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ESG Disclosures in the Private Equity Industry

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ABSTRACT

This paper offers the first systematic evidence on environmental, social, and governance (ESG) disclosures provided by a large global sample of private

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equity (PE) firms. Using historical websites from 2000 to 2022, we develop and validate a novel dictionary-based measure of voluntary PE firm ESG disclosures. Descriptive statistics reveal an increasing time trend in these disclosures, with social topics becoming as important as environmental topics recently. Multivariate analyses show that the demand for ESG information from fund investors is a significant determinant of PE firms' ESG disclosures. Leveraging data on PE firms' portfolio companies, we document that more PE firm ESG disclosures are associated with better ESG outcomes at the portfolio company level, suggesting that voluntary ESG disclosures align with real actions for the average PE firm.

JEL codes: G12, G32, G34, M41

Keywords: private equity; financial reporting; ESG disclosures; voluntary disclosures; ESG investing; sustainable investment

1. Introduction

Whether companies operate sustainably and how investors can learn about sustainability outcomes to make informed capital allocation decisions are first-order economic questions. These questions have also become increasingly important in the private equity (PE) industry, which currently manages more than $7.6tn in global investor capital (McKinsey [2023]). Beyond its economic relevance as an alternative asset market, the PE industry has unique features that motivate our study. First, PE firms manage capital on behalf of investors, or limited partners (LPs), that have become increasingly focused on sustainability aspects. Second, in contrast to other investment firms, PE firms hold significant equity stakes in portfolio companies and can thereby directly influence sustainability outcomes. Third, PE firms are typically not mandated to make detailed financial or sustainability disclosures, and their portfolio companies usually provide little public disclosures, except for limited mandatory financial statements if they are based in Europe (Weitzman [2023]).[1] We study whether PE firms provide environmental, social, and governance (ESG) disclosures in response to the information needs of LPs and whether these disclosures align with ESG outcomes of PE firms' portfolio companies. To do so, we create a novel and representative data set on PE firms' voluntary ESG disclosures collected from the firms' websites over a period of 20 years.

Our first research question investigates whether PE fund investors' (LPs') preference for sustainable investments influence PE firms' voluntary ESG disclosures. Ex-ante, it is unclear if LPs incentivize PE firms to provide

[1] As PE firms raise capital only from a sophisticated set of institutional and high net-worth individual investors, regulators like the SEC traditionally did not think it was necessary to impose a public disclosure mandate. This view is, however, changing. For instance, in a recent 2022 speech at the University of Chicago, SEC commissioner Caroline Crenshaw argued that private firms, especially those backed by PE funds, should provide disclosures, in line with their public peers to protect investors in the funds (SEC [2022]).

voluntary public ESG disclosures because the role of an LP is unique and understudied. In contrast to institutional investors who demand climate-related information from publicly listed firms (e.g., Cohen, Kadach, and Ormazabal [2023a]), LPs have access to robust private communication channels with PE firm managers, potentially limiting the need for public voluntary ESG disclosures (see appendix B).[2]

However, several reasons could explain why PE firms may provide voluntary public ESG disclosures in the context of their relationship with LPs. First, in the early screening phase, not all LPs have access to private communications and struggle to select PE managers in a large market with thousands of firms. Thus, PE firms' public voluntary disclosures of ESG activities can reduce economically relevant adverse selection costs given that over 70% of the LPs, representing nearly 76% of current PE assets under management (AUM), adhere to investment policies with an ESG approach (Bain & Company, ILPA [2022]). Second, voluntary ESG disclosures can serve as a commitment device for PE firms, potentially reducing reputational hazard, political intervention, regulatory oversight, or legal risk for any unexpected breaches.[3] This commitment is likely critical in our setting as PE firms predominantly manage closed-ended funds that lock LPs' capital for 10 years or more. Additionally, LPs such as pension funds, university endowments, or government investment agencies need to cater to their own stakeholders who often have ESG objectives. These stakeholders benefit from public disclosures that allow them to verify that their capital ultimately flows to high ESG performing investments. LPs face challenges in providing this verification because they are restricted from sharing their private communications with PE firms. Finally, PE firms might disclose ESG information publicly as a strategy to lower the costs associated with privately reporting to a diverse group of individual LPs, each potentially requiring different ESG reports with varying frequencies.

Our second research question arises naturally as it is key to ascertain the informativeness of ESG voluntary disclosures to their recipients. Therefore, we ask if PE firms' ESG disclosures align with the ESG outcomes of their

[2] This institutional aspect stands in contrast to the public equity setting where public reporting mandates for financial and often also ESG-related disclosures exist *and* differential private reporting amongst investor classes is often explicitly restricted (e.g., Regulation FD in the United States). Although the overwhelming majority of PE firms are private entities, a small subset of very large PE firms is listed on stock exchanges. As we discuss in section 4.4, we show evidence that their public listing status does not affect our inferences.

[3] Kreutzer [2011], Amel-Zadeh and Serafeim [2018], Cohen, Kadach, and Ormazabal [2023a], or Bourveau et al. [2023] provide such evidence on public firms. Regulatory pressure on PE firms has emerged recently. The European Union's (EU) Sustainable Finance Disclosure Regulation (SFDR) from March 2021 requires PE firms in the EU to provide sustainability risk disclosures to their investors and more publicly on their websites. Similarly, in May 2022, the Securities and Exchange Commission (SEC) issued proposed rules that require PE firms employing ESG strategies to report additional information about those strategies to the SEC and to provide more details to their investors (Investment Advisers Act of 1940).

portfolio companies. Studying whether PE firms' ESG disclosures accurately reflect tangible ESG results of their portfolio companies is important given PE firms' influence on portfolio companies' operations and the ambiguous evidence from the prior literature regarding the potential for greenwashing (see, e.g., Delmas and Burbano [2011], Li and Wu [2020], Dikolli et al. [2022], Raghunandan and Rajgopal [2022], Wang [2023], Cohen, Kadach, and Ormazabal [2023a]).[4] Voluntary disclosure theory (Verrecchia [1983], Dye [1985]) would suggest that PE firms with superior ESG outcomes will offer more ESG disclosures to differentiate from average or inferior firms. In our specific setting, one might further expect that ESG disclosures align with investment outcomes as the reputational costs of greenwashing are likely high given PE firms' repeated interactions with large LPs across fundraising rounds. In contrast, sociopolitical theories (e.g., Patten [2002]) would predict that PE firms with poor ESG performance might increase ESG disclosures in response to societal and political pressures. This could be a PE firm strategy to manage perceptions and draw in capital from sustainability-conscious LPs, especially when PE firms are criticized for investing in environmentally detrimental assets that generate high financial returns (Economist [2022]).

To measure PE firms' ESG disclosures, we use 5,468 global PE firms from the Preqin fund-manager database and source data from the firms' historical websites in English through the Wayback Machine over the period 2000–2022, consistent with the approach in Boulland, Bourveau, and Breuer [2024]. Absent a public disclosure mandate, PE firms' websites are the most comprehensive public source of information on the objectives, strategies, activities, and achievements of PE firms. Importantly, the Internet archive allows us to observe ESG disclosures across a representative, global panel of PE firms. We construct an annual PE firm ESG disclosure measure by scaling the number of ESG-related keywords mentioned on a PE firm's historical website by the total website word count.[5] We use a dictionary sourced from the United Nations Principles of Responsible Investing (UN PRI) Reporting Framework glossary, industry associations, and trade bodies that allows us to separately capture ESG-related topics. On average, we observe 33 ESG-related words per 10,000 total words on a PE firm's website. We validate our ESG disclosure measure by showing its strong correlation with the PE firms' public commitments to sustainable

[4] Greenwashing is the practice of companies making misleading or unsubstantiated claims about the environmental benefits of their products, services, or activities, thereby creating a false impression of environmental responsibility.

[5] Boulland et al. [2021] create a novel website disclosure measure for public firms using the Wayback Machine. Our use of website disclosures also shares the motivation of other papers that use online media to study timely firm disclosures (e.g., Blankespoor, Miller, and White [2014], Blankespoor [2018], and Jung et al. [2017]). Consistent with the view in this related work, we consider website information a nontraditional form of voluntary disclosure, which can complement traditional financial disclosures (which are private for PE firms) but also reflect firms' decision to talk about a wide array of activities.

investments when signing up to the UN PRI and with cross-sectional and time-series evaluations of website ESG content using ChatGPT's Large Language Model (LLM).

Before testing our research questions, we explore variation in our new measure and document a strong rise in PE firms' ESG disclosures over the past two decades. Although the general disclosure content on PE firm websites has expanded, the relative importance of ESG has increased steadily, particularly when benchmarked against financial value creation terms, which were dominant before the 2008/09 Financial Crisis. PE firms receiving capital from LPs based in regions with more ESG-related policies, like the United Kingdom and the European Union, and PE firms with investments in eco-sensitive industries disclose more ESG information. Notably, PE firms with a greater footprint in industries with high environmental risks have considerably increased ESG disclosures recently, possibly to address sustainability concerns. We finally show that U.S.-based PE firms increased ESG disclosures significantly post–Financial Crisis, whereas U.S.-based hedge funds' disclosures remained stable, pointing at the distinct nature of PE firm ESG disclosures.

We conduct three sets of tests to examine our first research question on the role of LPs in PE firms' ESG disclosures decisions. First, we exploit variation in LPs becoming signatories to the UN PRI as a proxy for LPs' increased ESG information demand. Using a stacked cohort difference-in-differences design, we document that PE firms' ESG disclosures increase by approximately 9% after UN PRI–committed LPs invest in a PE firm's funds. This result is consistent with PE firms increasing their ESG disclosures to appeal to ESG-committed LPs, or LPs gravitating towards PE firms that prioritize sustainable investments and thus increase ESG disclosures. Second, we examine the exposure of PE firms to LPs that are headquartered in jurisdictions with mandatory sustainability disclosure regulations for publicly listed firms. The intuition is that LPs are often also institutional investors in public markets and therefore used to receiving detailed ESG disclosures prescribed by mandatory regulations in their home jurisdictions. Consequently, PE firms might enhance their ESG disclosures to meet these LPs' information needs and to compete more effectively with public firms for capital. Consistent with this prediction, we find that ESG disclosures increase if a PE firm's fund share of LPs from mandatory sustainability disclosure regulation countries increases. Third, we focus on periods when PE firms raise capital from LPs. We document abnormally high ESG disclosures in the years leading up to large fundraising events, with a peak in the fundraising year. Our results also show that a doubling of ESG disclosures is associated with a 15% faster fundraise (approximately an additional $100 million in capital every six months) and a significantly higher likelihood of a UN PRI–committed LP investing in a fund. Collectively, these findings suggest that the LP-driven ESG-information demand is a strong driver for PE firms' website-based ESG disclosures.

To test our second research question, we merge several data sets on ESG outcomes at the portfolio company level to our PE firm-level data set. We then conduct triple-differences analyses comparing changes in ESG outcomes within portfolio companies acquired by PE firms with high versus low ESG disclosures. For environmental outcomes, we merge chemical release information from the U.S. Environmental Protection Agency (EPA)'s Toxic Release Inventory (TRI) and CO_2 emission proxies from S&P Global's Trucost data to our PE firms' portfolio companies. Results indicate that chemical releases and emissions of portfolio companies decrease by 12% to 26% after buyouts by PE firms with high environmental disclosures, compared to those of companies acquired by PE firms with lower environmental disclosures. In fact, emissions remain unchanged when the acquiring PE firms provide relatively few environmental disclosures.

We also study social and governance outcomes. For social outcomes, we leverage U.S. Department of Labor's OSHA data set on workplace safety. We document that companies experience a significant drop in safety inspections due to complaints following investments by PE firms with more comprehensive social topic disclosures. To assess overall ESG risk management—a governance-centric metric (Burke, Hoitash, and Hoitash [2019])—we rely on ESG-related reputational risk information from RepRisk. Results suggest that portfolio companies experience a 14% reduction in ESG-related reputational risks after investments by PE firms with high ESG disclosures, compared to companies acquired by PE firms with fewer ESG disclosures. Overall, our findings indicate that PE firms provide ESG voluntary disclosures that are consistent with the ESG performance of their portfolio companies.

Our study contributes to the corporate sustainability literature by providing systematic empirical insights into the ESG disclosures of a representative and international sample of PE firms. We introduce a novel, transparent, and intuitive measure of voluntary ESG-related website disclosures. Our measure is particularly useful in the PE setting as PE firms mostly operate without mandatory reporting requirements and their investors often rely on private information channels. Also, a representative panel of ESG ratings for PE firms from commercial providers does not exist. By showing that fund investors (LPs) as clients and key stakeholders are an important driver of PE firms' voluntary ESG disclosures and that these disclosures are positively associated with ESG performance, we expand the body of work that has so far been limited to publicly listed firms and the role of mandatory ESG regulations (e.g., Darendeli et al. [2022], Fiechter, Hitz, and Lehmann [2022], Rajgopal and Tantri [2022], Wang [2023], Cohen, Kadach, and Ormazabal [2023a], Krueger et al. [2024]).

By doing so, we also inform several debates specific to ESG issues in the PE industry. Eccles et al. [2022] provide insights from interviews with PE firm managers claiming that their unique role as majority investors facilitates positive ESG outcomes for their portfolio firms. The analysis in Balakumar and Whelan [2023] suggests that PE firms can live up to

these claims due to their significant control over portfolio companies as well as their expertise in performance measurement and operational improvements. However, survey evidence and recent market statistics suggest that sustainability investments may not be a genuine focus among most PE firms and could constitute a short-term trend (Eccles et al. [2022], Day [2024]). Our large-sample analyses suggest that there has been a steady increase in PE firms' sustainability focus in the past two decades, which is likely driven by the demand of PE firms' investors. Or findings also suggest that such focus potentially benefits the broader stakeholder community through realized ESG outcomes.

By documenting discretionary disclosure patterns on corporate websites, we also contribute to the accounting literature on private firms whose disclosures are still not well understood and where the focus has been on investigating financial reporting quality in the context of mandatory versus voluntary reporting (e.g., Minnis and Shroff [2017], Bernard, Burgstahler, and Kaya [2018], Lisowsky and Minnis [2020], Aghamolla and Thakor [2022], Breuer, Hombach, and Müller [2023]). In particular, we add to the concurrent work by Campbell et al. [2024], who find that environmental disclosures with a negative tone in SEC-mandated fillings (Form ADV) submitted by PE firms are negatively associated with fundraising.[6]

Finally, we contribute to the literature on the impact of PE ownership for stakeholders like portfolio company customers, employees, or local governments (e.g., Davis et al. [2014, 2021], Antoni, Maug, and Obernberger [2019], Eaton, Howell, and Yannelis [2020], Olbert and Severin [2023], Sorensen and Yasuda [2023]). Our analysis builds on Bellon [2024], who studies PE buyouts in the U.S. Oil & Gas sector and shows that PE firms reduce portfolio companies' pollution only if liability risks provide strong financial incentives to do so. We document improved portfolio company environmental but also social and governance performance when these companies receive investments from PE firms that provide more public ESG disclosures, suggesting a strong alignment between ESG disclosures and outcomes. Our findings can thus inform regulators who are concerned about PE firms' lack of transparency and are considering ESG disclosure rules to address potential greenwashing.

[6] Campbell et al. [2024] study a significantly smaller sample of 773 U.S. registered PE firms and focus on annual regulatory filings that likely cover ESG risk discussions (as opposed to ESG initiatives and their outcomes that are disclosed on websites). In addition, Campbell et al. [2024] focus on the association between ESG disclosures and fundraising outcomes whereas our main analysis examines LPs' demand for ESG disclosures and the alignment of these disclosures with ESG activities in portfolio companies. Crifo and Forget [2013] also offer some initial survey evidence based on a sample of 72 French PE firms and find that large PE firms have developed a strong focus on ESG issues, largely driven by their investors' demand. Crifo, Forget, and Teyssier [2015] provide experimental evidence suggesting that PE fund managers respond to ESG disclosures of their potential target portfolio companies.

2. *Institutional Background and Economic Framework*

PE firms are investment management entities primarily engaged in raising and administering PE funds, which are invested in nonlisted companies, often referred to as portfolio companies. The global PE fund industry has grown its AUM by approximately 10% annually over the past decade, with projections that AUM could reach nearly $10tn by 2025 (Economist [2020], Preqin [2022]). From 2011 onwards, PE firms have consistently raised more capital annually than public firms through IPOs. For instance, PE firms secured $800bn in 2022, whereas annual IPO capital has hovered around $200bn each year (see figure 1 and Minnis [2022]).

Appendix B visualizes the main players in the PE setting as well as the economic flows and information transfers. A key stakeholder of PE firms is the investor who contributes capital to PE funds. These investors are referred to as limited partners (LPs) because they do not participate in the day-to-day management or investment decisions of the fund. However, LPs negotiate information rights with PE fund managers, which usually give LPs access to quarterly private disclosures of a fund's financial statements, portfolio company valuations, investment activities, fund fees and capital calls, conflicts of interest-related and other material information. Without these rights, LPs would not receive regular information from managers given that PE firms (except those that are listed) are not mandated to disclose publicly their financial performance.

Prior to investing in a PE fund and receiving access to these private disclosures, prospective LPs likely examine PE firms' website disclosures as part of their initial due diligence (Bain & Co. [2022]). This preliminary evaluation typically occurs before LPs commit substantial resources to evaluate a PE fund manager in depth, a necessary and effort-intensive step before any fund investment.[7] As part of this assessment, it is now standard for prospective investors to scrutinize not only a PE firm's investment strategies, operations, regulatory compliance, and track record, but also its ESG approach.[8] As PE firms typically raise new funds every three to five years, prospective LPs' evaluation is an ongoing exercise.

Over the past decades, LPs' and other outsider stakeholders' demand for ESG initiatives in PE funds has increased substantially, reflecting a general trend in the investment community (e.g., Natixis [2021]). Several factors drive this demand (and the supply) for PE firms' ESG disclosures, which are distinct from other financial and nonfinancial disclosures in the PE and other settings for several reasons. First, LPs increasingly

[7] The Institutional LPs Association, the industry body representing investors in PE funds, offers guidelines for investors conducting due diligence. These guidelines include reviewing publicly accessible information about the fund manager, a process which involves examining the fund manager's website (https://ilpa.org/due-diligence-questionnaire/).

[8] See the list of ESG related due diligence questions stipulated by the UN PRI (UN PRI [2021]).

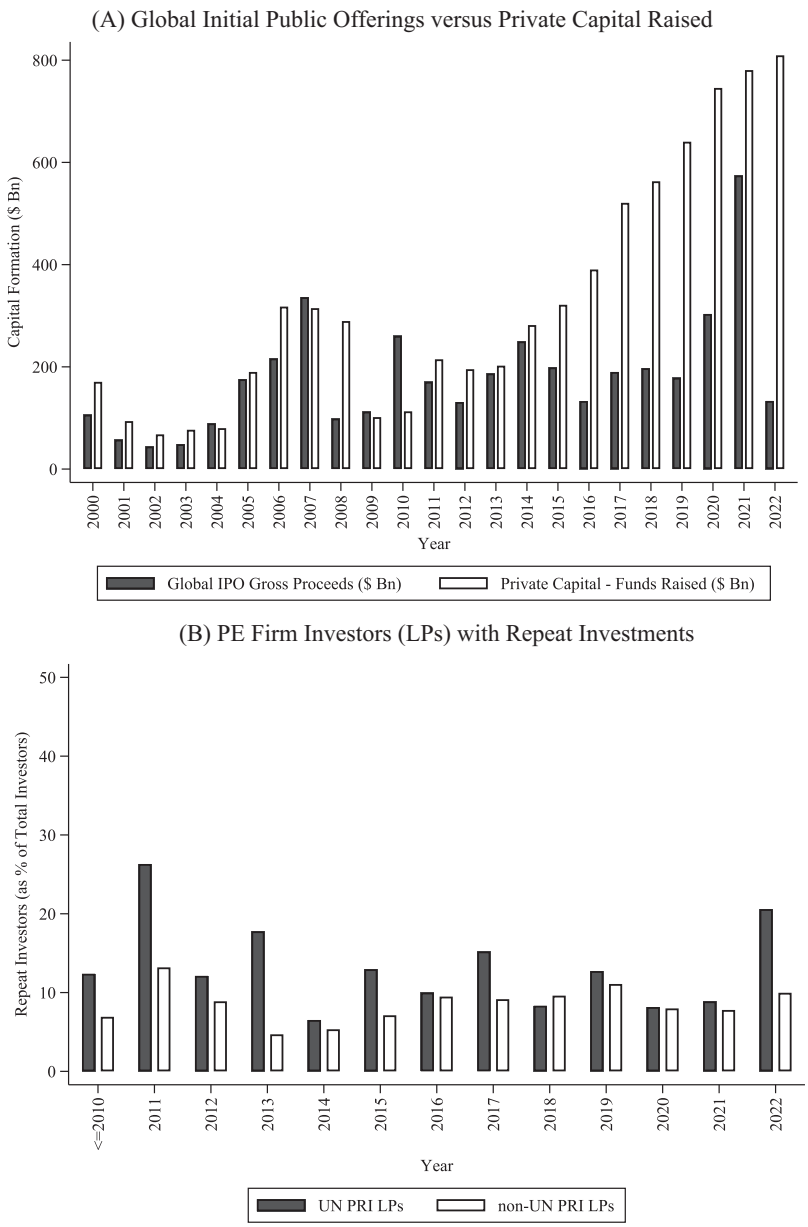

FIG. 1.—PE assets under management (AUM) and investors (LPs). Panel A of this figure shows the total U.S. dollar value of the gross proceeds from initial public offerings (IPOs, filled bars) and the private capital raised by PE firms (empty bars) around the world. IPO gross proceeds are obtained from Capital IQ (vintage: April 25, 2023). Private capital funds raised are from Preqin (excluding secondaries, coinvestment, and fund of funds). Panel B presents the percentage of total investors that are repeat investors separately for UN PRI LPs and non–UN PRI LPs. An LP is defined as a repeat investor for a particular GP in a year if it has invested in any fund of the GP in any prior year. An average PE firm has around 20 unique LPs that invest in its funds.

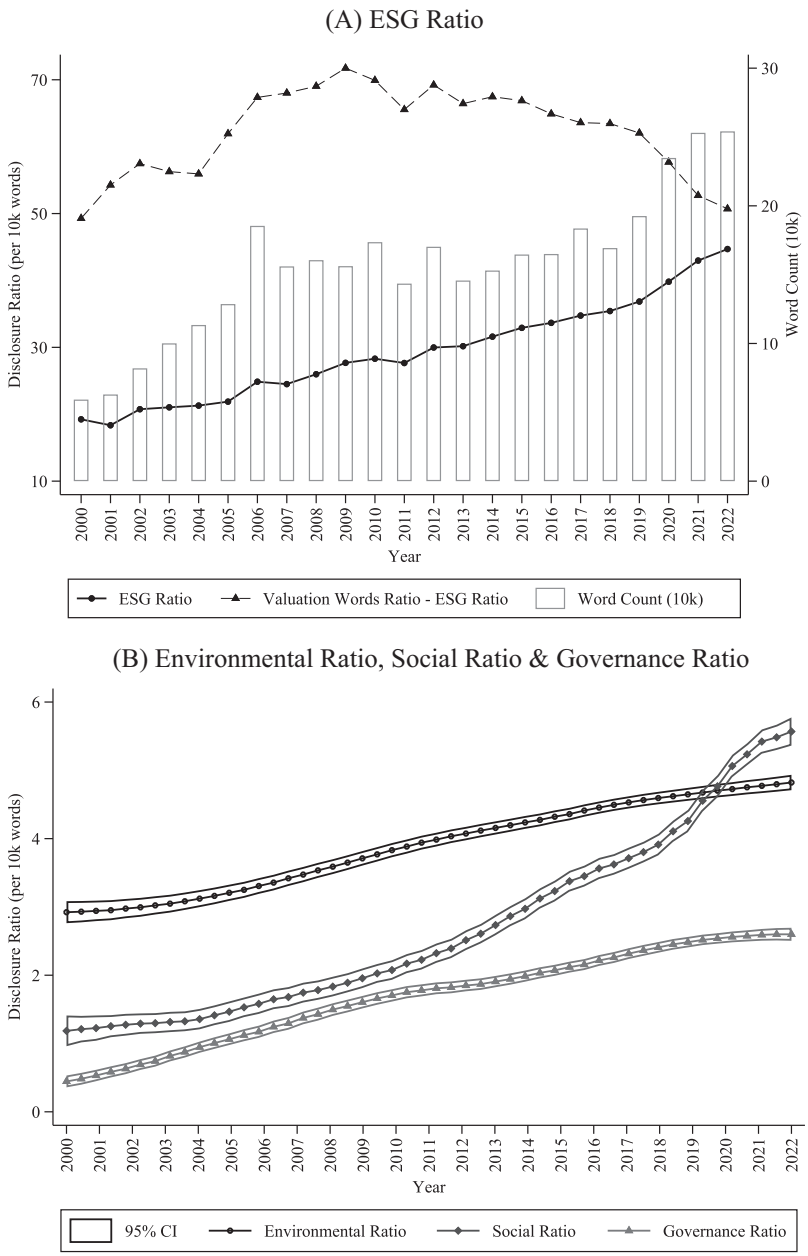

FIG. 2.—Evolution of PE firms' ESG disclosures from 2000 to 2022. This figure shows the evolution of PE firms' ESG disclosures on their websites from 2000 to 2022. We provide variable definitions in appendix A. Panel A shows different lines for the average annual *ESG Ratio* and the difference between *Valuation Words Ratio* and *ESG Ratio*. Panel A also shows bars for the average total website word count (in 10k words). Panel B plots the average values, together with the 95% confidence intervals, separately for *Environmental Ratio*, *Social Ratio*, and *Governance Ratio* using a local polynomial smooth function (number of PE firms: 5,468; number of observations: 54,068).

recognize that good ESG practices can enhance the value of a portfolio company through operational efficiencies and revenue growth. Operationally, for example, enhancing energy efficiency (an environmental issue) can reduce costs, treating employees well (a social issue) can help attract talent, improve retention and boost productivity, and having a diverse and independent board of directors (a governance issue) can augment decision-making. Financially, strong ESG practices may foster a positive reputation among customers, aiding in their attraction and retention. Second, ESG factors can present significant financial, reputational, regulatory, and legal risks if not properly managed (see global LP survey provided by Coller Capital [2022]). These risks and the increasing societal focus on ESG suggest that LP investors but also regulators, banks, and many other stakeholders are likely interested in PE firms' ESG activities. These other stakeholders include LPs' own stakeholders (e.g., pensioners, university staff) who care about ESG, government agencies who need to meet ESG mandates, employees of current and potential portfolio companies who want to understand the investment approach of the PE fund, buyers and sellers of companies who perform due diligence before transacting with a PE fund manager, or service providers who worry about risks when supporting PE transactions. Websites provide a unique channel that allows PE firms to provide ESG disclosures to these stakeholders, in real time and at a low cost. Beyond ESG information, websites also include details about the PE firm itself, its investment philosophy and strategy, core values and vision, profiles of team members, details about portfolio companies, governance structures, or other regulatory disclosures.[9] In contrast to publicly listed firms, nonlisted PE firms do not provide financial information on their websites to avoid a loss of their competitive advantages and to avoid violating agreements with their investors who prefer exclusivity over that information.

Whether PE firms' voluntary public ESG disclosures are a function of LPs' information demand is an open empirical question. PE firms may prefer direct private communications with LPs over public ESG website disclosures to avoid the risk of making public claims that could lead to legal action and public scrutiny or to inform competition, disregarding the demand from other stakeholders who do not have access to these communications. Further, PE firms may face uncertainty about LPs' ESG disclosure

[9] In the United States, most PE fund managers are required to register with the SEC as investment advisers, unless they qualify for an exemption (e.g., they have less than USD 150m in AUM). Registered investment advisers must file Form ADV, which includes information about their business, ownership, clients, employees, business practices, affiliations, fees and compensation, and any disciplinary events. In the European Union, registered fund managers also have to regularly report to national regulators on areas such as the main markets and instruments in which they trade, the principal exposures and most important concentrations of the funds they manage. Our data provider Preqin also sources information from these disclosures. However, the overall regulatory disclosures required of PE fund managers are significantly less extensive than those mandated for publicly listed companies.

expectations as not all may value ESG and LPs' preferences can change over time.

However, the institutional background suggests that PE firms likely cater their voluntary public ESG disclosures to LPs as the central stakeholders who increasingly focus on sustainability (e.g., Kreutzer [2011], Amel-Zadeh and Serafeim [2018], Cohen, Kadach, and Ormazabal [2023a], Berg, Heeb, and Kölbel [2024]). Several arguments predict that PE firms manage their website ESG disclosures in response to LPs' demand. First, publicly available ESG disclosures can reduce adverse selection costs for LPs by facilitating search and screening of PE firms. At an early stage, most LPs do not yet have access to proprietary PE firm investment information and must screen hundreds of PE firms offering investment opportunities. Salient website-based ESG disclosures can effectively reduce the search costs for these LPs. PE firms who disclose information about their ESG strategies and activities can signal their type, aiming to lower the cost of and increase the access to capital (e.g., Diamond and Verrecchia [1991], Breuer, Hombach, and Mueller [2023]). In particular, PE firms compete for capital with public firms that are increasingly providing detailed ESG disclosures and thus need to persuade a growing share of LPs with ESG investment policies (Bain & Company, ILPA [2022]).

Second, ESG disclosures can reduce ongoing monitoring costs for current ESG-focused LPs and the LPs' own stakeholders. Although PE firms can privately share any form of ESG information with LPs, *public* website disclosure of ESG information entails a greater commitment due to the risk of regulatory oversight, political intervention, and reputational damage in case of making unsubstantiated claims. Voluntary public disclosures thus act as a credible binding mechanism, particularly important for LPs who need to invest in long-term closed ended PE funds. These LPs lack the option to withdraw their investment if they are unhappy with the performance of the PE firm (e.g., Talmor and Vasvari [2019]). In addition, ESG public disclosures likely foster trust with the LPs' own stakeholders who would otherwise have limited access to information about the fund manager. LPs are constrained in sharing the private information obtained from PE managers with third parties, including their own stakeholders due to confidentiality agreements and legal and regulatory mandates (e.g., Talmor and Vasvari [2019]). Therefore, LPs' stakeholders—such as pensioners, governments overseeing pension funds and sovereign wealth funds, or directors of other institutional investors—receive assurance directly from PE firms that their investments meet appropriate ESG standards.

Third, voluntary public disclosure of ESG information may reduce disclosure preparation costs for PE firms. A single set of ESG disclosures on their websites can substitute for highly tailored and more frequent disclosures that various LPs might demand in their private communications. Such heterogeneous demands are driven by a lack of clear ESG reporting standards. As PE firms raise more and larger funds, the number of individual LPs is growing and record-keeping costs are thus increasing. For example, the

average PE firm in our sample receives capital from 19 LPs (figure 1B). In addition, LPs likely expect PE firms' portfolio companies to be prepared for the globally evolving landscape of ESG disclosure regulations faced by public firms (e.g., Christensen, Hail, and Leuz [2021]). PE firms' public ESG disclosures can signal such preparedness.

A unique feature of our setting is that, in contrast to asset managers in the public market who typically hold small minority stakes, PE firms control decisions in portfolio companies. This is particularly true for buyout and growth-oriented PE firms that hold significant stakes. Paired with scale of assets managed by these funds, which reached at least $5 trillion by the end of 2023 (Bain & Company [2024]), this governance feature suggests that PE firms could directly shape sustainability outcomes at a large scale globally (Eccles et al. [2022]).

Whether PE firms' voluntary ESG disclosures are informative for recipients in that they align with actual ESG outcomes is unclear. Theory (e.g., Grossman [1981], Milgrom [1981], Verrecchia [1983], Dye [1985]) predicts a positive relationship between discretionary PE firm ESG disclosures and the ESG performance of the PE firms' portfolio companies in the spirit of reducing adverse selection and aiding capital allocation. Superior PE managers should showcase their ESG initiatives to mitigate information asymmetry because the ESG initiatives are difficult for inferior PE firms to imitate. In contrast, inferior PE firms may choose to disclose less or remain silent about their ESG initiatives and performance, thereby being grouped with firms that have an average performance. This partial disclosure equilibrium is sustained by the proprietary costs associated with ESG disclosure (Verrecchia [1983]) and the uncertainty surrounding a PE firm's knowledge of ESG capabilities in the portfolio companies (Dye [1985]). These arguments would suggest that PE firms might not engage in cheap talk or even greenwashing when making public ESG disclosures, particularly because the reputation cost is high as PE firms transact with LPs on a repeated basis (figure 1B).[10]

The positive effect of a commitment to ESG through disclosures might not be of first order, as anecdotal evidence indicates that sustainability strategies have not been a primary focus in PE investments historically (Eccles et al. [2022]). Furthermore, PE firms' ESG disclosures might negatively correlate with portfolio companies' ESG performance. Sociopolitical theories (Patten [2002]) predict a negative relationship between discretionary ESG disclosures and actual ESG outcomes. These theories suggest that social and political pressures would influence ESG disclosure. Specifically, if PE firms anticipate poor ESG outcomes from their investments, they may increase ESG disclosure to manage scrutiny. Such a potential negative association would align with concerns about greenwashing.

[10] Figure 1B shows that 10% to 28% of ESG-oriented LPs have invested in the same PE firm's funds in the past.

3. Data

3.1 PE FIRM DATA

We source our PE firm sample from Preqin's fund-manager database, a market-leading data provider in the alternative asset market. Preqin provides comprehensive information about PE firms, their funds, portfolio companies, and fund metrics such as fundraising, exits, and returns. Preqin assembles the data from regulatory filings, press releases, business media, and website content. We use Preqin's February 2023 release, which covers 23,252 unique PE firms for which the Preqin provides a unique URL and headquarter location (panel A of table 1); 5,598 unique PE firms have websites in English and buyout or growth as their main investment strategy. We focus on these firms given their significant influence over their portfolio companies.

We successfully locate 5,468 PE firm URLs in the Wayback Machine, a digital archive of websites maintained by the Internet Archive since 1996. Consistent with aggregate statistics on the global PE market (Preqin [2022]), most sample firms are incorporated in the United States (51.4%). The next-largest home markets are the United Kingdom, Canada, and China (see the online appendix). Our baseline sample consists of PE firms with data on completed buyout/growth deals, including portfolio companies' names, industries and addresses, as well as deal dates. We obtain data from 69,672 PE deals in the period 2000–2022 for 3,411 unique PE firms to merge data on ESG outcomes at the portfolio company level from the EPA TRI, Trucost, OSHA, and the RepRisk databases (see section 5.1). In some tests, we use LP data, which are available for 7,330 funds linked to 1,815 PE firms and fundraising information that is available for 11,901 funds from 2,304 PE firms.

To address sample selection concerns, we examine whether PE firms with website and deal data differ systematically from the average buyout/growth PE firm. The statistics in panel B of table 1 suggest that the PE firms in our primary sample are, on average, similar to the typical firm in Preqin in terms of AUM, employees, and both geographic and industry diversification, alleviating sample selection bias concerns. Further, our 3,411 main sample firms collectively manage funds of more than USD 2.5tn and thus account for the largest part of worldwide PE activity. We note that our study compares PE firm ESG disclosures conditional on website availability. Thus, our interpretations apply to firms with websites and not necessarily to the few firms not disclosing information online.

3.2 A NOVEL MEASURE OF PE FIRMS' ESG DISCLOSURES

The Wayback Machine allows us to track the evolution of websites over time as it periodically crawls the Internet to archive existing and newly created websites. As Boulland, Bourveau, and Breuer [2024] point out, this mostly text-based website information is invaluable to measure the extent of firms' disclosures (like website size or word count) and to conduct

TABLE 1
Sample Selection and Bias Tests

Panel A	# of Unique PE Firms
(1) Unique PE/VC firms in Preqin with nonmissing website and domicile information	23,252
less PE/VC firms with non-English language website or website Alexa rank ≤ 10,000	3,367
less Firms w/o *Buyout* or *Growth* as main firm strategy	14,287
(2) PE Firms in Preqin	5,598
less PE Firms with missing website data on the Wayback Machine	130
(3) PE Firms with Website Data	5,468
less PE Firms without data on completed Buyout deals for portfolio companies in Preqin	2,057
(4) PE Firms with Buyout deals data	3,411

(*Continued*)

TABLE 1—*(Continued)*

	(1) All PE Firms		(2) w/ Website Data in Internet Archive		(3) PE Firms w/Buyout Data		Std. Differences in Mean		
Panel B	*N*	Mean	*N*	Mean	*N*	Mean	(2) vs. (1)	(3) vs. (1)	(3) vs. (2)
Unit of Obs: PE Firm									
Unique PE Firms	*5,598*		*5,468*		*3,411*				
No. of Employees	4,035	114.0	3,967	108.9	2,744	112.5	0.00	0.00	0.00
Total AUM (USD Bn)	1,611	18.0	1,589	17.2	1,265	20.3	0.00	0.01	0.02
Log. No. of Employees	4,035	2.2	3,967	2.2	2,744	2.4	0.00	0.11	0.10
Log. Total AUM (USD Bn)	1,611	0.2	1,589	0.2	1,265	0.3	0.00	0.05	0.05
Number of Geographies	5,553	1.5	5,424	1.5	3,384	1.6	0.00	0.06	0.06
Number of Industries	5,576	5.3	5,447	5.3	3,407	6.3	0.01	0.18	0.17

This table presents the sample construction steps in panel A and a comparison of sample means constructed in each step in panel B. In panel B, column 1 includes all PE firms (firms with either Buyout or Growth as the main strategy) from Preqin with non-missing websites and headquarter country as indicated in step (2) in panel A. Column 2 includes PE firms with available website data on the Internet Archive as indicated in step (3) in panel A. Column 3 includes the main sample of our analysis as indicated in step (4) in panel A: PE firms with available website data on the Internet Archive *and* with available completed buyout deal data in Preqin. The variation between the different samples is examined using standardized differences. Imbens and Wooldridge [2009] suggest that if standardized differences surpass 0.25, the differences in average sample firm characteristics can affect the sensitivity in linear regression methods.

content-specific analyses. We create an annual time series of these websites from 2000 to 2022 by accessing Wayback Machine's Application Programming Interface (API). When multiple snapshots are available for a year, we choose the most recent one based on the timestamp.

Our algorithm scrapes all URLs of a given PE firm-year snapshot and counts the total words and the ESG-related words, as defined by the UN PRI Reporting Framework's glossary. We define our main measure, the *ESG ratio*, as the number of ESG words per 10,000 words on the website. We provide details on the definition of the ESG ratio in appendix C and showcase an example of our algorithm and the raw data using snapshots of Blackstone's URLs in the online appendix. We use an analogous method to quantify valuation-related words. We list all dictionaries in the online appendix.

Our dictionary-based approach of exploiting websites has several advantages. First, most PE firms are not subject to public disclosure mandates, making websites often the sole source of public information. Thus, our measure is unlikely to suffer from coverage issues. Second, websites are available for a representative and global sample of PE firms, regardless of age, size, or location, resulting in a consistent measure of ESG disclosures over time. Third, using established dictionaries generates measures that separately and objectively capture E, S, and G aspects, which allows for empirical analyses on the specific topics. Fourth, PE firms' website disclosures are likely timely. PE firms' have ongoing interactions with fund investors and stakeholders in portfolio companies who demand timely information and have reputational concerns. Finally, website-based disclosure measures have been shown to be a valid proxy for voluntary disclosures, displaying meaningful cross-sectional and within-firm time-series variation (Boulland, Bourveau, and Breuer [2024]).

3.3 DESCRIPTIVE STATISTICS OF PE FIRMS' ESG DISCLOSURES

Table 2 shows that the mean of our main measure, *Log. ESG Ratio*, for PE firm-years with website and deal data period 2000–2022 is 2.98, or approximately 33 ESG-related words for every 10,000 words on a website. The raw *ESG Ratio* has an unconditional standard deviation of 38 and a within-firm standard deviation of 19 (untabulated). Consistent with Boulland, Bourveau, and Breuer's [20212022] findings, these statistics suggest that our measure exhibits significant cross-sectional and firm-level variation. In tests exploring the sources of this variation, we find that year trends and time-invariant PE firm characteristics explain more than two thirds of the variation (see section 6 for a discussion).

Figure 2, panel A, shows the evolution of PE firms' ESG disclosures (solid line with dots) on their websites from 2000 to 2022. To provide benchmarks, panel A also plots the annual total word counts (bars) and differences between the ESG ratio and the ratio of valuation-related keywords (diamonds with dashed line), which capture common terms around financial value creation. We note that the overall information content on PE

TABLE 2
Summary Statistics

Variable	*N*	Mean	SD	P5	Median	P95
- PE Firm Website Disclosure Variables						
Log. ESG Ratio	37,802	2.98	1.20	0.00	3.15	4.64
Log. Envir. Ratio	37,759	1.09	0.98	0.00	1.07	2.89
Log. Social Ratio	37,869	0.78	0.96	0.00	0.43	2.80
Log. Gov. Ratio	37,517	0.56	0.85	0.00	0.00	2.51
- LP ESG Information Demand Variables						
Post PRI Investor Present	17,222	0.40	0.49	0.00	0.00	1.00
Log. PRI Investors	17,222	0.48	0.71	0.00	0.00	1.95
Log. Wgtd. PRI Investors	17,222	0.32	0.50	0.00	0.00	1.39
LP ESG Reg. Exposure	17,222	1.04	2.16	0.00	0.25	4.50
- Fundraising Outcomes						
USD Mn Raised/6 mo Fundraising	5,328	502.7	1340.0	5.3	121.1	2100.0
Log. USD Mn Raised/6 mo Fundraising	5,328	4.75	1.82	1.67	4.80	7.65
PRI Investor in Fundraise	3,619	25.42	43.55	0.00	0.00	100.00
- Toxic Release Variables from EPA-TRI						
Log. Total Onsite Releases						
(All Chemicals)	361,685	5.73	4.24	0.00	6.22	12.37
(CERCL Act)	340,298	5.56	4.22	0.00	6.05	12.05
(Clean Air Act)	316,833	5.24	4.19	0.00	5.50	11.81
(Safe Drinking Water Act)	303,241	4.60	4.05	0.00	4.16	11.49
(Hazardous Air Pollutant)	309,294	5.30	4.19	0.00	5.53	11.84
(Less Harmful Chemicals)	66,461	5.34	3.92	0.00	5.58	11.44
- Emissions from Trucost						
Log. Scope 1 Emissions	154,469	9.76	3.24	4.47	9.66	15.50
Log. Scope 2 Emissions	154,561	9.64	2.57	5.24	9.76	13.60
Log. Scope 3 Emissions (Upstream)	154,630	11.47	2.47	7.34	11.58	15.32
- Inspections/Violations from OSHA						
Inspections (Count) - Complaints	26,069	0.15	0.45	0.00	0.00	1.00
Inspections (Count) - Planned	27,557	0.20	0.93	0.00	0.00	1.00
Violations (Count)	50,652	0.68	3.16	0.00	0.00	4.00
- ESG Rating/Index from Reprisk						
Reprisk Index	3,534,343	2.11	6.11	0.00	0.00	19.00
Reprisk Rating	3,534,343	3.70	2.02	1.00	3.00	8.00
- Validation Variable						
Post UN PRI Pledge (PE Firm)	17,222	0.04	0.20	0.00	0.00	0.00
- Control Variables						
Log. Positive Words Ratio	37,781	5.02	1.11	3.39	5.29	5.88
Log. Valuation Words Ratio	37,294	4.24	1.21	0.55	4.55	5.41
Log. Website Size (in MB)	38,469	−1.50	2.20	−5.18	−1.55	2.26
Log. Total number of words (in 10k)	38,463	1.31	1.34	0.01	0.88	4.02

(*Continued*)

TABLE 2—*(Continued)*

Variable	*N*	Mean	SD	P5	Median	P95
Log. GDP (World Bank)	17,221	31.20	1.78	27.77	31.42	33.54
GDP Growth (World Bank)	17,222	15.29	32.56	−16.61	8.74	67.38
Log. Population (World Bank)	17,222	20.45	1.69	17.29	20.67	22.66
Labor Force (%) (World Bank)	17,222	588.84	775.49	71.84	315.37	2025.07
Female Representation (%) (World Bank)	17,222	176.52	235.05	16.78	98.40	609.91

This table presents summary statistics for the main variables used in the analyses. We provide variable definitions in appendix A and follow the same structure as the variable list in appendix A. EPA-TRI toxic release and OSHA labor incident variables are measured at the U.S. facility-year level (facilities are operated by portfolio companies). Trucost emission and Reprisk variables are measured at the PE portfolio company-year level. All other variables are measured at the PE firm-year level.

firms' websites has increased steadily since 2000. The ESG disclosures have surged, particularly from 2011 onward. Although valuation-related disclosures are generally more prevalent than ESG disclosures, their dominance has been steadily decreasing since the Global Financial Crisis in 2008/09. This shift mirrors the PE industry's evolving commitment to focus less on pure financial returns and more on sustainable investments (Kreutzer [2011], Cumming [2021], Kenan Insight [2022], PRI Blog [2022]). To assess the relative importance of E, S, and G topics, we plot their evolution separately using local polynomial mean-smoothed values and their 95% confidence intervals in panel B of figure 2. Although environmental topics have traditionally been most important, disclosures about social issues have strongly increased recently and overtook environmental disclosures after 2020. Governance matters, often a key area of focus for PE firms, are less prevalent and increase smoothly over time. The greater prevalence and growth in environmental and particularly social-topic disclosures contrasts the disclosure patterns in Form ADV disclosures mandated by the SEC as studied in Campbell et al. [2024]. Our textual analysis using ChatGPT's LLM suggests that this finding is likely due to PE firms increasingly using website disclosures to discuss ESG strategies and showcase specific investment cases, whereas the SEC-mandated disclosures mostly contain governance information and E- and S-risk exposures (Campbell et al. [2024]).

Figure 3 shows cross-sectional differences in ESG disclosures based on PE firm characteristics. Panel A plots average ESG disclosures by selected PE firm headquarter countries and suggests that the growth in ESG disclosure is stronger among European, including U.K., PE firms compared to their U.S. counterparts. Panel B plots average ESG disclosures by selected countries in which the LPs invested in a PE firm's funds reside. We document that PE firms whose LPs are resident in the countries where ESG and CSR disclosures are more prevalent, mostly due to regulatory mandates such as in the United Kingdom or the European Union (Fiechter, Hitz, and Lehmann [2022]), exhibit higher levels of ESG disclosures suggesting that the PE fund investors' home country ESG disclosure landscape may drive disclosures by PE firms. Panels C and D plot averages by selected countries and industries of the PE firms' portfolio company investments.

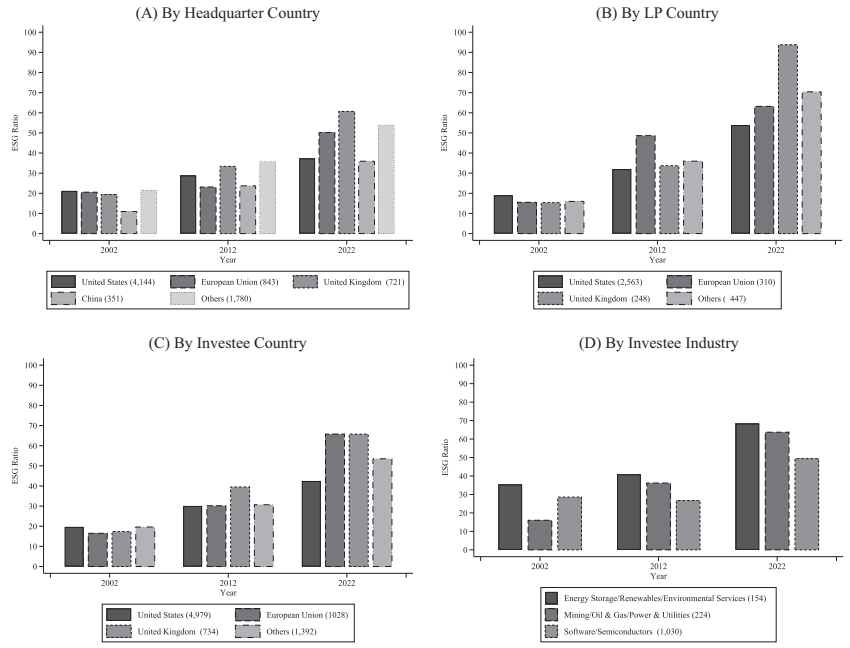

FIG. 3.—PE firm ESG disclosures and PE firm characteristics. This figure presents the average values of the *ESG Ratio* for the years 2002, 2012, and 2022 based on different sample splits as indicated in the subtitles. The number of observations in each subsample is provided in parentheses in the legends. Panel A is based on all PE firms (those that have buyout or growth as their main firm strategy) (number of PE firms: 5,468). Panel B is based on PE firms that have data on LPs that are invested in their funds (number of PE firms: 1,468). Panels C and D are based on PE firms that also have portfolio company buyout deal data available in Preqin (number of PE firms: 3,411). The countries and industries in panels C and D relate to the countries and industries in which PE firms invest—that is, the countries in which portfolio companies are incorporated and industries in which the portfolio companies mainly operate as indicated by Preqin.

Similar to panel B, panel C suggests that PE firms disclose more ESG information when LP home countries have ESG disclosure mandates. In panel D, we see that ESG disclosures as of 2022 are highest in eco-friendly technology industries. In industries with high exposure to environmental risk (Mining/Oil & Gas/Power & Utilities), ESG disclosures have grown strongly since 2002. This pattern could indicate that PE firms justify the sustainability of these investments and manage ESG-related risks via website disclosures.

We argue that ESG disclosure incentives are specific in the PE setting due to PE firms' fundraising from large ESG-oriented LPs and PE firms' controlling stakes in portfolio companies. To support this notion, we collect and examine website-based ESG disclosure data from U.S.-based hedge fund firms, another important class of investment companies. Figure 4 plots U.S. PE firms' versus hedge fund firms' ESG disclosures using local polynomial

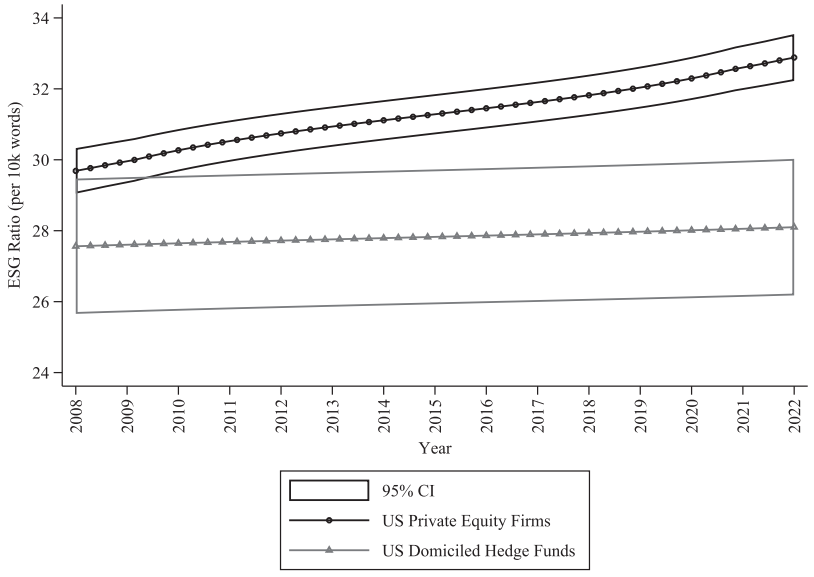

FIG. 4.—PE firms' versus hedge fund firms' ESG disclosures. The figure shows the evolution in the average annual values of *ESG Ratio* for U.S.-based PE firms (solid-circle connected line) and U.S. domiciled hedge funds (triangle connected line), together with the 95% confidence intervals using a local polynomial smooth function. For comparability, we use balanced samples of U.S.-based PE firms and U.S.-domiciled hedge funds from 2008 to 2022. For hedge funds, we keep any fund management company (from Thomson Reuters Eikon) that has had at least one U.S.-domiciled fund in the period 2008 to 2022 and with a nonmissing website (number of PE firms: 860; number of hedge fund firms: 284 firms).

mean-smoothed values to formally compare the disclosures over time.[11] We observe that PE firms and hedge fund firms had similar levels of ESG disclosures on their websites during the Global Financial Crisis. Post-crisis, ESG disclosures of hedge fund firms largely plateaued whereas those of PE firms steadily increased, leading to a pronounced discrepancy in recent years. This finding suggests that hedge funds managers might prioritize immediate financial gains over sustainable investments, as supported by prior evidence that they invest more in low ESG-companies (Avramov et al. [2022], Liang, Sun, and Teo [2022]). Alternatively, hedge fund investors might not demand hedge fund managers to prioritize sustainable investments.

3.4 VALIDATION AND CONTEXT OF THE ESG DISCLOSURE MEASURE

If our ESG disclosure measure accurately reflects PE firms' focus on sustainability, increased disclosures should coincide with commitments to responsible investments. Since 2009, several PE firms have become UN

[11] For comparability, we use balanced samples of PE and hedge fund firms from 2008 to 2022. Confirming the main finding on the time trend shown in figure 2 based on a balanced sample for PE firms since 2008 mitigates potential measurement issues due to changes in technical standards in the web (departure from Adobe Flash).

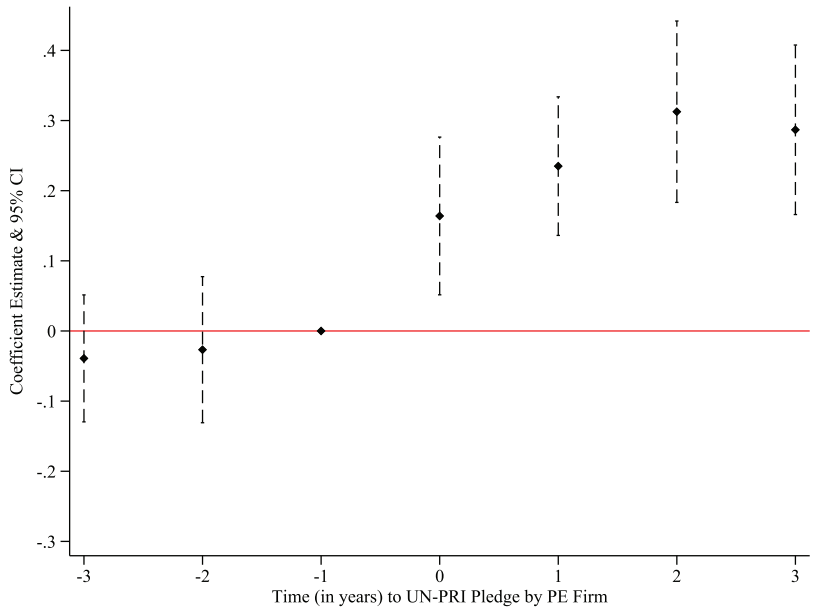

FIG. 5.—PE firms' signing up to UN PRI and PE firm ESG disclosures. This figure shows coefficient estimates of a regression of PE firms' ESG disclosures on relative event years indicating the distance to a PE firm's signing up year to the United Nations Principles of Responsible Investment (UN-PRI). We estimate the following equation using a stacked cohort design following Cengiz et al. (2019).

$$Log.\ ESG\ Ratio_{i,t} = \alpha_0 + \sum_{d=-3}^{d=3} \beta_d \cdot Year\ to\ UN\text{-}PRI\ Pledge_{i,d} + X_\phi + \alpha_i + \alpha_t + \varepsilon_{it}$$

The unit of observation is PE firm-year [*i, t*] in the period 2000 to 2021. The relative event year $d = 0$ is the year in which a PE firm becomes a UN-PRI signatory. Controls included in vector *X* and all other variables are defined in Appendix A. Online Appendix Table OA.8 shows the annual number of PE firms that became UN PRI signatories. Standard errors are clustered at the PE firm's headquarter country-year level. The y-axis shows coefficient estimates and their 95% confidence intervals. The pre-treatment year $d = -1$ serves as the baseline year for the regression. [No. of PE Firms: 3,340; No. of observations: 32,010, No. of stacked cohort observations: 516,300].

PRI signatories (Crifo and Forget [2013]) to show a credible commitment mechanism to emphasize their dedication. We exploit the staggered sign-up process of 381 PE firms in our sample. Figure 5 shows our results from regressing the *Log. ESG Ratio* measure on UN PRI event year indicators. Using a stacked cohort design (see Cengiz et al. [2019], Baker, Larcker, and Wang [2022], Barrios [2024]), we find that ESG disclosures of PE firms signing the UN PRI and those of firms not or not yet doing so are nearly identical in the pre-signing years. Starting in the year of the sign-up, we document positive and significant coefficients that grow in later years. This suggests that PE firms increase the proportion of ESG words on their websites by up to 28% post the UN PRI signing. Although the decision of PE

managers to join the UN PRI is endogenous, our analysis demonstrates that changes in ESG disclosures match PE firms' commitments to responsible investments. Notably, these inferences do not change when we account for potentially correlated factors like observed and unobserved time-invariant PE firm characteristics, macroeconomic factors, other website disclosures, and time trends by country and PE firm size group (untabulated).

A potential drawback of our dictionary-based ESG disclosure measure is that it only captures the relative frequency of ESG-related words. To provide additional context, we employ ChatGPT-3.5 Turbo, similar to the analysis of U.S. public firms' disclosures in Kim, Muhn, and Nikolaev [2024] and Jha et al. [2024], to summarize and assess the ESG content on PE firms' websites. We provide details in section B of the online appendix). We observe that ESG scores provided by ChatGPT show a robust positive correlation with our *ESG Ratio* measure. When the dictionary-based ESG measure for a website is high, ChatGPT identifies PE firms' disclosures as being driven by environmental activities, commitments to social responsibility, and governance-enhancing measures at portfolio companies. These findings suggest that our quantitative dictionary-based measure is a valid ESG-disclosure construct. However, we also find that the dictionary-based measure exhibits a decreasing returns-to-scale relationship with the ChatGPT ESG score, suggesting that a higher number of ESG words on websites becomes a noisier signal of incremental ESG activities once PE firms disclose relatively detailed ESG information.

4. LP Demand for ESG Information and PE Firm ESG Disclosures

4.1 LPs' SUSTAINABILITY INVESTING FOCUS AND PE FIRMS' ESG DISCLOSURES

To examine the association between LPs' demand for ESG information on the supply of PE firm website ESG disclosures, we start by exploiting the staggered signing of the UN PRI pledge by LPs. Signing up to the UN PRI increases the sustainable reporting requirements for these LPs and can potentially increase the need for ESG information from PE firms. Similarly in spirit to the use of institutional investors' Climate Disclosure Pledge in Cohen, Kadach, and Ormazabal [2023a], we estimate the impact of LPs' UN PRI commitment on PE firms' supply of ESG information using the following model:

$$Log.ESGRatio_{i,t} = \alpha_0 + \beta_1 PostPRIInvestorPresent_{i,t} + X\phi + \alpha_i + \alpha_t + \varepsilon_{i,t}. \quad (1)$$

Log. ESG Ratio is the natural logarithm of one plus the number of ESG words per 10,000 words on the website of PE firm i in year t.[12] In our baseline test, the variable of interest, *Post PRI Investor Present*, is an indicator

[12] In our regression analyses, we use the logarithm to account for skewness in the data and allow for an interpretation of regression results in percentage terms. This approach is also

equal to one if at least one LP invested in PE firm *i*'s funds is a signatory to the UN PRI in year *t*. To account for a potential bias due to variation in treatment timing, we use a stacked cohort design as in Cengiz et al. [2019]. We cluster standard errors within PE headquarter-country-years to account for arbitrary dependence. In additional OLS specifications, we use the natural logarithm of the number of UN PRI–committed LPs invested in a PE firm's funds as a continuous treatment variable. We also assign weights to this treatment variable based on fund size to capture the relative influence a particular LP might have on a PE firm's disclosure practices.

X is a vector of control variables. It includes the PE firm's total website size to control for the overall level of voluntary disclosures and PE firms' disclosures of both positive and valuation-related words to control for concurrent changes in the general sentiment or financial performance. We also include several PE fund exposure-weighted macroeconomic characteristics of the countries in which PE firms' LPs reside as defined in appendix A. These controls help to isolate the variation from LPs' ESG information demand that is not purely driven by macroeconomic changes. The term α_i denotes PE firm fixed effects, absorbing time-invariant omitted variables by PE firm, whereas α_t denotes year fixed effects, absorbing unobserved time trends that affect all PE firms. In additional specifications, we include separate year fixed effects for PE firms within specific size groups, as overall economic trends might differently affect large and small PE firms given disparities in their fundraising and investment capabilities. Further, trends in ESG investing might have affected larger PE firms more in our sample period as large PE firms' LPs showed an early interest in ESG issues (Kreutzer [2011]).

Figure 6 presents estimates for the three relative years around the initial investment of a UN PRI–committed LP in a PE firm's funds. We see nearly identical ESG disclosure trends between PE firms with and without UN PRI–committed LPs in the period prior to the first year in which treated PE firms receive capital from a UN PRI signatory LP. The estimates in the postperiod suggest that PE firm ESG disclosures increase by approximately 10% when UN PRI LPs invest in a PE firm's funds, compared to disclosures of PE firms without UN PRI LPs.

Table 3 presents the regression results based on equation (1). The coefficient on *Post PRI Investor Present* in column 1 of panel A indicates a 9% increase in ESG disclosures postinvestment by a UN PRI–committed LP—a statistically significant jump at the 1% level. Columns 2 and 3 suggest that a one standard deviation increase in the number of UN PRI–

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motivated by our findings on the correlation between the dictionary-based ESG ratio and the ChatGPT ESG score in section 3.4 suggesting a decreasing informational value for additional increases in the dictionary-based ESG count for high disclosures. The log transformation reduces the influence of large positive outliers. Results are robust to using the inverse hyperbolic sine (IHS) transformation of the ESG ratio, alleviating concerns related to measurement bias due to the log-transformation (see also Glaeser and Omartian [2022]).

TABLE 3

LPs' Sustainability Investing Focus and PE Firms' ESG Disclosures

	(1)	(2)	(3)
Panel A		*Log. ESG Ratio*	
Post PRI Investor Present	0.09***		
	(0.02)		
Log. PRI Investors		0.11***	
		(0.02)	
Log. Wgtd. PRI Investors			0.09***
			(0.02)
Log. Wgtd. Total Investors			0.02
			(0.02)
Log. Website Size (in MB)			0.17***
			(0.01)
Log. Positive Words Ratio			0.18***
			(0.02)
Log. Valuation Words Ratio			0.29***
			(0.02)
Log. GDP			−0.00
			(0.06)
GDP Growth			−0.00
			(0.00)
Log. Population			0.05
			(0.06)
Labor Force (%)			−0.00
			(0.00)
Female Representation (%)			0.00
			(0.00)
Observations	16,632	16,632	16,555
Adj. R^2	0.709	0.681	0.785
PE Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	No
Size Group-Year FE	No	No	Yes

Panel B	(1) *Log. Envir. Ratio*	(2) *Log. Social Ratio*	(3) *Log. Gov. Ratio*
Post PRI Investor Present	0.08***	0.10***	0.09***
	(0.02)	(0.02)	(0.02)
Observations	16,628	16,678	16,548
Adj. R^2	0.776	0.774	0.777
PE Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

This table presents the results of regressions which model PE firms' ESG disclosures as a function of the presence of PE firm investors (Limited Partners) that are signatories to the United Nations Principles of Responsible Investment (UN PRI) based on the following baseline model (equation (1)):

$$Log.ESG\ Ratio_{i,t} = \alpha_0 + \beta_1 Post\ PRI\ Investor\ Present_{i,t} + X_\phi + \alpha_i + \alpha_t + \varepsilon_{i,t}$$

The unit of observation is PE firm-year [*i*, *t*] over the period 2000 to 2021. Variable definitions are provided in appendix A. In column 1 of panel A and in all specifications in panel B, we estimate the above equation using a stacked cohort design following Cengiz et al. [2019] with an effective number of observations of 104,350. For size group-year fixed effects in column 3 of panel A, we define size groups based on the average total word count on PE firms' websites and interact the decile categories with year indicators. Robust standard errors are clustered at the PE firm headquarter country-year level and are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

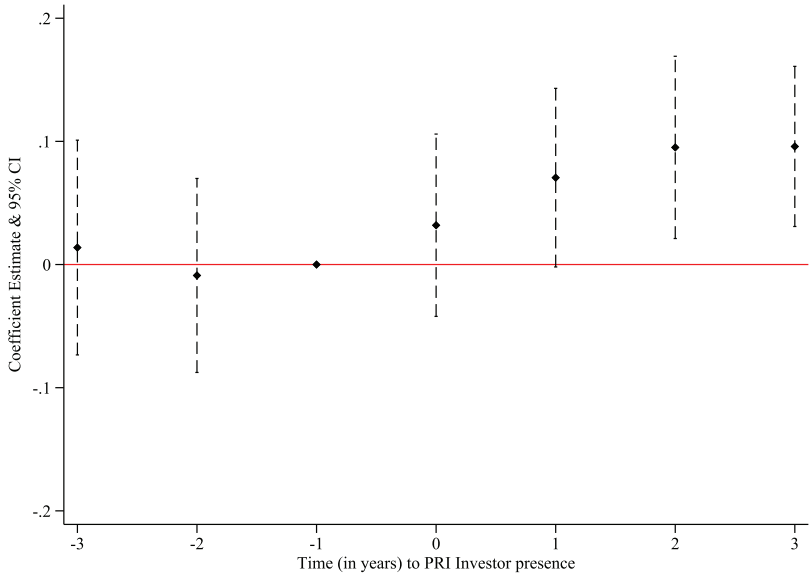

FIG. 6.—Limited partners' (LPs') demand for sustainable investments and PE firm ESG disclosures. This figure shows coefficient estimates of a regression of PE firms' ESG disclosures on relative event years indicating the distance to the presence of a fund investor (Limited Partner) that is a signatory to the United Nations Principles of Responsible Investment (UN-PRI). We estimate the following equation (see Eq. (1)) using a stacked cohort design following Cengiz et al. (2019).

$$Log.\ ESG\ Ratio_{i,t} = \alpha_0 + \sum_{d=-3}^{d=3} \beta_d \cdot Year\ to\ UN\text{-}PRI\ Investor_{i,d} + \alpha_i + \alpha_t + \varepsilon_{it}$$

The unit of observation is PE firm-year $[i, t]$ in the period 2000 to 2021. The relative event year $d = 0$ is the first full year in which any of a PE firm's funds receives capital from an LP signed up to the UN-PRI. Online Appendix Table OA.8 shows the annual number of LPs that became UN PRI signatories. Standard errors are clustered at the PE firm's headquarter country-year level. The y-axis shows coefficients estimate and their 95% confidence intervals. The pre-treatment year $d = -1$ serves as the baseline year for the regression. [No. of PE Firms: 1,471; No. of observations: 14,836, No. of stacked cohort observations: 104,653].

committed LPs is associated with a 26.84% and 19.96% increase in PE firms' ESG disclosures. The results in panel B imply that the presence of a UN PRI–committed LP is associated with an 8%, 10%, and 9% increase in E-, S-, and G-related disclosures, respectively.[13]

[13] We calculate the relative magnitudes in columns 2 and 3 of panel A based on the unconditional sample means and standard deviations in the raw (weighted) number of UN PRI-committed LPs which are 1.34 and 3.27 (0.64 and 1.42) respectively. For example, in column 2 a one-standard deviation increase in the raw number of UN PRI LPs corresponds to an increase of 144% relative to the unconditional sample mean (3.27/1.34 = 2.44). Based on the log-log specification and a coefficient estimate of 0.11, this translates to an increase of 15.8% in the ESG disclosure outcome variable (= 244% * 0.11). The seemingly smaller coefficient for

4.2 LPs' EXPOSURE TO PUBLIC FIRM ESG DISCLOSURES AND PE FIRMS' ESG DISCLOSURES

To support the inference that PE firms' ESG disclosures respond to LPs' demand for ESG information related to their investments, we further exploit variation in mandatory sustainability disclosure regulations for publicly listed firms in LPs' home countries. LPs from countries with such mandates likely demand more ESG disclosures from PE firms because they often also invest in public equities with correspondingly detailed ESG disclosures. This creates incentives for PE firms to provide more ESG disclosures to compete for LPs' capital. LPs may also expect a higher level of ESG disclosure across their PE investment portfolio, even if they do not invest in local public equities, because they are exposed to the disclosure norms in their home market. In both cases, sustainability disclosure mandates for publicly listed firms can thus spill over to PE firms through the increased demand for ESG information.

To examine the association between PE firms' supply of ESG disclosures and PE firms' exposure to LPs' information demand that is at least partially associated with LPs' home-country mandatory sustainability disclosure regulations, we estimate the following ordinary least squares (OLS) model:

$$Log.ESGRatio_{i,t} = \alpha_0 + \beta_1 LPESGRegExposure_{i,t} + X\phi + \alpha_i + \alpha_t + \varepsilon_{i,t}, \quad (2)$$

where $LPESG\ Reg\ Exposure_{i,t}$ is $\sum_{c=1}^{C} Funding\ Exposure_{i,c,t} * ESG\ Disclosure\ Mandate_{c,t}$.

$Funding\ Exposure_{i,c,t}$ is equal to $\frac{\sum_{l=0}^{L}\sum_{f=0}^{F} 1_{l,c,f,i,t}}{Number\ of\ Active\ Funds_{i,t}}$ and is a time-varying measure of the extent of funding that a PE firm receives from LPs headquartered in a particular country. Specifically, $1_{l,c,f(i),t}$ is an indicator variable equal to one when the LP l headquartered in country c has invested in fund f of PE firm i in year t, and $Number\ of\ Active\ Funds_{i,t}$ is the total number of funds managed by a given PE firm in a given year. *ESG Disclosure Mandate* is an indicator variable equal to one if there is an ESG disclosure mandate for publicly listed firms in country c in year t as provided in Krueger et al. [2024]. Consequently, *LP ESG Reg Exposure* proxies for a PE firm's relative share of capital from LPs exposed to worldwide mandatory sustainability disclosure regulation. As in equation (1), we cluster the standard errors at the country-year level. X is a vector of control variables as described in the previous section. α_i and α_t denote PE firm fixed and year fixed effects.

The coefficient of interest, β_1, estimates the effect of PE firms' increased exposure to LPs who are based in geographies with ESG disclosure mandates for public firms relative to control PE firms that are not (or are less)

"E" is economically more significant because a 10% change in E disclosures results in a larger absolute increase in the number of E-related words compared to S- or G-related words. On average, the level in environmental disclosures is higher than that of social and governance disclosures.

exposed to such LPs. We acknowledge that unmodeled factors like country-level economic fundamentals may be correlated with the country-level LP funding exposure. However, we believe it is unlikely that these factors would be correlated with our measure's systematic cross-sectional variation across LP funding exposure in countries with or without mandatory ESG regulations for publicly listed firms over time. Specifically, Krueger et al. [2024] show that economic factors are unlikely to affect the introduction of ESG mandates. Further, and importantly, these mandates are not directly targeted at PE firms in the first place.

Table 4 presents the results based on equation (2). The coefficient estimate of 0.03 in column 1 of panel A suggests that a one standard deviation increase in the *LP ESG Reg Exposure* is associated with an approximately 6.24% increase in the *ESG Ratio*,[14] an economically significant estimate statistically significant at the 1% level. Estimates remain broadly stable in the presence of more stringent controls and fixed effects. The results in panel B suggest that a one standard deviation increase in the corresponding *LP E/S/G Reg Exposure* is associated with a 3.89%, 10.00%, and 8.26% increase in E-, S-, and G-related disclosures, respectively. These results provide additional evidence consistent with LPs increasing their demand for specific E, S, and G disclosures when they observe more of these disclosures made by public firms in their home markets.

4.3 FUNDRAISING FROM LPS AND PE FIRMS' ESG DISCLOSURES

To disentangle the screening by prospective LPs from the monitoring role of currently invested LPs as a driver of PE firm ESG disclosures, we explore granular data on PE firms' fundraising periods when PE firms aim to attract new capital. To satisfy the demand for ESG information in the search and screening process by ESG-focused LPs, PE firms may increase the supply of ESG information on their websites. This mechanism should be particularly relevant for PE firms that compete for ESG-focused capital, consistent with theory and prior evidence suggesting that firms increase voluntary disclosures to mitigate adverse selection and access capital from investors (e.g., Diamond and Verrecchia [1991], Breuer, Hombach, and Mueller [2023]).

We conduct tests to investigate whether PE firms likely alter their ESG disclosures to influence capital allocations from ESG-focused LPs. First, we explore within-PE firm variation in ESG disclosures around fundraising events. To this end, we use a standardized time-series variable with relative "event years." The *event year* t = 0 indicates the year end when a large fundraising round closes, relative to the immediate two prior and subsequent years. For each PE firm and fundraising window, we demean our

[14] We derive this relative economic magnitude based on the unconditional sample mean and standard deviation of *LP ESG Reg Exposure* of 1.04 and 2.16. A one-standard deviation increase corresponds to an increase of 208% over the unconditional mean. Based on the log-linear specification, the increase in ESG disclosures is 208% * 0.03 = 6.24%.

TABLE 4

LPs' Exposure to Public Firm Disclosures and PE Firms' ESG Disclosures

	(1)	(2)	(3)
Panel A		*Log. ESG Ratio*	
LP ESG Reg. Exposure	0.03***	0.02***	0.02***
	(0.01)	(0.00)	(0.00)
Log. Website Size (in MB)		0.17***	0.17***
		(0.01)	(0.01)
Log. Positive Words Ratio		0.19***	0.18***
		(0.02)	(0.02)
Log. Valuation Words Ratio		0.28***	0.29***
		(0.02)	(0.02)
Log. GDP		0.01	0.00
		(0.06)	(0.06)
GDP Growth		−0.00	−0.00
		(0.00)	(0.00)
Log. Population		0.04	0.05
		(0.06)	(0.06)
Labor Force (%)		−0.00	−0.00
		(0.00)	(0.00)
Female Representation (%)		−0.00	0.00
		(0.00)	(0.00)
Observations	16,632	16,562	16,555
Adj. R^2	0.681	0.779	0.785
PE Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	No
Size Group-Year FE	No	No	Yes

	(1)	(2)	(3)
Panel B	*Log. Envir. Ratio*	*Log. Social Ratio*	*Log. Gov. Ratio*
LP Envir. Reg. Exposure	0.02***		
	(0.00)		
LP Social Reg. Exposure		0.05***	
		(0.01)	
LP Gov. Reg. Exposure			0.04***
			(0.00)
Observations	16,628	16,678	16,548
Adj. R^2	0.756	0.748	0.743
PE Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

This table presents the results of regressions which model PE firms' ESG disclosures as a function of their investors (LPs) exposure to mandatory ESG disclosure regulation around the world based on following baseline OLS model (equation (2)):

$$Log.\ ESG\ Ratio_{i,t} = \alpha_0 + \beta_1 LP\ ESG\ Reg.\ Exposure_{i,t} + X_\phi + \alpha_i + \alpha_t + \varepsilon_{i,t}$$

The unit of observation is PE firm-year [*i*, *t*] in the period 2000 to 2021. Variable definitions are provided in appendix A. Panel B presents the results of re-estimating the specification in column 1 of panel A, using separate environment, social, and governance disclosure and regulation exposure variables. For size group-year fixed effects in column 3 of panel A, we define size groups based on the average total word count on PE firms' websites and interact the decile categories with year indicators. Robust standard errors are clustered at the PE firm headquarter country-year level and are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

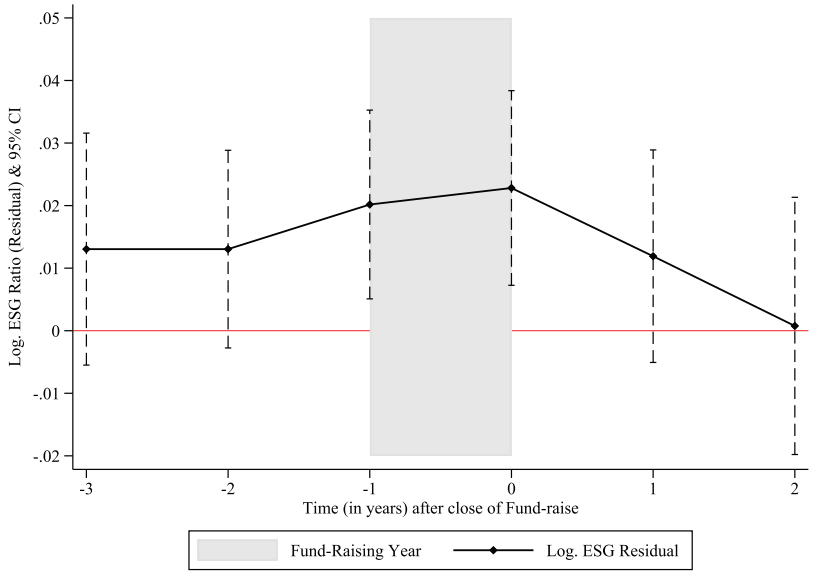

FIG. 7.—PE firm ESG disclosures and fundraising. The figure shows PE firm ESG disclosures around large fundraising events. It plots the evolution of average annual residual values of *Log. ESG Ratio* after regressing *Log. ESG Ratio* on *Log. Website Size (in MB)* and PE firm and calendar-year fixed effects for fundraising PE firms in the five years before, in the year of the fundraising, and in the three years after large fundraise events. The relative event-year $t = 0$ on the *x*-axis denotes the close of fundraising. We classify a year as a large fundraising year if a given PE firm raises funds that exceed any funds raised in the immediate prior and following years (number of PE firms: 2,304; number of observations:15,907; and number of large fundraises: 5,723).

measure of interest, *Log. ESG Ratio*, purging it from the correlation with a website's total size and year trends. This approach accounts for any observed and unobserved time-invariant firm characteristics and time-varying non-ESG disclosures that might correlate with both ESG disclosures and fundraising outcomes. We present the average residualized Log. ESG Ratio in the years around the fundraising-end year in figure 7. We note an upward trend in abnormal ESG disclosures in the year leading up to the fundraising, with the disclosures peaking in the final fundraising year. After the fundraising event, ESG disclosures are statistically indistinguishable from the level PE firms exhibit in an average year without fundraising. The average firm enhances the relative prominence of ESG disclosures on its website by 2–3% before successfully collecting the targeted amount of funds. The significantly higher disclosures up to 24 months before close of fundraising suggest that PE managers highlight ESG activities while fundraising and being under LP due diligence, consistent with recent statistics suggesting that fundraising take up on average about 21 months (Preqin [2023]).

Second, we investigate whether higher ESG disclosures enable PE firms to raise more funds in less time and attract more ESG-oriented LPs. To

TABLE 5
Fundraising from LPs and PE Firms' ESG Disclosures

	(1) *USD Mn raised / 6 mo Fundraising*	(2) *Log. (USD Mn raised / 6 mo Fundraising)*	(3) *PRI Investor in Fundraise*
Log. ESG Ratio	107.34***	0.15***	5.73***
	(32.95)	(0.04)	(1.28)
Observations	3,568	3,288	2,540
Adj. R^2	0.062	0.105	0.063
Pre-Fundraise PE Firm Controls	Yes	Yes	Yes
Fundraise Year FE	Yes	Yes	Yes
Country * Fundraise Year FE	No	Yes	No

This table presents results of regressions, which model PE firms' fundraising outcomes as a function of PE firms' ESG disclosures based on the following OLS model:

$$Fundraising\ Outcome_{i,t} = \alpha_0 + \beta_1 \cdot Log.ESG\ Ratio_{i,t} + X_\phi + \alpha_t + \varepsilon_{it}$$

The unit of observation is PE firm-year [*i*, *t*] in the period 2000–2022. Variable definitions are provided in appendix A. The independent variable in all specifications is *Log. ESG Ratio*. *X* denotes website related prefundraise controls: three-year averages of Log. ESG Ratio, Log. Website Size (in MB), Log. Valuation Words Ratio and Log. Positive Words Ratio. Robust standard errors are clustered at the PE firm headquarter country-year level and are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

do so, we relate ESG disclosures to the amount of funds raised relative to the time spent in the market or an indicator variable equal to one if LPs committed to the UN PRI invest in a fund. Results in column 1 of table 5 suggest that, when a PE firm doubles the ratio of ESG to total website disclosures, the firm raises approximately USD 107 million more capital for every six months of fundraising on the market. We control for the three-year average in ESG, total, positive, and valuation-related disclosures before the fundraising window to account for confounding factors. Given a sample mean of USD 502.7 million raised for each six months in the market, this result suggests that doubling the ESG ratio is associated with an approximately 20% faster fundraising success.

To corroborate this result, we also study the log ratio of USD raised per six months and compare only to fundraising rounds of PE firms from the same country and the same year. The estimate in column 2 of table 5 suggests that PE firms with an ESG disclosure ratio twice as high as that of peer firms, also raising capital in the same country and year, raise 15% more USD in funds every six months. Lastly, in column 3 of table 5, we provide evidence that the likelihood of a UN PRI–committed LP investing in a fund is 6 percentage points higher if a PE firm doubles its ESG disclosure ratio. Although this result is based on a comparison of ESG disclosures within fundraising rounds only, it is consistent with the increase in ESG disclosures upon the first-time presence of a UN PRI–committed LP relative to PE firms without UN PRI–committed LP in the same year (figure 6). Although having the opposite sign, the absolute magnitudes of our estimates are comparable to those in Campbell et al. [2024]. Campbell et al. [2024]

document that a one standard deviation increase in their environmental disclosure measure is associated with 15% reduction in the funds raised.

Notably, our findings contrast with those of Campbell et al. [2024], who show a negative association between PE firms' ESG disclosures and fundraising success. This discrepancy likely stems from several factors. First, disclosure contents differ significantly. Mandatory Form ADV disclosures in Campbell et al. [2024] mostly reveal ESG risks, as their tone analysis indicates. Our textual analysis shows that voluntary website disclosures mainly cover ESG strategies and investment initiatives (see section 3.4). Credible voluntary disclosures about strategies and investments plausibly correlate positively with future fundraising. In contrast, risk-focused regulatory disclosures likely reveal material financial downsides, deterring investors, as seen with PE firms' ESG incident press coverage (Duevski, Rastogi, and Yao [2024]) or corporate misconduct (Jiang et al. [2024]). Second, the large positive association between fundraising success and ESG disclosures in our study may partly be due to the LPs in our international setting being more ESG-friendly than those in the U.S. setting of Campbell et al. [2024]. Supporting this assumption, we find smaller yet still positive coefficients when rerunning the tests with a U.S. PE firm sample. For the specifications of columns 1 and 3, these untabulated results are significant at conventional levels of statistical significance. Third, Campbell et al. [2024] mostly focus on the extensive margin, counting new fundraising events and the new funds raised. Our analysis reveals a positive association between ESG disclosures and fundraising at the intensive margin as we focus on the amount raised and speed of fundraising, conditional on PE firms raising funds.

4.4 DISCUSSION OF LPS AND OTHER DETERMINANTS OF PE FIRMS' ESG DISCLOSURES

We cautiously refrain from interpreting our results on LPs' information demand as evidence for a causal impact of investments from UN PRI-committed LPs on subsequent PE firm ESG disclosures. We acknowledge that the decision to become a UN PRI signatory is likely endogenous. Specifically, UN PRI–affiliated LPs might pursue PE firms that already invest in sustainable investments and therefore have better ESG-disclosures in the future. Our results show a robust descriptive association between changes LP ESG-information demand and within-PE firm changes in the supply of ESG disclosure, while controlling for overall disclosure characteristics and LP fund investments and comparing PE firms of similar sizes in the same year. Thus, our evidence suggests that LPs play an important role in the supply of *public voluntary* disclosures despite the presence of private communication channels between PE firms and their LPs.

We further acknowledge that our study focuses on one of many plausible determinants of PE firm ESG disclosures. As we mention in section 3.1, general year trends and time-invariant PE firm characteristics explain more than two thirds of the variation (see the online appendix for details). We focus on LPs because LPs are an important, if not the most important,

stakeholder for PE firms and our setting offers us the opportunity to examine voluntary public disclosure behavior when differential access to private communication is possible.

However, we note that some large PE firms are being publicly listed and face information demand of public equity shareholders and mandatory (ESG) disclosure regulations. Therefore, we examine whether the ESG disclosure responses of these firms to the demand from LPs is different, and find little supporting evidence (see the online appendix). Also, in untabulated tests, we further find that our results across the analyses in sections 4 and 5 remain unaffected when we remove publicly listed PE firms from our sample (92 firms).

Further, PE firms impact many employees, customers, suppliers, other shareholders, or local communities through their significant ownership in portfolio companies. These stakeholders also have ESG expectations, potentially pushing toward greater ESG transparency. Future research could look at the role of these stakeholders, as recent studies on non-PE firms suggests that consumers or retail investors respond to voluntary (ESG) disclosures (e.g., Li, Watts, and Zhu [2024], Noh, So, and Zhu [2024]), and PE firms might anticipate such stakeholder behavior.

5. *PE Firm ESG Disclosures and Portfolio Company ESG Outcomes*

5.1 DATA AND BASELINE EMPIRICAL FRAMEWORK

To examine ESG outcomes of portfolio companies, we merge our panel data with portfolio company ESG performance metrics from several databases. For environmental insights, we combine our PE firm portfolio company data with the U.S. EPA's TRI and S&P Global's Trucost databases on environmental performance. To examine social outcomes, we use information on workplace safety from the U.S. Department of Labor's OSHA data set. For an overall ESG risk management perspective, which typically emphasizes governance (Burke, Hoitash, and Hoitash [2019]), we turn to RepRisk's data on ESG-related reputational risk. Our matching approach yields different subsamples. To mitigate concerns regarding sample selection bias, we conduct diagnostic tests that yield the following insight. Due to coverage in the databases, the ESG outcomes tests likely reflect the economics within relatively large PE firms. However, the subsamples with ESG outcome data cover a substantial share of worldwide PE-managed assets, suggesting that our results reflect the global PE activity.[15] We estimate variants of the following baseline triple difference-in-differences framework via OLS:

$$ESG\,Outcome_{p(i),t} = \alpha_0 + \beta_1 HighESGDiscl._{i,t=0} * Post\,Deal\,Period_{p,t}$$

[15] We provide a comprehensive discussion on the data sets and the name matching process to our sample portfolio companies in the online appendix.

$$+ \beta_2 Post\,Deal\,Period_{p,t} + \alpha_p + \alpha_t + \varepsilon_{p,t}. \quad (3)$$

ESG Outcome is a measure of environmental pollution, workplace safety, or ESG-related reputational risk of portfolio company p owned by PE firm i in year t. In some data sets, the unit of observation is the facility-year $(f(i),t)$. *Post Deal Period* is an indicator equal to one for portfolio company-years beginning in the year of the PE firm's acquisition of the portfolio company. *High. ESG Discl.* is an indicator variable equal to one for PE firms with ESG disclosure ratios in the highest quartile of sample PE firms in the year of the investment. The coefficient of interest, β_1, measures changes in ESG outcomes for portfolio companies that received capital from a PE firm with high ESG disclosures, compared to ESG outcomes of portfolio companies that received capital from a PE firm with low ESG disclosures. For the triple differences design, we also use control companies never owned by PE firms, in which case, the *High ESG Discl.* and *Post Deal Period* variables are always equal to zero. Depending on the underlying data set, we redefine our variable of interest, include different fixed effects to account for time trends, and account for arbitrary dependence as discussed in the following subsections.

5.2 ENVIRONMENTAL PERFORMANCE RESULTS

Our main analysis uses chemical release data at the U.S. facility-year level in the period 2000–2021. We identify 1,908 acquired facilities owned by 434 unique PE firms after matching the company associated with a facility to our PE firm portfolio companies. Because we lack data on financial characteristics of portfolio companies or facilities, we use their locations and industries to account for separate time trends within U.S. counties and industries. We cluster standard errors by state-year.[16]

We first investigate the average changes in environmental pollution around PE deals, unconditional on PE firms' ESG disclosures. We plot the event study results in panel A of figure 8. Leading up to the PE buyout, we do not detect any significant divergence in toxic chemical releases between soon-to-be-acquired facilities and their unacquired counterparts. Post-buyout, there is a small and statistically insignificant decrease in toxic emissions for the acquired facilities.

To test whether PE firms take actions consistent with their disclosures, our next test distinguishes between deals by PE firms with relatively high versus low environmental disclosures. We plot event study estimates separately for observations associated with PE firms in the top quartile of

[16] Similar in spirit to the peer-group clustering approach in Johnson [2020], this conservative clustering choice accounts for arbitrary correlation in pollution across observations within comparable regulatory and geographic boundaries. Inferences remain unchanged if we cluster standard errors at the PE firm level, the level of variation in treatment (investment and environmental disclosures by a given PE firm). Inferences are also unchanged if we cluster by state.

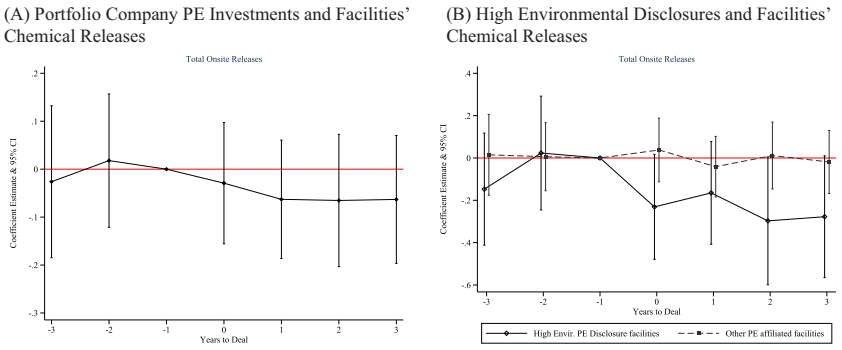

FIG. 8.—PE firm ESG disclosures and PE-owned facilities' emissions. The figures present coefficient estimates from regressions of facility-level chemical releases on the relative event years indicating the time to PE firms' investments in portfolio companies operating the facility. The baseline OLS regression specification is (equation (3)):

$$Log.TotalOnsiteRelease_{f(i,k,j),t} = \alpha_0 + \sum_{d=-3}^{d=3} \beta_d \cdot YeartoBuyout_{f,d} + \gamma\, BenchmarkRelease_{j,t} + \alpha_f + \alpha_{k,t} + \varepsilon_{f,t}$$

The unit of observation is the facility-year $[f(i, k, j), t]$, where a facility is acquired by PE firm i, located in county k, and operating in industry j in the period 2000–2021. The relative event year $d = 0$ corresponds to the calendar year of PE investment in portfolio companies operating the facility. Variable definitions are provided in appendix A. Standard errors are clustered at the state-year level. The y-axis shows coefficient estimates and their 95% confidence intervals. The pre-treatment year at $d = -1$ serves as the baseline year for the regression. Panel A presents the results from the baseline regression specification based on the full sample. Panel B presents results from a regression based on facilities acquired by PE firms with environmental disclosure values in the top quartile of the sample distribution in the year of the acquisition (continuous line) and based on facilities acquired by PE firms which are not in the top quartile. Facilities that have not been acquired by a PE firm serve as control observations (number of PE firms: 434; number of facilities: 30,359 and observations: 354,249).

environmental disclosures versus the rest in panel B of figure 8. Results suggest that chemical releases decrease after deals by PE firms with high environmental disclosures whereas they do not change for those of PE firms with low disclosures. Estimates indicate a 17–26% greater decrease in toxic chemical releases after accounting for general trends in pollution by controlling for county-year trends and the average level of emissions of all facilities in the same industry and year. Our documented magnitudes compare to a 24.8% reduction in pollution after PE buyouts of portfolio companies that face high environmental liability risks in Bellon [2024], who also uses data on toxic chemical releases from the EPA to measure environmental outcomes.

Analyses across different specifications reported in panel A of table 6 confirm these findings. In panel B of table 6, we re-estimate the model of column 2 of panel A for different categories of chemicals. We document consistently negative coefficients when focusing on chemicals that are

TABLE 6

PE ESG Disclosures and Portfolio Company Emissions

	(1)	(2)	(3)
Panel A	*Log. Total Onsite Releases*		
High Envir. Discl$_{t0}$ * *Post Deal Period*	−0.30***	−0.28***	
	(0.07)	(0.07)	
Log. Envir. Ratio$_{t0}$ * *Post Deal Period*			−0.09***
			(0.03)
Post Deal Period	0.03	0.09***	0.12***
	(0.03)	(0.03)	(0.04)
Industry-Year Benchmark Release	0.34***		
	(0.01)		
Observations	353,839	352,149	352,149
Adj. R^2	0.844	0.849	0.849
Facility FE	Yes	Yes	Yes
County-Year FE	Yes	Yes	Yes
Industry-Year FE	No	Yes	Yes

	(1)	(2)	(3)	(4)	(5)
Panel B	*Log. Total Onsite Releases*				
	CERCL Act	Clean Air Act	Safe Drinking Water Act	Hazardous Air Pollutants	Other Chemicals
High Envir. Discl$_{t0}$ * *Post Deal Period*	−0.26***	−0.19***	−0.20***	−0.22***	−0.08
	(0.07)	(0.07)	(0.07)	(0.07)	(0.16)
Post Deal Period	0.09***	0.08***	0.10***	0.07**	0.05
	(0.03)	(0.03)	(0.03)	(0.03)	(0.07)
Observations	330,439	306,776	293,370	299,227	55,656
Adj. R^2	0.863	0.866	0.869	0.872	0.869

(*Continued*)

TABLE 6—*(Continued)*

	(1)	(2)	(3)	(4)	(5)
Panel B	*Log. Total Onsite Releases*				
	CERCL Act	Clean Air Act	Safe Drinking Water Act	Hazardous Air Pollutants	Other Chemicals
Facility FE	Yes	Yes	Yes	Yes	Yes
County-Year FE	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes	Yes	Yes

Panel C	(1) *Log. Scope 1 Emissions*	(2) *Log. Scope 2 Emissions*	(3) *Log. Scope 3 Emissions (Upstream)*
High Envir. Discl.$_{t0}$ * *Post Deal Period*	−0.13***	−0.21***	−0.14***
	(0.04)	(0.05)	(0.03)
Post Deal Period	0.05**	0.09***	0.01
	(0.02)	(0.02)	(0.02)
Observations	154,263	154,355	154,425
Adj. R^2	0.940	0.915	0.950
Portfolio Company FE	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes

This table provides results of regressions which model facility-level onsite toxic chemical releases (from EPA TRI, panels A and B) or portfolio company-level emissions (from Trucost, panel C) as a function of PE firm investments and the level of PE firms' environmental disclosures using triple-difference specifications. Column 1 of panel A uses the following OLS model.

$$Log.\ Total\ Onsite\ Release_{f(i,k,j),t} = \alpha_0 + \beta\, High\ Envir.\ Discl._{i,t=0} * Post\ Deal\ Period_{f,t} + \beta_2 Post\ Deal\ Period_{f,t} + \gamma\, Benchmark\ Release_{j,t} + \alpha_f + \alpha_{k,t} + \varepsilon_{f,t}$$

In panels A and B, the unit of observation is the facility-year [$f(i, k, j)$, t], where a facility is acquired by PE firm i, located in county k, and operating in industry j in the period 2000–2021. Variable definitions are provided in appendix A. The coefficient of interest is β_1. *High Envir. Discl.*$_{t=0}$ is an indicator variable equal to 1 if the *Log. Envir. Ratio* of PE firm i is in the top quartile of its distribution in the year of the PE buyout deal. Panel B provides the results using disaggregate total onsite release by different categories of chemicals. In panel C, the unit of observation is portfolio company-year in the period 2002 to 2022. Robust standard errors are clustered at the facility state-year level in panels A and B and at the portfolio company country-year level in panel C and are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

harmful to the environment as classified in the CERCLA, Clean Air, and Safe Drinking Water Acts, or as Hazardous Air Pollutants (columns 1–4). In contrast, we do not document comparable patterns when focusing on other chemicals that are not considered as harmful by the U.S. EPA (column 5). These findings support the interpretation that our results capture improvements in environmental performance.

A notable advantage of the TRI data is that the EPA oversees and enforces its collection, circumventing misreporting issues in ESG data collected by second parties or not subject to stringent regulatory enforcement (e.g., Bailey et al. [2024]). However, the data set's scope is limited by focusing on chemical releases in certain industries in the United States. To corroborate our inferences, we construct an international sample using portfolio companies' greenhouse gas (GHG) emissions based on public disclosures or alternative estimates from the Trucost database (the U.S. data in Trucost also rely on EPA's disclosures; e.g., Cohen et al. [2023b]). This sample covers more than 150,000 portfolio company-years from across the world, with the greatest coverage in the United States, large European countries, China, Japan, South Korea, and Australia, and better coverage after 2015. Panel C of table 6 shows results consistent with lower emissions after deals by PE firms with high environmental disclosures. Comparing changes within portfolio companies in the same country and year, we document estimates that suggest greater decreases in Scope 1, 2, and 3 emissions by approximately 12%, 19%, and 13% for portfolio companies linked to PE firms with higher environmental disclosures. These magnitudes compare to a 7–10% reduction in CO_2 emissions by public firms following these firms' voluntary environmental disclosures to the Carbon Disclosure Project documented in Cohen, Kadach, and Ormazabal [2023a], who also rely on the Trucost database. Although the Trucost database has limitations with respect to coverage and potential misreporting, our evidence is consistent with the main tests based on the EPA's TRI data.

5.3 SOCIAL PERFORMANCE RESULTS

To study social performance, we follow recent work that has used the OSHA data to study enforcement and disclosure effects on workplace safety (e.g., Johnson [2020], Heese, Cavazos, and Silva [2023], Leonelli [2023], Raghunandan and Ruchti [2024]). We limit our sample to acquired facilities because the OSHA data are not in a panel format. To study facilities with potential for improvement in social outcomes, we construct the sample based on facilities with OSHA data both before and after a PE buyout and at least one workplace safety violation or inspection in the preperiod. Using data from five years before and after these buyouts, we cover approximately 25,000 U.S. facility-year observations in the period 2000–2022. Due to the count nature of the data, we estimate a Poisson specification as recommended in Cohn, Liu, and Wardlaw [2022], including both facility and state-year fixed effects. As in our tests using the EPA TRI data, we cluster standard errors by state-year.

TABLE 7
PE ESG Disclosures and Portfolio Company Workplace Safety Outcomes (OSHA)

	(1) *Inspection - Complaints (Count)*	(2) *Inspection - Planned (Count)*	(3) *Violations (Count)*
*High Social Discl.$_{i0}$ * Post Deal Period*	−0.40*	−0.06	−0.11
	(0.21)	(0.21)	(0.20)
Post Deal Period	−1.81***	−1.40***	−1.69***
	(0.10)	(0.14)	(0.09)
Observations	23,783	24,476	48,492
Pseudo. R^2	0.216	0.284	0.357
Facility FE	Yes	Yes	Yes
State-Year FE	Yes	Yes	Yes

This table provides results of regressions which model facility-level labor outcomes from OSHA as a function of PE firm investments and the level of PE firms' social disclosures using triple-difference specifications. Column 1 uses the following Poisson fixed effects specification.

$$Inspections\text{-}Complaints(Count)_{f(i,s),t} = \alpha_0 + \beta_1 High\ Social\ Discl._{i,t=0} * Post\ Deal\ Period_{f,t} + \beta_2 Post\ Deal\ Period_{f,t} + \alpha_f + \alpha_{s,t} + \varepsilon_{f,t}$$

The unit of observation is the facility-year [$f(i, s)$, t], where a facility is acquired by PE firm i and located in state s in the period 2000-2022. Variable definitions are provided in appendix A. The coefficient of interest is β_1. *High Social. Discl.$_{t=0}$* is an indicator variable equal to 1 if the *Log. Social Ratio* of PE firm i is in the top quartile of its distribution in the year of the PE buyout deal. Robust standard errors are clustered at the facility state-year level and are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

The result in column 1 of table 7 suggests that the number of facilities' workplace safety inspections due to complaints decreases significantly after deals by PE firms with high social topic disclosures. The coefficient of −0.40 (p-value of 5.2%) suggests that the number of complaints decreases by around 33%. We document a small statistically insignificant coefficient for planned inspections, suggesting the result is not driven by economic activity changes. In column 3, we also document a reduced number of violations with a relative effect size of approximately 11%, though the associated coefficient remains statistically insignificant. Our results suggest that PE firms with a high level of voluntary disclosures of social issues invest in portfolio companies that succeed in strongly managing the workplace complaints downwards. However, the actual number of workplace safety violations does not seem to change much when compared to the large and statistically significant reduction of 22% in response to OSHA inspections as documented in Raghunandan and Ruchti [2024].

5.4 REPUTATIONAL RISK AND GOVERNANCE PERFORMANCE RESULTS

We finally examine ESG-related reputational risk using the Reprisk database. Prior research has used these data to measure negative media coverage of CSR risks (Darendeli et al. [2022]) and to proxy for ESG-governance issues detected by auditors (Burke, Hoitash, and Hoitash [2019], Burke [2021]). We successfully merge portfolio company-level in-

TABLE 8
PE ESG Disclosures and Portfolio Company ESG-Reputational Risk

	(1) *Reprisk Index*	(2) *Reprisk Rating*
High ESG Discl$_{t0}$ * *Post Deal Period*	−0.29*	−0.06**
	(0.17)	(0.02)
Post Deal Period	1.17***	0.06**
	(0.13)	(0.02)
Observations	35,33,574	35,33,574
Adj. R^2	0.186	0.702
Portfolio Company FE	Yes	Yes
Country-Year FE	Yes	Yes

This table provides results of regressions which model portfolio company-level ESG-related reputational risk from Reprisk as a function of PE firm investments and the level of PE firms' ESG disclosures using triple-difference specifications. Column 1 uses the following OLS model.

$$Reprisk\ Index_{p(i,c),t} = \alpha_0 + \beta_1 High\ ESG\ Discl._{i,t=0} * Post\ Deal\ Period_{p,t} + \beta_2 Post\ Deal\ Period_{p,t} + \alpha_f + \alpha_{c,t} + \varepsilon_{p,t}$$

The unit of observation is portfolio company-year [$p(i, c)$, t], where a portfolio company is acquired by PE firm i and located in country c in the period 2007–2022. Variable definitions are provided in appendix A. The coefficient of interest is β_1. *High ESG Discl.*$_{t=0}$ is an indicator variable equal to 1 if the *Log. ESG Ratio* of the PE firm i that acquired the portfolio company p is in the top quartile of its distribution in the year of the PE acquisition. Robust standard errors are clustered at the portfolio company country-year level and are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

formation from RepRisk to 3,865 portfolio companies in 84 countries, owned by 1,285 unique PE firms. The sample period is 2007–2022 with the United States, China, and the United Kingdom accounting for almost 35% of the 3.5 million sample observations. We then use our baseline empirical strategy based on equation (3) with portfolio company and country-year fixed effects and cluster standard errors at the country-year level.

Table 8 reports results. Based on an unconditional sample mean in the RepRisk index of 2.11, the estimate on column 1 suggests that portfolio companies' ESG-related reputational risk decreases by approximately 14% after investments by PE firms with high ESG disclosures relative to that of companies acquired by low ESG disclosure PE firms. Column 2 shows consistent results when using the RepRisk rating.

5.5 DISCUSSION OF ESG OUTCOME RESULTS

Collectively, our findings suggest that portfolio companies of PE firms with more environmental disclosures increase environmental performance after receiving the PE investment. In contrast, portfolio companies owned by low-disclosure PE firms see no change. Moreover, companies in the portfolios of high–ESG-disclosure PE firms experience a significant decrease in workplace safety complaints and ESG-related reputational risk. These supplementary findings indicate that also social outcomes and the perception of ESG practices by external parties (media) improve for portfolio companies backed by PE firms with greater ESG disclosures.

We acknowledge that the relationship between voluntary disclosures and associated outcomes may not be causal (Leuz and Wysocki [2016], Christensen, Hail, and Leuz [2021]). A concern in our case is that PE firms might target better ESG-performing companies and thus discuss more about ESG. However, our tests closely compare ESG outcomes of similar PE-backed companies that experience the same general economic and regulatory trends within geographies or industries. Thus, we interpret our results as evidence that the level of ESG disclosure provided by PE firms can, on average, serve as a good indicator of ESG outcomes for portfolio companies. This suggests that some, but not necessarily all, PE firms play an active role in shaping ESG outcomes. Our findings underscore the role of transparency and proactive ESG measures in the PE space, and more research in this area is needed.

6. *Robustness and Supplementary Analyses*

We conduct an extensive set of tests to support our interpretation that LPs' information demand likely is an important determinant of PE firms' ESG disclosures and that these disclosures are in line with actual, ex- post portfolio company-level outcomes. First, we connect the analyses in the two parts of our paper by rerunning our main test on LPs' information demand after limiting the sample to PE firms included in the different ESG outcome subsamples in tables 6 to 8. We continue to find robust results across all outcomes-based subsamples, suggesting our results are not subject to subsample selection issues and that those PE firms increasing ESG disclosures due to LP information demand make real actions consistent with the disclosures (online appendix table OA.13). Further consistent with this interpretation, we find qualitatively similar results on ESG outcomes when we predict changes in ESG disclosures using changes in PE firms' exposure to ESG-focused LPs. Second, we address that the significant positive time trend in ESG disclosures as evident in figure 2 could mechanically drive our results even after controlling for year and PE firm size group-year fixed effects. We document consistent results for the main tests on LPs' information demand and toxic chemical release outcomes after detrending *Log. ESG Ratio* or including a separate linear time trend for specific PE firm size groups (untabulated).

Finally, we address measurement issues and find further support for our inferences. Specifically, our results are robust to using the IHS transformation of the ESG ratio, using alternative standard error clustering choices, directly purging regressions from the time-series correlation between ESG disclosures and overall disclosure amounts (website size control), weighting regressions based on the PE firm size or total emission levels in the environmental outcome tests, and excluding deals of low environmental disclosure PE firms and solely using non-PE-backed companies as controls (untabulated).

7. *Conclusions*

Our study offers the first systematic evidence on voluntary ESG disclosures of PE firms. Using a dictionary-based approach and historical website data, we develop a novel measure of voluntary ESG disclosures for a global PE firm sample in the period 2000–2022. Our measure identifies PE firms' commitment to sustainable investment strategies and portfolio companies' ESG activities. We document that PE firms' ESG disclosures have been strongly growing in the last 20 years. Our results also show that PE fund investors' demand for sustainable investment opportunities is a key determinant of these disclosures. On the ESG outcome side, we find that portfolio companies' ESG performance improves after deals by PE firms that have high ESG disclosures. Collectively, our evidence suggests that, although PE firms' ESG disclosures are voluntary and intend to attract capital, on average, PE firms exhibit investment strategies that are consistent with the promise in their ESG disclosures.

Our evidence fills a void in existing research by examining the nature and extent of voluntary ESG disclosures of PE firms that typically face lax disclosure regulation but control a substantial fraction of worldwide economic activity and can thereby directly impact corporate sustainability. The finding that the voluntary ESG disclosures are, on average, in line with actual ESG outcomes is likely attributable to the monitoring function of LPs as sophisticated and powerful institutional investors in PE. This finding also informs the recent debates around the need for more financial disclosures in PE and ESG disclosure regulation more broadly.

We believe future research can build on our global panel of PE firms' ESG disclosure data to examine other important determinants of voluntary PE firm disclosures as well as the broader economic consequences of ESG investing and disclosure in the growing private capital space. In addition, future research could employ our measures to study outcomes at the aggregate industry-country level (e.g., Breuer [2021], Breuer and Breuer [2023]), at the level of non–PE-owned peer firms potentially learning from these disclosures (Bernard, Kaya, and Wertz [2021], Breuer [2022]), or in terms of capital reallocation across private and public securities (e.g., Kim and Olbert [2022], Minnis [2022], Baik, Berfeld, and Verdi [2023]). Further analyses could also exploit more nuanced settings and cross-sectional differences in PE firms' exposure to social and political pressures to focus on greenwashing and inform regulators who are concerned about PE firms' lack of transparency.

APPENDIX A: VARIABLE DEFINITIONS

Variable	Definition & Source
PE Firm Website Disclosure Variables	
Word Count	Sum of all words in a firm's website (Source: Wayback Machine)
Website Size (in MB)	Size of a firm's website in megabytes (Source: Wayback Machine)
ESG Words	Sum of all ESG-dictionary words in a firm's website.
Environmental Words	Sum of all environmental-dictionary words in a firm's website.
Social Words	Sum of all social-dictionary words in a firm's website.
Governance Words	Sum of all governance-dictionary words in a firm's website.
Positive Words	Sum of all positive words in a firm's websites from the Loughran-McDonald list
Valuation Words	Sum of all valuation words in a firm's websites from the American Institute of Certified Public Accountants (AICPA) valuation glossary.
LP ESG Information Demand Variables	
Post PRI Investor Present	Indicator variable equal to 1 when a UN PRI signatory is an investor (LP) in a PE firm's fund
Log. PRI Investors	Natural logarithm of the sum of UN PRI signatories that are investors (LP) in a PE firm's fund
Log. Wgtd. PRI Investors	Natural logarithm of the weighted sum of UN PRI signatories that are investors (LP) in a PE firm's funds. Weights are the ratio of the fund size (in USD) that the UN PRI LP has invested in to the total funds (in USD) managed by the PE firm
LP ESG Reg. Exposure	The sum-product, in a year, of a PE firm's funding exposure to a given country and an indicator variable equal to one if there is an ESG disclosure mandate active in the year for publicly listed firms in that country. Funding exposure is the number of distinct LP commitments across all funds of a PE firm in a given country and year scaled by the total number of active funds of the PE firm in the same year.
- Fundraising Variables	
USD Mn Raised/6 mo Fundraising	Funds raised (in USD million) by a PE firm in a period of six months
PRI Investor in Fundraise	Indicator variable equal to 1 when a PE investor (LP) that is a UN PRI signatory invests in the fund raised by the PE firm. Multiplied by 100 for ease of interpretation in regressions.

Variable	Definition & Source
- Toxic Release Variables from EPA TRI	
Total Onsite Release	Total release of a chemical at the site of a facility (in Pounds)
Industry Benchmark	Average of the facility-level total release of a chemical across all facilities that belong to the same industry in a year
- Emissions from Trucost	
Scope 1 Emissions	A company's direct greenhouse gas (GHG) emissions from owned or controlled sources (in metric tons of $C0_2$ equivalent)
Scope 2 Emissions	A company's indirect GHG emissions associated with the purchase of energy (in metric tons of $C0_2$ equivalent)
Scope 3 Emissions (Upstream)	All indirect GHG emissions (not included in scope 2) in the upstream value chain (in metric tons of $C0_2$ equivalent)
- Inspections/Violations from OSHA	
Inspections - Complaints	A facility's number of inspections due to complaints conducted by OSHA
Inspections - Planned	A facility's number of planned inspections conducted by OSHA
Violations	A facility's number of violations of OSHA standards
- ESG Rating/Index from Reprisk	
Reprisk Index	Variable from 0 to 100 quantifying a company's exposure to media and stakeholder attention regarding ESG and business conduct risks
Reprisk Rating	Company-specific ESG Reprisk Index variable benchmarked against country and industry-sector averages
- Validation Variable	
Post UN PRI Pledge (PE Firm)	Indicator variable equal to 1 in years post the signing of the UN PRI pledge by a PE firm
- Control Variables from World Bank	
The below variables are calculated for a PE firm-year as a weighted average across all countries where LPs invested in the PE firm's funds are located. The weights are equal to the funding exposure of a PE firm to a country as defined for equation (2)	
Log. GDP	Log. GDP (current USD)
GDP Growth	GDP growth (annual %)
Log. Population	Log. Population (total)
Labor Force (%)	Labor force participation rate, total
Female Representation (%)	Proportion of seats held by women in national parliaments (%)

This table provides definitions for variables used throughout the analyses. Time subscripts are omitted for brevity. The table is structured into the different types of variables used in the analysis: PE firm website disclosure variables are constructed using websites scraped from the Internet Archive's Wayback Machine (available at https://archive.org). LP ESG information demand variables and fundraising variables are from Preqin, portfolio company ESG outcome variables are from EPA TRI, Trucost, OSHA, and Reprisk, and control variables are from the World Bank. Disclosure word counts are based on dictionaries provided in the online appendix tables OA.1, OA.2, and OA.3. Based on the disclosure variables, we construct log ratios for our analysis. Our main variable of interest, *Log. ESG Ratio*, is $\ln(1 + ((ESG\ Words * 10,000)/Word\ Count))$. EPA-TRI toxic release and OSHA labor inspection variables are measured at the U.S. facility-year level (facilities are operated by portfolio companies). Trucost emission and Reprisk variables are measured at the PE portfolio company-year level. All other variables are measured at the PE firm-year level.

APPENDIX B: ECONOMIC FRAMEWORK

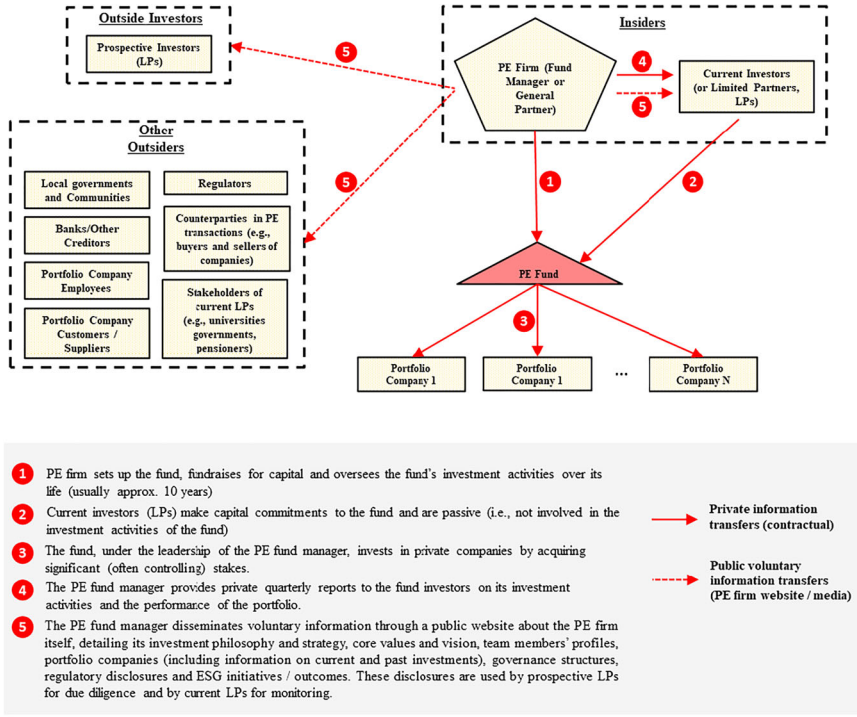

FIG. B1.—Illustration of PE industry's institutions and players. This figure presents the conceptual and institutional framework of our study. Red solid lines and arrows represent private information transfers. Red dashed lines and arrows represent public voluntary information transfers. Numbered red circles refer to the players' interactions as discussed in section 2.1. Private information transfer exists between the PE firms' managers, also called general partners (GPs), and current investors in a PE firm's fund, also called limited partners (LPs). Publicly disclosed information (voluntary or otherwise), including the information disclosed on the websites, is for the benefit of potential new investors and other stakeholders.

APPENDIX C: CALCULATION OF DICTIONARY-BASED ESG DISCLOSURE MEASURE

As an example, consider the archived website for an illustrative PE firm, ABCD Capital, which has a public website in English in 2015.[17] We extract all textual content from all subpages of ABCD Capital's website that was archived on December 31, 2015. The following table illustrates this hypothetical sample of webpages:

ABC Capital 2015 Snapshot	Word Count	ESG Words	Envir. Words	Social Words	Gov. Words
Page 1	20,000	5	2	2	1
Page 2	30,000	10	4	2	4
Page 3	25,000	400	134	88	150
Page 4	100,000	15	8	0	7
Page 5	60,000	125	100	20	4
Page 6	215,000	50	50	0	0
Page 7	20,000	15	10	0	4
Page 8	75,000	5	1	2	2
Page 9	10,000	35	15	10	10
Page 10	45,000	10	5	3	2
Total	600,000	670	329	127	184
Log. ESG Ratio	2.50				
Log. Envir. Ratio	1.87				
Log. Social Ratio	1.14				
Log. Gov. Ratio	1.40				

In this example, there are a total of 10 pages in the archived website of ABCD Capital in 2015. The 10 pages consist of the main landing page (page 1) and nine subpages that the user can reach through clickable links. Thus, these pages are part of a hierarchical tree. The "Word Count" column in the table shows the total number of words on each page and the "ESG Words" column shows the number of ESG-related words (based on the ESG dictionary; see the online appendix table OA.1) on each page. The total number of words (ESG words) in the December 31, 2015 website archive of ABC Capital is 600,000 (670). The ESG Ratio is the number of ESG words per 10,000 words:

$$ESG\ Ratio = \frac{670}{600,000} * 10,000 = 11.167.$$

[17] We rely on the English language filter because all our dictionaries (ESG and others) are in English. We use the Python package "pycld2" to determine the language of the website. This package is a part of Google's language detection library that supports over 165 languages. We drop a small number of websites with an Alexa rank of below 10,000. This imposition of the Amazon Alexa rank filter allows us to remove websites that see abnormally high traffic and are primarily unrelated to PE information. In these cases, the URL provided by Preqin was likely inaccurate and often leads to generic websites like search platforms.

The *Log. ESG Ratio* is thus defined as follows:

$$Log.\ ESG\ Ratio = \log(1 + ESG\ Ratio) = \log(1 + 11.167) = 2.50.$$

The calculation of *Log. Envir. Ratio, Log. Social Ratio*, and *Log. Gov. Ratio* is:

$$Log.\ Envir.\ Ratio = \log(1 + Envir.\ Ratio) = \log\left[1 + \frac{Envir.\ Words}{Word\ Count}\right] = 1.87,$$

$$Log.\ Social\ Ratio = \log\,(1 + Social\ Ratio) = log\left[1 + \frac{Social\ Words}{Word\ Count}\right] = 1.14,$$

$$Log.\ Gov.\ Ratio = \log\,(1 + Gov.\ Ratio) = log\left[1 + \frac{Gov.\ Words}{Word\ Count}\right] = 1.40.$$

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