</i>}		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Mandatory ESG Disclosure</i> ^{Gov. Inst.} _{<i>c,t</i>}	-0.099*** (0.009)		-0.102*** (0.009)			
<i>Mandatory ESG Disclosure</i> ^{Stock Exch.} _{<i>c,t</i>}		-0.018 (0.012)	-0.037*** (0.012)			
<i>Mandatory ESG Disclosure</i> ^{Comply} _{<i>c,t</i>}				-0.088*** (0.010)		-0.098*** (0.010)
<i>Mandatory ESG Disclosure</i> ^{Comply-or-Explain} _{<i>c,t</i>}					-0.050*** (0.010)	-0.067*** (0.010)
<i>F</i> -test for difference across coefficients (<i>p</i> -value)						
<i>Mand. ESG Disc.</i> ^{Gov. Inst.} = <i>Mand. ESG Disc.</i> ^{Stock Exch.}			0.000			
<i>Mand. ESG Disc.</i> ^{Comply} = <i>Mand. ESG Disc.</i> ^{Comply-or-Explain}						0.025
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sample	All countries	All countries	All countries	All countries	All countries	All countries
# Observations	136269	136269	136269	136269	136269	136269
# Unique firms	17680	17680	17680	17680	17680	17680
% Never-treated firms	44%	44%	44%	44%	44%	44%
# Countries	65	65	65	65	65	65
Adj. R-squared	0.897	0.896	0.897	0.897	0.896	0.897

This table reports regressions at the firm-year level to investigate the role of different implementation mechanisms for the impact of mandatory ESG disclosure on stock liquidity. We use the following dependent variable: *Illiquidity Factor*_{*i,c,t+1*} is an aggregate illiquidity factor constructed as the score of a single factor extracted from the three liquidity measures *Bid-Ask Spread*_{*i,c,t+1*}, *Price Impact*_{*i,c,t+1*}, and *Zero Return*_{*i,c,t+1*}. We use the following key independent variables: i) *Mandatory ESG Disclosure*^{Gov. Inst.}_{*c,t*} equals one starting from the first year in which a government institution in a country implemented mandatory ESG disclosure, and zero otherwise; ii) *Mandatory ESG Disclosure*^{Stock Exch.}_{*c,t*} equals one starting from the first year in which a stock exchange in a country introduced mandatory ESG disclosure; iii) *Mandatory ESG Disclosure*^{Comply}_{*c,t*} equals one starting from the first year in which a country introduced mandatory ESG disclosure if the disclosure is on a full-compliance basis (not on a comply-or-explain basis), and zero otherwise; and iv) *Mandatory ESG Disclosure*^{Comply-or-Explain}_{*c,t*} equals one starting from the first year in which a country introduced mandatory ESG disclosure if the disclosure is on a comply-or-explain basis (not on a full-compliance basis), and zero otherwise. The sample consists of firm-year observations from 65 countries between 2002 and 2020. Data Appendix A defines all variables. Standard errors, reported in parentheses, are clustered at the firm level. *, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.

TABLE 6

Mandatory ESG Disclosure and Liquidity: Enforcement by Formal and Informal Institutions

	Panel A: Formal institutions		Panel B: Informal institutions		
	<i>Illiquidity Factor</i> _{<i>i,c,t+1</i>}		<i>Illiquidity Factor</i> _{<i>i,c,t+1</i>}		
	(1)	(2)	(3)	(4)	(5)
<i>Mandatory ESG Disclosure</i> _{<i>c,t</i>} × <i>Rule of Law</i> ^{Res} _{<i>c,t</i>}	0.003 (0.015)				
<i>Mandatory ESG Disclosure</i> _{<i>c,t</i>} × <i>Govt. Effectiveness</i> ^{Res} _{<i>c,t</i>}		-0.023* (0.014)			
<i>Mandatory ESG Disclosure</i> _{<i>c,t</i>} × <i>EPI Norms</i> ^{Res} _{<i>c,t</i>}			-0.003** (0.001)		
<i>Mandatory ESG Disclosure</i> _{<i>c,t</i>} × <i>IVS E Norms</i> ^{Res} _{<i>c,t</i>}				-0.474*** (0.085)	
<i>Mandatory ESG Disclosure</i> _{<i>c,t</i>} × <i>IVS S Norms</i> ^{Res} _{<i>c,t</i>}					-0.574*** (0.116)
<i>Mandatory ESG Disclosure</i> _{<i>c,t</i>}	-0.077*** (0.007)	-0.076*** (0.008)	-0.089*** (0.009)	-0.072*** (0.008)	-0.063*** (0.008)
<i>Rule of Law</i> ^{Res} _{<i>c,t</i>}	-0.052*** (0.014)				
<i>Govt. Effectiveness</i> ^{Res} _{<i>c,t</i>}		-0.072*** (0.012)			
<i>EPI Norms</i> ^{Res} _{<i>c,t</i>}			-0.000 (0.001)		
<i>IVS E Norms</i> ^{Res} _{<i>c,t</i>}				0.430*** (0.050)	
<i>IVS S Norms</i> ^{Res} _{<i>c,t</i>}					-0.737*** (0.106)
Controls	Yes	Yes	Yes	Yes	Yes
Industry × year fixed effects	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Sample	All countries	All countries	All countries	All countries	All countries
# Observations	121353	121353	121353	120555	120555
# Unique firms	16048	16048	16048	15924	15924
% Never-treated firms	46%	46%	46%	46%	46%
# Countries	60	60	60	55	55
Adj. R-squared	0.900	0.900	0.900	0.901	0.901

This table reports regressions at the firm-year level to investigate the role of country-level formal and informal institutions for the impact of mandatory ESG disclosure on stock liquidity. We use the following dependent variable: *Illiquidity Factor*_{*i,c,t+1*} is an aggregate illiquidity factor constructed as the score of a single factor extracted from the three liquidity measures *Bid-Ask Spread*_{*i,c,t+1*}, *Price Impact*_{*i,c,t+1*}, and *Zero Return*_{*i,c,t+1*}. We use the following key independent variables: i) *Mandatory ESG Disclosure*_{*c,t*} equals one starting from the first year in which a country introduced mandatory ESG disclosure, and zero otherwise; ii) *Rule of Law*^{Res}_{*c,t*} is the residual from a regression of *Rule of Law*_{*c,t*} on countries' legal origins, GDP per capita, and an index reflecting the globalization in a country (*Rule of Law*_{*c,t*} captures the quality of contract enforcement, property rights, the police, and the courts; higher values indicate stronger rule of law); iii) *Govt. Effectiveness*^{Res}_{*c,t*} is the residual from a regression of *Govt. Effectiveness*_{*c,t*} on country variables (*Govt. Effectiveness*_{*c,t*} captures the quality of public services, the quality of the civil service and its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to its stated policies.; higher values indicate higher government effectiveness); iv) *EPI E Norms*^{Res}_{*c,t*} is the residual from a regression of *EPI E Norms*_{*c,t*} on country variables (*EPI E Norms*_{*c,t*} is Yale University's EPI and measures societal outcomes related to environmental health and ecosystem vitality); v) *IVS E Norms*^{Res}_{*c,t*} is the residual from a regression of *IVS E Norms*_{*c,t*} on country variables (*IVS E Norms*_{*c,t*} is an index of the environmental awareness in a country; higher values indicate better environmental awareness); and vi) *IVS S Norms*^{Res}_{*c,t*} is the residual from a regression of *IVS S Norms*_{*c,t*} on country variables (*IVS S Norms*_{*c,t*} is an index of the social norms in a country; higher values indicate stronger social norms). The sample consists of firm-year observations from 60 countries between 2002 and 2020 (unless indicated otherwise). Data Appendix A defines all variables. Standard errors, reported in parentheses, are clustered at the firm level. *, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.

TABLE 7

Mandatory ESG Disclosure and Stock Liquidity: Voluntary Firm Disclosures and PRI Ownership

Panel A: Voluntary firm disclosures				
	Illiquidity Factor _{i,c,t+1}			
	(1)	(2)	(3)	(4)
<i>Mandatory ESG Disclosure_{c,t} × Late Vol. Adopter_{i,c,t}</i>	0.031** (0.013)	0.044*** (0.016)		
<i>Mandatory ESG Disclosure_{c,t} × Early Vol. Adopter_{i,c,t}</i>	0.068*** (0.015)	0.119*** (0.017)		
<i>Mandatory ESG Disclosure_{c,t} × Vol. Earnings Guidance_{i,c,t}</i>			0.034** (0.016)	0.057*** (0.018)
<i>Mandatory ESG Disclosure_{c,t}</i>	-0.070*** (0.016)	-0.104*** (0.023)	-0.085*** (0.007)	-0.108*** (0.012)
<i>Late Vol. Adopter_{i,c,t}</i>	0.002 (0.007)	0.001 (0.008)		
<i>Early Vol. Adopter_{i,c,t}</i>	-0.001 (0.008)	-0.019* (0.010)		
<i>Voluntary Earnings Guidance_{i,c,t}</i>			-0.019*** (0.007)	-0.038*** (0.008)
Controls	Yes	Yes	Yes	Yes
Industry × year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
		Exclude Vol. ESG disc		Exclude Vol. ESG disc
Sample	All countries	All countries	All countries	All countries
# Observations	34778	23497	136269	76437
# Unique firms	4571	3195	17680	9148
% Never-treated firms	58%	60%	44%	40%
# Countries	53	23	65	28
Adj. R-squared	0.892	0.904	0.897	0.912

Panel B: PRI ownership		
	Illiquidity Factor _{i,c,t+1}	
	(1)	(2)
<i>Mandatory ESG Disclosure_{c,t} × PRI IO_{i,c,t-1}</i>	-0.050 (0.325)	-0.147** (0.072)
<i>Mandatory ESG Disclosure_{c,t}</i>	-0.031 (0.020)	-0.083*** (0.009)
<i>PRI IO_{i,c,t-1}</i>	-0.056 (0.180)	-0.097** (0.041)
Controls	Yes	Yes
Industry × year fixed effects	Yes	Yes
Firm fixed effects	Yes	Yes
	All countries before 2010	All countries in/after 2010
Sample		
# Observations	20348	83779
# Unique firms	6079	12958
% Never-treated firms	39%	45%
# Countries	49	64
Adj. R-squared	0.938	0.912

TABLE 7— Continued

This table reports regressions at the firm-year level to investigate the role of voluntary firm-level disclosure (panel A) and ownership by PRI signatories (panel B) for the impact of mandatory ESG disclosure on stock liquidity. We use the following dependent variable: *Illiquidity Factor* $_{i,c,t+1}$ is an aggregate illiquidity factor constructed as the score of a single factor extracted from the three liquidity measures *Bid-Ask Spread* $_{i,c,t+1}$, *Price Impact* $_{i,c,t+1}$, and *Zero Return* $_{i,c,t+1}$. We use the following key independent variables: i) *Mandatory ESG Disclosure* $_{c,t}$ equals one starting from the first year in which a country introduced mandatory ESG disclosure, and zero otherwise; ii) *Late Vol. Adopter* $_{c,t}$ equals one if a firm included in the Asset4 database has provided a sustainability report in firm-year $t-1$, and zero if a firm has not provided such a report; iii) *Early Vol. Adopter* $_{c,t}$ equals one if a firm included in the Asset4 database has provided a sustainability report in firm-year $t-2$, and zero if a firm has not provided such a report; iv) *Vol. Earnings Guidance* $_{i,c,t}$ equals one if a firm provides earnings guidance according to I/B/E/S, and zero if a firm does not provide guidance; and v) *PRI IO* $_{i,c,t}$ is the percentage of shares held by institutional investors who are PRI signatories; The sample consists of firm-year observations from 65 countries between 2002 and 2020 in panel A and between 2006 and 2020 in panel B (unless indicated differently). Data Appendix A defines all variables. Standard errors, reported in parentheses, are clustered at the firm level. *, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.

TABLE 8

Introduction of Mandatory ESG Disclosure: Falsification Test

	<i>Illiquidity Factor_{i,c,t+1}</i>	<i>Illiquidity Factor^{Pred}_{i,c,t+1}</i>
	(1)	(2)
<i>Mandatory ESG Disclosure_{c,t}</i>		0.000 (0.001)
<i>Google ESG Search_{c,t-1}</i> ($\times 10^4$)	0.003 (0.468)	
<i>ESG Incidents_{c,t-1}</i> ($\times 10^5$)	-0.011*** (0.001)	
<i>Google ESG Search_{c,t-2}</i> ($\times 10^4$)	6.923*** (0.564)	
<i>ESG Incidents_{c,t-2}</i> ($\times 10^5$)	0.012*** (0.002)	
<i>GDP per Capita_{c,t-1}</i> ($\times 10^5$)	0.417*** (0.054)	
<i>Globalization Index_{c,t-1}</i>	-0.004 (0.003)	
<i>Carbon Emissions per Capita_{c,t-1}</i>	0.049*** (0.004)	
Controls	Yes	Yes
Industry $\times$ year fixed effects	Yes	Yes
Firm fixed effects	Yes	Yes
Sample	All countries	All countries
# Observations	89028	89028
# Unique firms	13224	13224
% Never-treated firms	45%	45%
# Countries	61	61
Adj. R-squared	0.918	0.994

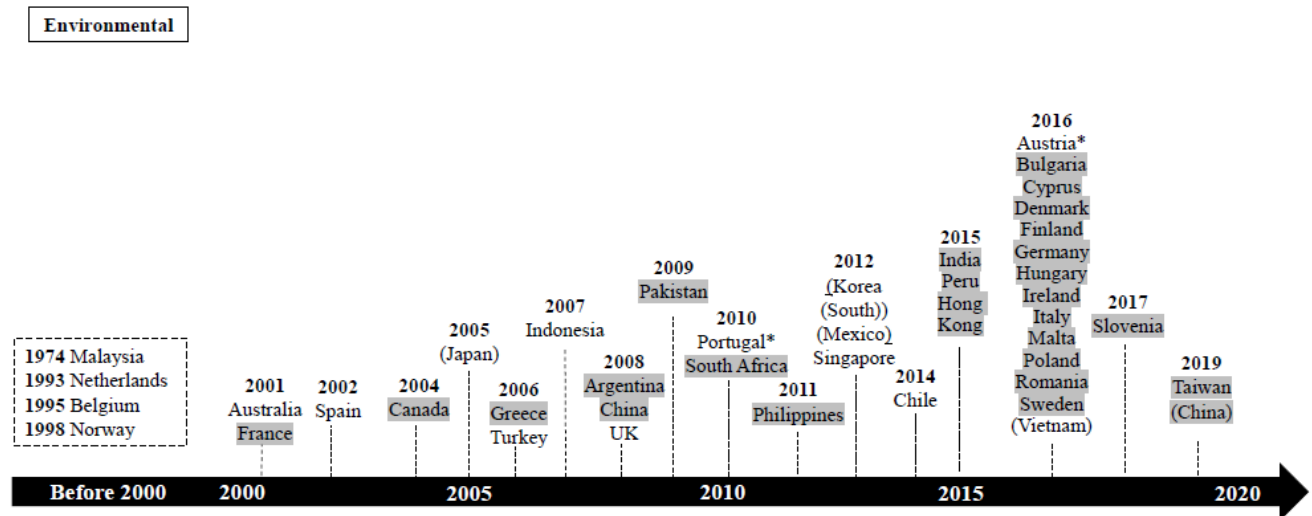
This table reports regressions at the firm-year level to conduct a two-step falsification test following an approach from Christensen, Hail, and Leuz [2016]. In column 1, we re-estimate our main regression model but exclude our variable of interest (*Mandatory ESG Disclosure_{c,t}*). Instead, we add country-level proxies for local factors that capture the public interest in ESG topics and ESG scandals and may explain the introduction of the disclosure mandates and may could be correlated with stock liquidity (*Google ESG Search_{c,t-1}* and *ESG Incidents_{c,t-1}*). These measures only go back to 2004 (*Google ESG Search_{c,t-1}*) or 2007 (*ESG Incidents_{c,t-1}*). We also add macroeconomic variables that may be related to ESG disclosure (*GDP per Capita_{c,t-1}*, *Globalization Index_{c,t-1}*, and *Carbon Emissions per Capita_{c,t-1}*). In column 2, we use the predicted liquidity values from the first step (*Illiquidity Factor^{Pred}_{i,c,t+1}*) as the dependent variable in our main regression model. The sample consists of firm-year observations from 61 countries between 2007 and 2020. Data Appendix A defines all variables. Standard errors, reported in parentheses, are clustered at the firm level. *, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.

TABLE 9
Introduction of Mandatory ESG Disclosure: Alternative Estimators

	<i>Illiquidity Factor_{i,c,t+1}</i>			
	<i>Callaway & Sant'Anna Estimator</i>		<i>Stacked Regressions</i>	
	(1)	(2)	(3)	(4)
<i>Mandatory ESG Disclosure_{c,t}</i>	-0.055*** (0.008)	-0.105*** (0.016)	-0.138*** (0.009)	-0.130*** (0.008)
Controls	No	Yes	No	Yes
Year fixed effects	Yes	Yes	No	No
Firm fixed effects	Yes	Yes	No	No
Firm × stack fixed effects	No	No	Yes	Yes
Year × stack fixed effects	No	No	Yes	Yes

Following Baker, Larcker, and Wang [2022], this table reports static effect estimates using the Callaway and Sant'Anna [2021] estimator and the stacked regression approach. We use the following dependent variable: *Illiquidity Factor_{i,c,t+1}*, is an aggregate illiquidity factor constructed as the score of a single factor extracted from the three liquidity measures *Bid-Ask Spread_{i,c,t+1}*, *Price Impact_{i,c,t+1}*, and *Zero Return_{i,c,t+1}*. We use the following key independent variable: *Mandatory ESG Disclosure_{c,t}* equals one starting from the first year in which a country implemented mandatory ESG disclosure, and zero otherwise. These estimation procedures in the table address possible Type 1 and Type 2 errors arising from estimating staggered DiD effects using OLS when heterogeneous treatment effects and/or variation in treatment timing are present. The control groups in these regressions are never treated and not-yet treated firms. Data Appendix A defines all variables. Standard errors, reported in parentheses, are clustered at the firm level. *, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.

Panel A: Introduction of Mandatory E Disclosure



Panel B: Introduction of Mandatory S Disclosure

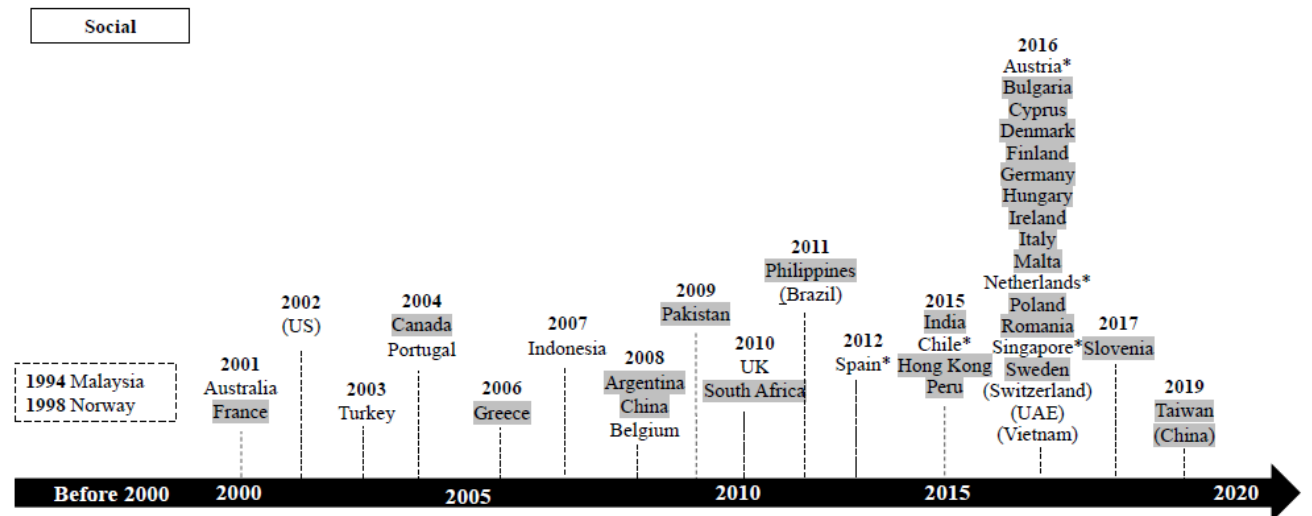


FIG 1— *Continued*

Panel C: Introduction of Mandatory G Disclosure

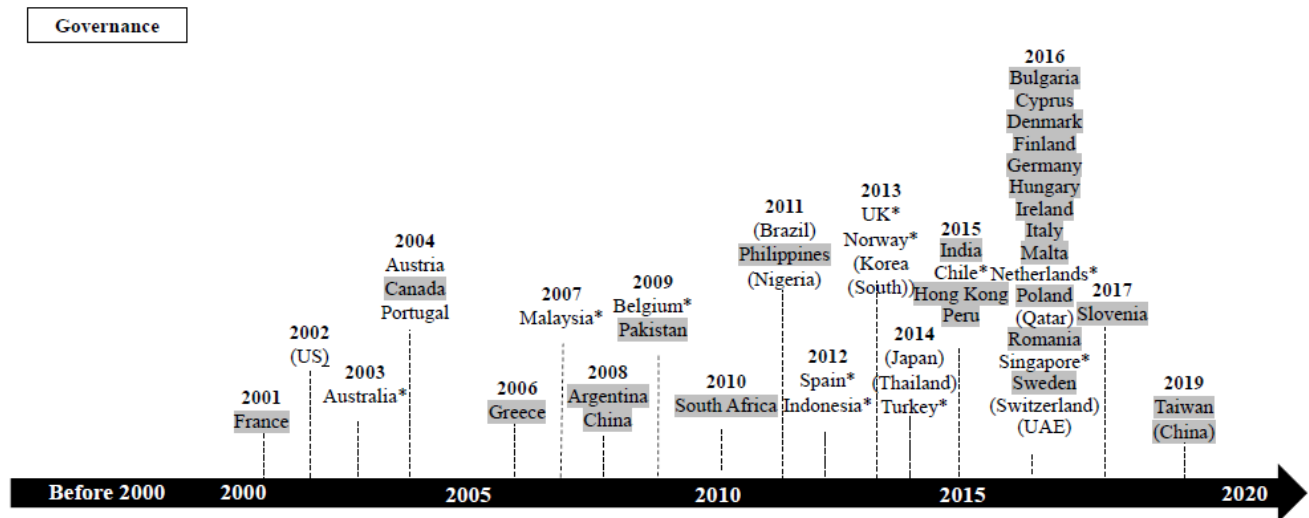
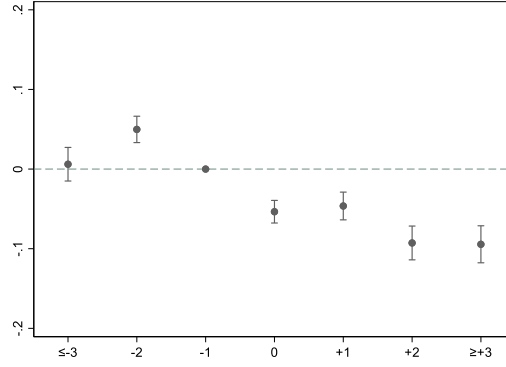


FIG 1—Timelines of the introduction of mandatory ESG disclosure regulations around the world. This figure exhibits the timeline of the introduction of mandatory environmental (panel A), social (panel B), and governance (panel C) disclosure around the world during our sample period. **France** (shaded country name) indicates sample countries that implemented mandatory E, S, and G disclosure all at once. The remaining countries implemented mandatory disclosure gradually one by one. (Japan) (country name in brackets) indicates sample countries that did not implement mandatory ESG disclosure on all three topics during the sample period. Australia* (country name with asterisk) indicates that the last of the three disclosure types (E, S, or G) is introduced. Estonia (2017) and Slovakia (2015) introduced mandatory ESG disclosure, but both countries are not listed in the figures as they are not included in the regression sample due to missing data.

Panel A: Full Sample



Panel B: Exclude Voluntary ESG Disclosure Countries

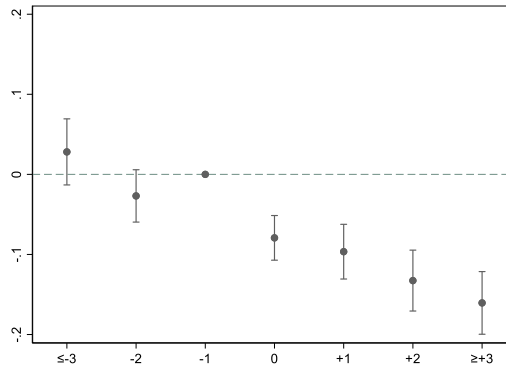


FIG 2— Mandatory ESG disclosure and stock liquidity: Event-time effects. This figure displays event time effects of mandatory ESG disclosure on *Illiquidity Factor*_{*i,c,t*}, which is an aggregate illiquidity factor constructed as the score of a single factor extracted from the three liquidity measures *Bid-Ask Spread*_{*i,c,t*}, *Price Impact*_{*i,c,t*} and *Zero Return*_{*i,c,t*}. Year $t=-1$ acts as the benchmark year. Standard errors are clustered at the firm level. In panel A, the estimation is based on regression specification in table 3, column 4 (full sample), but with individual year indicators (relative to the introduction of mandatory ESG disclosure in year $t=0$) instead of *Mandatory ESG Disclosure*_{*c,t*}. In panel B, the estimation is based on the regression specification in table 4, column 2 (we exclude voluntary ESG disclosure countries and use entropy balancing to create a synthetic control group). The figure plots the coefficient estimates for each event-time year together with 99% confidence intervals.

Online Appendix

for

The Effects of Mandatory ESG Disclosure around the World

Online Appendix A: Data Preparation and Sample Screening Procedures

Our analysis builds on data from Refinitiv Datastream, Eikon, and Worldscope. Specifically, equity price data is pulled from Datastream and Eikon, while accounting data is pulled from Worldscope. The detailed screening procedures are as follow.

Step 1: Create Static Firm List

Following Ince and Porter [2006], we use Datastream constituent lists to construct our list of firms. The lists include dead and active firms. We then search in the Datastream navigator for all stocks and only include i) stocks that are domestic, ii) securities that are of the equity type (i.e., we exclude other non-equity securities), iii) stocks that have a major listing in a given stock exchange, and iv) stocks from a domestic exchange. This procedure is also applied by Schmidt et al. [2019]. A detailed step-by-step filtering procedure is reported in OA table A1.

Step 2: Extract Equity Data from Eikon and Dynamic Filtering

We then pull global equity data from Eikon using the firm list after applying the static filtering. The detailed filtering procedures are reported in OA table A2.

Step 4: Calculate Liquidity Measures

We calculate the liquidity variables using daily equity data following the definitions in Data Appendix A.

Step 5: Merge with Firm Fundamental Data

We pull firm fundamental data from Worldscope and calculate variables following the definitions in Data Appendix A.

OA TABLE A1

Creation of Static Firm List

Static Screening ID	Static Screening Procedures	Items Involved
SS1	Delete firms that are not indicated as major listings.	Type of Instrumental = Equity Major Security Flag = Major Major = "1"
SS2	Delete firms that are not located on the domestic market.	
SS3	Keep the security whose type is equity.	TYPE = "EQ"
SS4	Delete stocks without adjusted price data.	ADP = "1"
SS5	Keep the ISIN of the primary listing in case of multiple ISINs.	ISINID = "P"
SS6	Keep the securities that are traded in the major equity exchanges in a country. Delete stock exchanges with less than 30 listed firms in our sample. Major exchanges in each country are reported in OA table A3 (the table includes countries that are not included in our final sample).	Exchange Market Code (BOURSEMNEMONIC)
SS6	Delete stocks that are not listed on domestic exchanges.	Datastream Exchange Mnemonic (EXMNEM)
SS7	Delete firms whose extended names contain suspicious word parts (Campbell et al. [2010, p. 3089].	Extended Name (ENAME)
SS8	Follow Griffin, Kelly, and Nardari's [2010] rule to exclude non-common equity securities. Detailed non-common equity security codes and industry codes for investment vehicles are obtained from Griffin, Kelly, and Nardari's [2010] Appendix table B.1 (p. 3272). The country-specific identifiers for excluding non-common equity securities are obtained from Griffin, Kelly, and Nardari's [2010] Appendix table B.2. (p. 3273).	Extended Name (ENAME) Industry Code (INDG)

This table reports the static screening procedures to create our global sample.

OA TABLE A2

Application of Dynamic Filtering Procedure

Dynamic Screening ID	Dynamic Screening Procedures	Items Involved
DS1	Delete observations with missing daily close prices, negative daily close prices, daily close prices < US\$ 0.1 (penny stocks) (Ince and Porter [2006]) or > US\$ 1,000.	TR.CLOSEPRICE (Adjusted=0 Curn=USD)
DS2	Set the daily total return to missing if it is greater than 200%.	TR.TotalReturn
	Delete abnormal return reversals. If Ret_t or $Ret_{t-1} > 100\%$ and $(1 + Ret_t)(1 + Ret_{t-1}) - 1 < 20\%$, set Ret_t and Ret_{t-1} to a missing value (Ince and Porter [2006], Lee [2011], Amihud et al. [2015]).	
DS3	Set bid (ask) price to missing if bid (ask) price is negative.	TR.BIDPRICE (Adjusted=1), TR.ASKPRICE (Adjusted=1)
DS4	Set daily share trading volume to missing if daily dollar trading volume is lower than US\$100 (Amihud et al. [2015]).	TR.Volume, TR.CLOSEPRICE (Adjusted=0 Curn=USD)

This table reports the dynamic filtering procedures to create our global sample.

OA TABLE A3
Primary Stock Exchanges

Country/Region	Primary Equity Exchanges	Exchange Code
Argentina	Buenos Aires Stock Exchange	BUE
Australia	Sydney Stock Exchange	ASX
Austria	Vienna Stock Exchange	WBO
Bahrain	Bahrain Stock Exchange	BAH
Belgium	Brussels Stock Exchange	BRU
Brazil	Sao Paulo Stock Exchange	BSP
Bulgaria	Sofia Stock Exchange	BUL
Canada	Toronto Stock Exchange; TSX Venture	TSE; TSX;
Chile	Santiago Stock Exchange	SGO
China	Shenzhen Stock Exchange; Shanghai Stock Exchange	SHE; SHG
Colombia	Bogota Stock Exchange	BOG
Cyprus	Cyprus Stock Exchange	CYS
Denmark	Copenhagen Stock Exchange	CSE
Egypt	Cairo Stock Exchange	CAI
Finland	Helsinki Stock Exchange	HEL
France	Paris Stock Exchange	PAR
Germany	Frankfurt Stock Exchange; Hamburg Stock Exchange; Munich Stock Exchange	FRA; HAM; MUN
Greece	Athens Stock Exchange	ATH
Hong Kong	Hong Kong Stock Exchange	HKG
Hungary	Budapest Stock Exchange	BUD
India	Bombay Stock Exchange; National India Stock Exchange	BOM; NSE
Indonesia	Indonesia Stock Exchange	IDX
Ireland	Dublin Stock Exchange	DUB
Israel	Tel-Aviv Stock Exchange	TAE
Italy	Milan Stock Exchange	MIL
Japan	Tokyo Stock Exchange; JASDAQ; Osaka Stock Exchange; Nagoya Stock Exchange	TKS; JAS; OSE; NGO
Jordan	Amman Financial Market	AMM
Kazakhstan	Kazakhstan Stock Exchange	KAZ
Kenya	Nairobi Stock Exchange	NAI
Malaysia	Kuala Lumpur Stock Exchange	KLS
Mauritius	Stock Exchange of Mauritius	MAU
Mexico	Mexico Stock Exchange	MEX
Morocco	Casablanca Stock Exchange	CAS
Netherlands	Amsterdam Stock Exchange	AMS
New Zealand	New Zealand Stock Exchange	NZE
Nigeria	Nigerian Stock Exchange	NSA
Norway	Oslo Stock Exchange	OSL
Oman	Muscat Securities Market	MUS
Pakistan	Pakistan Stock Exchange	KAR
Peru	Lima Stock Exchange	LIM
Philippines	Philippine Stock Exchange	PHS
Poland	Warsaw Stock Exchange; Warsaw Continuous Stock Exchange	WAR; WAS
Portugal	Euronext.liffe Lisbon Stock Exchange	LIS
Romania	Bucharest Stock Exchange; RASDAQ;	BSE; RAS
Russian Federation	Micex Stock Exchange; Russian Trading System	MIS; RTS
Saudi Arabia	Riyadh Stock Exchange	XRY

Singapore	Stock Exchange of Singapore; Singapore Catalist Market	SES; XSS
Slovenia	Bratislava Stock Exchange; Ljubljana Stock Exchange	BRA; LJU
South Africa	Johannesburg Stock Exchange	JSE
Spain	Madrid Stock Exchange	MAD
Sri Lanka	Colombo Stock Exchange	COL
Sweden	Spotlight Stock Market; Stockholm Stock Exchange; Nordic Growth Market	AKT; OME; NGM
Switzerland	Six Swiss Exchange	SWX
Taiwan (China)	Taiwan Stock Exchange; Taiwan OTC	TAI; XTO
Thailand	Stock Exchange of Thailand	BKK
Tunisia	Tunis Stock Exchange	TUN
Turkey	Istanbul Stock Exchange	IST
Ukraine	PFTS Stock Exchange	PFT
United Arab Emirates	Abu Dhabi Stock Exchange; Dubai Financial Market	ADS; DFM
United Kingdom	Aquis Stock Exchange; London Stock Exchange	AQS; LON
United States	New York Stock Exchange; NASDAQ; NYSE Market	NYS; NAS
Vietnam	Hanoi Stock Exchange; Ho Chi Minh Stock Exchange	HST; XHC

This table reports the major exchanges used in step SS6 in OA table OA1. The table includes countries that are not included in our final sample.

Online Appendix B: Additional Tables

OA TABLE B1

Overview of Mandatory ESG Disclosure Regulations

Country/Region	Mandatory ESG disclosure year	Disclosure venue	Regulation	Issuing institution
Argentina	2008	Sustainability Reports	Ley N 2594 de balance de responsabilidad social y ambiental	Buenos Aires City Council
Australia	2003	Annual Report	Listing Rule 4.10.3, Australian Stock Exchange	Australian Stock Exchange
Austria	2016	Management Report; Non-Financial Report	Transposition of EU NFR Directive: Sustainability and Diversity Improvement Act 257/ME	Ministry of Justice
Belgium	2009	Annual Report	The 2009 Belgian Code on Corporate Governance	Corporate Governance Committee
Bulgaria	2016	Annual Report	Transposition of EU NFR Directive	Governments
Canada	2004	Data Disclosure	The TSX Timely Disclosure Policy	Stock Exchange
Chile	2015	Annual Report	Norma de Caracter General N 385/386	Superintendencia de valores y seguros
China	2008	Annual Social Responsibility Report	Guidelines on Listed Companies' Environmental Information Disclosure	Shanghai Stock Exchange (SSE)
Cyprus	2016	Annual Report	Transposition of EU NFR Directive	Governments
Denmark	2016	Annual Report	Transposition of EU NFR Directive: Executive order No. 558	Governments (Danish Business Authority)
Finland	2016	Annual Report	Transposition of EU NFR Directive: HE 208/2016 Government proposal to Parliament for Amendments to Accounting Act and certain related Acts	Governments (Ministry of Economic Affairs and Employment)
France	2001	Annual Report	New Economic Regulations Act (NRE)	Parliament
Germany	2016	Annual Report	Transposition of EU NFR Directive: CSR Directive Implementation Act	Governments (Ministry of Justice and Consumer Affairs)
Greece	2006	Annual Report	Law 3487, 2006	Parliament
Hong Kong	2015	Directors' Report, ESG Report	HKEX Listing Rules Disclosure of Financial Information	Hong Kong Stock Exchange
Hungary	2016	Annual Report	Transposition of EU NFR Directive: Amendments to Accounting Act C of 2000	Governments (Ministry of National Economy, accounting and supervision)
India	2015	Sustainability Report	Circular No. CIR/CFD/CMD/10/2015 Format for Business Responsibility Report	Securities and Exchange Board of India (SEBI)
Indonesia	2012	Annual Report	Rule No.KEP-431/BL/2012 concerning the obligation to submit annual reports for issuers of public companies	Capital Market and Financial Institutions Supervisory Agency (Bapepam-LK)

Ireland	2016	Non-financial Statement, Director Report	Transposition of EU NFR Directive (1)	Governments (Department of Jobs, Enterprise and Innovation)
Italy	2016	Management Report	Transposition of EU NFR Directive: legislative Decree 30 December 2016, n.254	Ministry of Economic Affairs
Malaysia	2007	Annual Report	Main Markets listing requirements CSR description	Bursa Malaysia Securities Berhad
Malta	2016	Annual Report	Transposition of EU NFR Directive	Government (Ministry of Finance)
Netherlands	2016	Annual Management Report	Transposition of EU NFR Directive	Ministry of Security and Justice
Norway	2013	Annual and Sustainability Reports	Act amending the Norwegian Accounting Act	Norwegian Parliament
Pakistan	2009	Directors' Report	Companies (Corporate Social Responsibility) general order	Securities and Exchange Commission of Pakistan
Peru	2015	Sustainability Reports	Resolucion SMV No 033-2015-SMV/01	Peruvian Capital Markets Superintendency
Philippines	2011	Annual Report	Corporate Social Responsibility Act, 2011	Committee on Trade and Commerce
Poland	2016	Annual Report	Transposition of EU NFR Directive: Amendments to the Accounting Act	Governments
Portugal	2010	Annual Report	The Financial Reporting Accounting Standard n 26	Commission for Accounting Normalization
Romania	2016	Directive Report	Transposition of EU NFR Directive: Act No 1938 as "Order regarding changes and additions to existing accounting regulations"	Governments (Ministry of Public Finance)
Singapore	2016	Sustainability Reports	SGX0ST Listing Rules Practice Note 7.6 Amendments to sustainability reporting guide	Singapore Stock Exchange (SGX)
Slovenia	2017	Annual Reports	Transposition of EU NFR Directive: Amending the Companies Act	Governments
South Africa	2010	Integrated/Sustainability Report	Johannesburg Stock Exchange Listing Requirement 2010	Johannesburg Stock Exchange (JSE)
Spain	2012	Annual Report/Sustainability Report	Spanish Sustainable Economy Law (revision of 2011)	The National Securities Market (CNVM)
Sweden	2016	Annual Report, Sustainability Report	Transposition of EU NFR Directive: Corporate sustainability reporting and diversity policy	Governments (Ministry of Industries and Innovation)
Taiwan (China)	2019	Sustainability Reports	Taiwan Stock Exchange Corporation Rules Governing the Preparation and Filing of Corporate Social Responsibility Reports by TWSE Listed Companies	Taiwan Stock Exchange (TWSE)
Turkey	2014	GHG Report/Annual Report	GHG Monitoring Regulation/Communique on corporate governance principles	Capital Markets Board of Turkey
United Kingdom	2013	Strategic Report; Director's Report	The companies Act 2006 Regulations 2013	Secretary of State

This table reports information on the mandatory ESG disclosure regulations across 38 countries that introduced such disclosure mandates.

OA TABLE B2

Mandatory ESG Disclosure and Stock Liquidity: Robustness

	<i>Illiquidity Factor_{i,c,t+1}</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Mandatory ESG Disclosure_{c,t}</i>	-0.132*** (0.007)	-0.099*** (0.009)	-0.114*** (0.008)	-0.085*** (0.019)	-0.085*** (0.028)	-0.085*** (0.007)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year fixed effects	No	No	Yes	Yes	Yes	Yes
Firm fixed effects	No	No	Yes	Yes	Yes	Yes
Industry × country fixed effects	Yes	Yes	No	No	No	No
Time trend (squared) × country fixed effects	No	Yes	No	No	No	No
Standard error clustering	Firm	Firm	Firm	Country-year	Country	Industry-year
			Exclude US, Japan, UK, Korea (South)			
Sample	All countries	All countries		All countries	All countries	All countries
# Observations	139833	139833	74237	136269	136269	136269
# Unique firms	21244	21244	9861	17680	17680	17822
% Never-treated firms	43%	43%	12%	44%	44%	44%
# Countries	65	65	61	65	65	65
Adj. R-squared	0.738	0.746	0.872	0.897	0.897	0.897

This table reports regressions at the firm-year level to investigate the impact of mandatory ESG disclosure on stock liquidity. We use the following dependent variable: *Illiquidity Factor_{i,c,t+1}* is an aggregate illiquidity factor constructed as the score of a single factor extracted from the three liquidity measures *Bid-Ask Spread_{i,c,t+1}*, *Price Impact_{i,c,t+1}*, and *Zero Return_{i,c,t+1}*. We use the following key independent variable: *Mandatory ESG Disclosure_{c,t}* equals one starting from the first year in which a country introduced mandatory ESG disclosure, and zero otherwise. The sample consists of firm-year observations from 65 countries between 2002 and 2020 (unless indicated differently). Data Appendix A defines all variables. Standard errors, reported in parentheses, are clustered at the firm level (unless indicated differently). *, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.

REFERENCES

- AMIHUD, Y; A. HAMEED; W. KANG; AND H. ZHANG. “The Illiquidity Premium: International Evidence” *Journal of Financial Economics* 117 (2015) 350–368.
- CAMPBELL, C; A. COWAN; AND V. SALOTTI. “Multi-Country Event-Study Methods” *Journal of Banking & Finance* 34 (2010): 3078–3090.
- GRIFFIN, J.; P. KELLY; AND F. NARDARI. “Do Market Efficiency Measures Yield Correct Inferences? A Comparison of Developed and Emerging Markets” *Review of Financial Studies* 23 (2010): 3225–3277.
- INCE O.; AND R. PORTER. “Individual Equity Return Data from Thomson Datastream: Handle with Care!” *The Journal of Financial Research* 29 (2006): 463–479.
- LEE K. “The World Price of Liquidity Risk” *Journal of Financial Economics* 99 (2011): 136–161.
- SCHMIDT P.; U. ARX; A. SCHRIMPF; A. WAGNER; AND A. ZIEGLER; “Common Risk Factors in International Stock Markets” *Financial Markets and Portfolio Management* 33 (2019): 21–241.

Swiss Finance Institute

Swiss Finance Institute (SFI) is the national center for fundamental research, doctoral training, knowledge exchange, and continuing education in the fields of banking and finance. SFI's mission is to grow knowledge capital for the Swiss financial marketplace. Created in 2006 as a public-private partnership, SFI is a common initiative of the Swiss finance industry, leading Swiss universities, and the Swiss Confederation.

about ECGI

The European Corporate Governance Institute has been established to improve *corporate governance through fostering independent scientific research and related activities*.

The ECGI will produce and disseminate high quality research while remaining close to the concerns and interests of corporate, financial and public policy makers. It will draw on the expertise of scholars from numerous countries and bring together a critical mass of expertise and interest to bear on this important subject.

The views expressed in this working paper are those of the authors, not those of the ECGI or its members.

ECGI Working Paper Series in Finance

Editorial Board

Editor	Nadya Malenko, Professor of Finance, Boston College
Consulting Editors	Renée Adams, Professor of Finance, University of Oxford Franklin Allen, Nippon Life Professor of Finance, Professor of Economics, The Wharton School of the University of Pennsylvania Julian Franks, Professor of Finance, London Business School Mireia Giné, Associate Professor, IESE Business School Marco Pagano, Professor of Economics, Facoltà di Economia Università di Napoli Federico II
Editorial Assistant	Asif Malik, Working Paper Series Manager

Electronic Access to the Working Paper Series

The full set of ECGI working papers can be accessed through the Institute's Web-site (www.ecgi.global/content/working-papers) or SSRN:

Finance Paper Series	http://www.ssrn.com/link/ECGI-Fin.html
Law Paper Series	http://www.ssrn.com/link/ECGI-Law.html