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ABSTRACT

When do multinational corporations (MNCs) derive the most from internalizing the transfer of proprietary technological knowhow? We revisit this question, which lies at the core of theories on multinationality and performance, from the perspective of corporate strategy involving the mix of green versus non-green innovation effort and a foreign operations focus on countries with high-versus-low environmental standards. We find that high exposure to foreign markets with more stringent environmental regulations stimulates MNCs' green patent applications. We further show that MNCs' environmental competitive advantage obtained through green innovation activities, coupled with exposure to foreign countries with high environmental standards, increases firm value in the long run. However, this long-run advantage produces economic rents only when foreign countries have a common-law legal system, effective government, and high growth. Finally, the pursuit of green (or even non-green) innovation while competing in polluting industries is positively associated with market value. Overall, our study highlights that green technology development is a main source of value creation for multinationals.

JEL classification: F23, Q32, Q51, Q55
Keywords: Multinationality, environmental regulations, corporate environmental strategy, green innovation, firm value

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1. Introduction

The theory of international business (e.g., see Caves, 1974; Buckley and Casson, 1976; Hennart, 1982; and among many others) posits that multinational corporations (MNCs) possess proprietary knowhow and expertise that offer a competitive advantage over local corporations in foreign markets. By internally deploying firm-specific intangible assets into their foreign market's operations, MNCs can increase efficiency, avoid costs of external contracting, and therefore accrue economic rents. Although empirical tests of this conceptually appealing theory have provided a broad range of findings,[1] the consensus supports the notion that multinationality enhances the value-relevance of intangibles but also has its own intrinsic value separate from intangibles.[2] This paper explores the source of value creation in corporate multinationality from a perspective of corporate strategy involving the mix of foreign market focus and green technology development. This empirical investigation acknowledges the importance of national institutions to support innovative activity in a world where such activity has itself become largely internationalized (Carlsson, 2006) and intents to shed light on the value implications of location choice (Siedschlag *et al.,* 2013) for green technological development.

[1] For instance, Denis, Denis, and Yost (2002) show that firms with geographical diversified segments underperform relative to firms with a single-nation segment. A possible driver of the negative relation between geographical diversification and firm value is that the multinationality is also associated with higher monitoring costs and more severe agency problems as reflected in differences in MNC and domestic firms' capital structure. Errunza and Senbet (1981) is an early study that established a positive link between corporate internationalization (i.e., multinationality) and firm value. Kim, Hwang, and Burgers (1989) find a positive relation between global diversification and profitability, especially when diversification takes place across unrelated industries. Morck and Yeung (1991) show that the interaction of multinationality and R&D spending is positively associated with firm value, implying that intangible assets that MNCs possess are a source of value creation.

[2] Kirca *et al.* (2011) use a meta-analysis of 120 independent samples reported in 111 studies to confirm the predictions of internalization theory in the context of the multinationality-performance relationship. Their findings indicate that multinationality provides an efficient organizational form that enables firms to transfer their firm-specific assets across borders to generate higher returns in international markets. Furthermore, their evidence also suggests that multinationality has intrinsic value above and beyond the intangible assets that firms possess.

We first investigate whether MNCs adjust their green technology development based on their degree of exposure to foreign markets with more (less) stringent environmental regulations. Over the years, costs of compliance with new environmental regulations have rapidly risen as global environmental standards have become increasingly stringent. Accordingly, MNCs are forced to choose their best environmental strategies to cope with rising international environmental pressure (see Dechezleprêtre, Neumayer, and Perkins, 2015; Letchumanan and Kodama, 2000). Our empirical method accounts for the degree of environmental pressure, by differentiating between the percentage of foreign sales in countries whose environmental regulations are more stringent ($Foresale^{HIGH}$) and in countries where environmental pressure is low ($Foresale^{LOW}$). We quantify corporate environmental strategy in terms of efforts to develop green innovation using counts of patent applications associated with environmental protection. We find that the percentage of foreign sales in countries with stronger (weaker) environmental regulations than those of the MNC's home country is positively (negatively) associated with MNC green patent applications. This finding supports the notion that MNCs' exposure to markets with more environmental pressure can drive green innovation effort and is broadly consistent with Calel and Dechezleprêtre (2016) who show that European firms increase the number of patent applications related to low-carbon technology by 36% compared with non-European matched peers after the initiation of the 2005 European Union Emissions Trading System (EU ETS).

We next test whether MNCs' environmental competitive advantage (obtained through patent stocks related to environmental protection) becomes capitalized, resulting in higher market value, and under what conditions.[3] Porter (1991) and Porter and van der Linde (1995) argue that one of the bright

[3] A voluminous amount of research shows that corporate research and development intensity or innovation is positively associated with earnings and stock returns (e.g., Chan, Lakonishok, and Sougiannis, 2001; Sood and Tellis, 2009). In addition, a large number of studies provide evidence that multinationality enhances the value relevance of intangibles [e.g., Morck and Yeung (1991), Allen and Pantzalis (1996), and Pantzalis (2001)].

sides of having more stringent domestic environmental regulations is motivating firms to be more innovative. Products and services based on green innovation may thus potentially create a competitive advantage for MNCs over peers not equipped with ecofriendly mindsets in new foreign markets. We report a positive, long-term value impact of green innovation measured by environmental patent counts when coupled with a focus in countries with stronger environmental regulations than those of the MNC home country (i.e., business with high environmental pressure). This finding is consistent with prior research documenting the notion that good environmental performance is slowly incorporated into firm value (Derwall *et al.*, 2005). Our results further indicate that environmental competitive advantages are creating value in the long run when MNCs use them to penetrate foreign markets with strong environmental regulations.

We next explore different subsamples in order to gain more insight into the possible drivers of the above described, i.e., main results. We explore whether the results are industry-driven, i.e., more pronounced in industries that are subject to greater environmental pressure, or where there is greater demand for green innovation, such as polluting industries. We also investigate whether MNC home country characteristics are important in shaping an MNC's ability to exploit its innovation efforts. Specifically, we use measures of investor protection, government effectiveness, and economic growth as proxies for a home country environment that fosters innovative activity. We show that the combination of green innovation and MNC exposure to high environmental regulation standards creates value in polluting industries only, which is consistent with the notion that environmental pressure is stronger in such industries. We also find that the value impact from green innovation's coupling with environmental pressure only materializes if the MNC home country abides by the common law and has an effective government and a growing economy, all indicators of an innovation-friendly home market environment. Interestingly, for MNCs from such home countries, green innovation can generate economic rents even when environmental pressure is low, albeit this effect is just short term. Moreover, for MNCs from these home countries, which are also exposed to markets with high environmental standards, even non-green innovation can be value enhancing. Finally, we also find that non-green innovation coupled with exposure to high (low) environmental pressure can be value enhancing (reducing) in the short- and long-term (short term), unless the MNC's exposure is in a polluting industry, in which case non-green innovation is always value enhancing. Overall, these findings suggest that innovation is value-enhancing when coupled with market exposure to environmental pressure.

To mitigate concerns about endogeneity due to omitted variable(s), we run a test that exploits the 2005 launching of the European Union Emissions Trading System (EU ETS), the cornerstone of EU's environmental policy aimed at reducing greenhouse gas emissions.[4] Effectively, the ETS raised the environmental compliance costs associated with doing business in the European Union. We compare firm value between two groups of U.S. firms in three years surrounding 2005. The first group (i.e., treatment group) consists of U.S. firms that have a high percentage of European foreign sales (i.e., whose European foreign sales are greater than the median value of our sample's European foreign sales); the other group (i.e., control group) consists of U.S. firms that have no foreign sales (i.e., single-geographic-segment U.S. firms). We find that green patents significantly increase treated group firms' long-term value after the enforcement of the EU ETS.

Our study contributes to the literature that focuses on the merits of corporate internationalization by presenting empirical evidence that green technology development is a core source of value creation from multinationality.[5] Our study highlights that technological knowhow

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[4] The EU ETS is applied to more than 11,000 manufacturing facilities and power stations residing in 31 European countries (28 EU members plus Iceland, Liechtenstein, and Norway). The primary purpose of the EU ETS is limiting carbon emissions and imposing a cap for emission with heavy fines if firms produce emissions over their allowance. See this website: https://ec.europa.eu/clima/policies/ets_en

[5] Desai, Foley, and Forbes (2008) find that MNCs increase capital expenditure compared with domestic firms upon a currency crisis. In a similar vein, Jang (2017) shows that MNCs are less likely to be financially constrained than single-nation firms, especially when facing a financial crisis. Rego (2003) finds that MNCs are better able to pay lower taxes than

offers MNCs a competitive advantage in foreign markets, and that this advantage translates into excess value when environmental compliance costs reduce the level of competition. We further show that proactive environmental technology development is one of the mechanisms through which MNC intangibles can create value.

Our findings also contribute to the literature that studies the impact of the environmental regulation stringency of corporate foreign markets on corporate innovation. Consistent with Porter (1991), Jaffe and Palmer (1997), and Calel and Dechezlepretre (2016), we find that domestic stringency of environmental policies is positively associated with green patent development. Our study further adds to the line of research documenting that the structure of foreign sales can affect the value impact of firms' green patenting activities.

Last, our research adds to the growing corporate social responsibility (CSR) literature in the sense that environmental sustainability is a part of CSR. Extant literature has shown mixed evidence on the effect of CSR on firm value. One line of research views (e.g., Frideman, 1970; Cheng, Hong, and Shue, 2013; Masulis and Reza, 2014; Kruger, 2015) CSR as a waste of shareholders' resources, which are often disbursed by managers' interests, whereas another line of research supports the notion that corporate social commitment (e.g., protecting the environment) not only increases short-term profit maximization (e.g., Flammer, 2013; Flammer, 2015) but also is a good long-term investment to build corporate reputation. Overall, our results are broadly consistent with the latter group of research studies in line with Jensen's stakeholder theory (2001).

The remainder of the paper is organized as follows. Section 2 discusses the related literatures. Section 3 describes the data and the sample. Section 4 presents the empirical results. Section 5 concludes.

domestic firms. Further, Morck and Yeung (1991) demonstrate that MNCs with high levels of proprietary knowhow experience positive firm performance.

2. MNC strategy, green innovation, and their value implications

Corporate business is becoming increasingly more global. According to the S&P 500 Dow Jones Indices, over 40% of total sales of companies in S&P 500 have been generated from foreign markets over the last decade.[6] Among firms listed in Worldscope, about 25.1% of firms (15.8% of U.S. firms) are classified as multinational corporations[7] in 1995, and the proportion increases to 51.3% (40.6%) in 2014. While international expansions offer better opportunities to grow, several additional risks also continue to arise. One of recent challenges associated with international business emerges from increasing worldwide efforts concerning environmental preservation. For multinational corporations, it is important to adjust corporate environmental strategies to meet the country-specific environmental standard of current and potential business partners.

Inspired by the extant literature, we broadly sort corporate environmental strategies coping with global environmental pressure into two groups. First, it can be argued that, although corporate environmental commitment could help the environment, it also might hurt businesses by lowering corporate investment, decreasing production efficiency, impairing product market competition, and reducing, at least in the short-term, profitability. Extant literature (e.g., Gollop and Roberts, 1983; Murphy, 2004) also shares concerns that countries like the U.S., where stringent environmental standards are enforced, may curb domestic (manufacturing) firms' abilities to compete in international product markets. Therefore, the first group of MNCs consists of those that undertake more evasive strategies aimed at minimizing the costs of environmental regulations. Those MNCs primarily attempt to exploit cross-country differences in environmental regulations costs by shifting facilities

[6] https://us.spindices.com/indexology/djia-and-sp-500/sp-500-global-sales

[7] Multinational corporations are defined as if their foreign sales account for more than 20% of total sales (Denis *et al.*, 2002).

manufacturing toxic products to countries where environmental regulations are less strict than in their home country (i.e., pollution haven hypothesis) and by somewhat overlooking green innovation.[8] Such strategy can have dual benefits. MNCs could not only save compliance costs by avoiding tight environmental regulations, which could result in attracting foreign investors (Xing and Kolstad, 2002), but could also avoid risky (going-green) projects embedded in high uncertainty about future cash flows.

Some environmental advocates, however, warn that, ultimately, the above-described strategy may cause reputational damage for MNCs, which could be depicted as the main culprits that create the negative externality (i.e., aggravating pollution) that lowers social welfare in spite of the financial benefits of investing more in countries with less strict environmental regulations (i.e., "race to the bottom" in environmental quality). Accordingly, there exists a second group of MNCs consisting of firms more likely to take a proactive approach in preserving the environment, based on the expectation that corporate environmental performance can boost firm value or perhaps partly due to social pressure. Indeed, both anecdotal and empirical evidence support the notion of a positive relation between corporate environmental performance and profitability.[9] This line of research, overall, shows

[8] For example, a 1991 U.S. General Accounting Office survey documents that 2,675 wood furniture companies in Los Angeles moved their facilities to other areas in the United States or to Mexico to lower labor and environmental compliance costs. Keller and Levinson (2002) show that the state level pollution abatement costs are negatively associated with the inflow of foreign direct investment (FDI), implying that foreign investment favors places where expenditures necessary to meet environmental requirements are lower.

[9] For example, the Guardian (see hyperlinks below) reports that DuPont reduced 65% of its greenhouse gas emissions over a recent 10-year period, resulting in $2.2 billion annual saving due to energy efficiency. Toyota has already started implementing an environmental action plan aiming to reduce vehicle emissions and improve fuel efficiency. The British Petroleum (BP)'s oil spill into the Gulf of Mexico and its failure to address environmental issues in a timely manner became an enormous financial liability. Recent studies also argue that MNCs can often conform to social pressure and become motivated to maintain a high level of environmental performance. Christmann and Taylor (2001) show that the level of foreign ownership and the percentage of sales to developed countries are positively associated with the adoption of ISO 14000, a family of standards related to environmental management. Eskeland and Harrison (2003) find that foreign firms pollute less than domestic firms in developing countries. Christmann (2004) show that social pressure from corporate external stakeholders (e.g., government, industry, and customers) improves quality of internal corporate environmental management.

https://www.theguardian.com/sustainable-business/environmentally-friendly-sustainable-business-profitable
https://www.theguardian.com/environment/2016/apr/04/bp-oil-spill-judge-grants-final-approval-20-billion-dollar-settlement

that those MNCs that self-regulate their global businesses are more environmentally friendly and strive to develop green innovation.

To gauge the effectiveness (in terms of their value implications) of corporate environmental strategies, we examine the firm-level green innovation that appears in patenting activities. Green innovation activities involve multidimensional plans and actions aimed at achieving a competitive advantage in product market (i.e., through green product development), along with preserving the environment in terms of energy savings, pollution reduction, and waste recycling (Arundel and Kemp, 2009). Focusing on the economic effect[10] of corporate green innovation, a growing body of literature has shown a positive link between good environmental management and market valuation (e.g., Klassen and McLaughlin, 1996; Eichholtz, Kok, and Quigley, 2010; Guenster *et al.*, 2011). Moreover, Fernando, Sharfman, and Uysal (2017) document that firms with low environment risk exhibit higher firm value than other matched firms by attracting environment-sensitive institutional investors. Russo and Fouts (1997) further argue that new investments aimed at transitioning to clean technology can lead to the redesign of the manufacturing process or final products and eventually to improved upward product market competitiveness. Han, Yu, and Kim (2019) find that strong environmental performance increases corporate brand image and, thus, customers' loyalty in the airline industry.

Equally importantly, the failure of conforming to environmental regulations could result in penalties, sanctions, or litigations. For instance, Karpoff, Lott, and Wehrly (2005) show that, on average, firms experience market value losses of 1.68% on the announcement of environmental violation news, an effect similar to that of legal penalties. Chava (2011) finds a positive association between corporate environmental concerns and the cost of capital. Flammer (2013) show that the magnitude of the negative market reaction on corporate "eco-harmful" behavior increases over time,

[10] Rugman and Verbeke (1998) show that the corporate response to environmental policies primarily depends on its expected economic benefits.

while that of the positive market reaction on corporate "eco-friendly" behavior decreases over the corresponding periods. Based on the aforementioned evidence, we can infer that taking actions to develop clean technology is imperative not only in terms of increasing firm value but also in terms of avoiding potential financial losses.

The preceding discussion motivates the United States to investigate the value implications of green and non-green innovation that MNCs choose to adopt under varying degrees of global environmental pressure. Accordingly, we first examine whether the structure of foreign sales after conditioning on foreign market stringency of environmental standards is correlated with the intensity of MNCs' green innovation activities. Subsequently, we test the hypothesis that foreign market location choice in conjunction with a firm's innovation activities can have market value implications. Since environmental outperformance is only slowly incorporated into firm value (Derwall *et al.*, 2005), we also check the time horizon over which green and non-green technology development coupled with a geographic focus (in high versus low environmental regulation compliance cost countries) is eventually capitalized into MNCs' valuation.

3. Data

3-1) Environmental databases

We construct our sample by combining information from several sources. First, we obtain the country-level environmental stringency index from the OECD website.[11] The index aggregates information on the domestic environment-related policies (e.g., environment-related taxes, feed-in-tariff, and R&D subsidy) scored on a 0 (least stringent) to 6 scale (most stringent) for 29 countries (all 23 OECD countries plus Brazil, China, India, Indonesia, Russia, and South Africa) from 1990 to 2012. The index score, which measures the difference in the strength of environmental policies between the

[11] https://stats.oecd.org/Index.aspx?DataSetCode=EPS

headquarters and subsidiaries' countries, is assigned to each country and year (Javier *et al*., 2012). To identify places where foreign sales take place, we obtain corporate sales information by geographic segment (e.g., the dollar value of sales per country) since 2002 from Factset.[12] Because the main interest of our study is testing the effect of MNCs' environmental performance on firm value, we limited our analysis to firms residing in those countries and delete corporate foreign sales outside the 29 countries.

Based on the information compiled, we create *Foresale*, which is the percentage of foreign sales for firm *j* in a given year as a proxy for level of internationalization. To distinguish different levels of environmental stringency, we construct two additional variables, namely, $Foresale^{HIGH}$ and $Foresale^{LOW}$. Specifically, following Dyreng and Lindsey (2009), we define $Foresale^{HIGH}$ (or $Foresale^{LOW}$) as the percentage of foreign sales that incur in countries whose environmental stringency is higher (or lower) than that of the corporate home country. These variables allow us to identify the extent of the MNCs' foreign sales associated with the strength of environmental regulations.

To measure MNCs' green technology development, we use the patent applications reported in the Patent Network Dataverse managed by Harvard University.[13] The database includes a patent's applicant name, date, location, and class number for both U.S. and non-U.S. corporations for 26 years from 1975 to 2010. We conduct fuzzy matching, merging two databases by company names and locations, to link the unique patent number with GVKEY from Global Compustat. For ambiguous company names, we go through the matching manually. Thereafter, we classify patents as environment-related (or green) patents based on the primary class numbers[14] as was done by Carrion-

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[12] The Factset database provides geographically segmented corporate sales information for international firms since 2003. The Worldscope database by Thomson Financial also reports segmented corporate sales information since 1990, but about half of that is at the regional level.

[13] https://dataverse.harvard.edu/dataverse/patent

[14] The following patent class numbers indicate classification as an environmental patent; wind energy (242, 073, 180, 440, 340, 343, 422, 280, 104, 374), solid waste prevention (137, 435, 165, 119, 210, 205, 405, 065), water pollution (405, 203,

Flores and Innes (2010), Popp and Newell (2012), and Amore and Bennedson (2016). We then proxy environmental innovations by counting the total number of granted green patent applications and using in our tests their log-transformed value in year *t+1*, *t+2*, and *t+3*, namely, $Ln(GreenPat)_{t+1}$, $Ln(GreenPat)_{t+2}$, and $Ln(GreenPat)_{t+3}$, respectively. In our sample of firms, about 88.2% of all patents (or 87.1% of green patents) are filed in countries where corporate headquarters reside. Most innovation studies suffer from truncation problems, which involve the significant lag (average two to three years) between the year of the application and the year the patent was granted. Therefore, around the end of the sample period, the number of patents reported in the data set might be underreported compared to the actual number of patents, since many patent applications filed during those years would still be under review and not yet granted. To address this problem, we adjusted the number of patents using a "weight factor," i.e., by scaling the number of patents with the mean value of green patents in a given year and country (Hall, Jaffe, and Trajtenbert, 2001, 2005). After deleting firms in the finance industry and those with missing financial information, our final sample consists of 29,991 firm-year observations, across 20 countries spanning the period from 2002 to 2010.

3-2) Financial databases

We obtain financial and accounting information from Worldscope. To measure the long-term performance of multinational firms, we rely on Tobin's *q*, which has been a widely utilized in the literature to examine the variation of firm value under different firm structures (Chung and Pruitt, 1994; Berger and Ofek, 1995). Following Berger and Ofek (1995), we construct the Tobin's *q* proxy as the sum of market value of equity, the liquidating value of preferred stock, and the book value of

210), Recycling (264, 201, 229, 460, 526, 106, 205, 425, 060, 075, 099, 100, 162, 164, 198, 210, 216, 266, 422, 431, 432, 502, 523, 525, 902); alternative energy (204, 062, 228, 248, 425, 049, 428, 242, 222, 708, 976); alternative energy sources (062, 425, 222); geothermal energy (060, 436); air pollution control (123, 060, 110, 422, 015, 044, 423); solid waste disposal (241, 239, 523, 588, 137, 122, 976, 405); and solid waste control (060, 137, 976, 239, 165, 241, 075, 422, 266, 118, 119, 435, 210, 405, 034, 122, 423, 205, 209, 065, 099, 162, 106, 203, 431) (Carrion-Flores and Innes, 2010) debt divided by the book value of assets. Our tests' main dependent variable is the industry-adjusted version of Tobin's *q*, *TobinQ_adj*. As a robustness check, we also use the unadjusted Tobin's *q* and excess value (i.e., *ExcessVal*) as alternative proxies of firm value. A firm's excess value is computed as market value of equity minus book value of equity divided by sales. We also include a set of control variables in our analysis. Extant literature highlights the effect of industrial diversification on firm value. For instance, Berger and Ofek (1995) show that firms with multiple segments exhibit 13% to 15% diversification discount compared to firms with a single segment. It might be the case that geographically diversified firms are highly likely to be industrially diversified as well. To address this issue, we construct the Herfindahl index based on the amount of sales on top-five products, namely, HHI^{PROD}. The Worldscope database provides the segmented amount of sales per product as well as an SIC code associated with a product. High (low) value of HHI^{PROD} indicates that firms are less (more) diversified in their industrial products. Additional control variables include the following firm characteristics: 1) *Ln(MkCap)*, the natural logarithm of the market value of equity at the end of year; 2) *ROA*, earnings before interests and taxes divided by total assets; 3) *Cash*, cash divided by assets; 4) *Leverage*, long-term debts plus debts in current liabilities divided by total assets; 5) *Tangibility*, the net amount of property, plant, and equipment divided by total assets; 6) *R&D*, R&D intensity measured by the research and development expenditure divided by total assets; 7) HHI^{IND}, the Herfindahl index based on sales across the first two digits of SIC code and some country variables. The country-level control variables are 8) *Ln(GDPpa)*, log-transformed GDP per capita; 9) *Trade,* imports minus export divided by GDP; 10) *RuleLaw,* the index that measures quality of domestic laws; 11) *EPS*, environmental stringency index; 12) *PPindex*, intellectual property protection index; 13) *Educ*, public spending on R&D educations divided by GDP. In addition, $Ln(GpatStock)_{[t-1,t]}$, $Ln(GpatStock)_{[t-3,t]}$, and $Ln(GpatStock)_{[t-5,t]}$, are the log-transformed cumulative number of green patents from year *t*-*N* (*N*=1, 3, and 5) to year *t* by adding one. All variables are winsorized at their 1st and 99th percentile values.

3-3) Summary statistics

Table 1 provides detailed summary statistics. The median value of adjusted Tobin's *q* and excess value is slightly different from zero, which is consistent with the findings in Berger and Ofek (1995). The average percentage of foreign sales is about 27.5% for a typical firm, with 12.4% of them from the countries with more stringent environmental protection laws and the remaining 15% from the countries with less stringent environmental protection laws.

Insert Table 1 about here

In Table 2, we report mean values of the environmental stringency index, foreign sales, and green innovations by country. In our sample of firms, the country with strictest environmental protection law is Denmark with an EPS score of 3.56. On the other end of the spectrum, the country with the worst environmental protection law is Japan with an EPS score of 1.88. Sample firms from Switzerland, Denmark, and Ireland have high average foreign sales ratios, over 70% of total sales. Whereas Danish firms' foreign sales come primarily (almost 69%) from countries with less stringent environmental protection, Irish firms' foreign sales are mostly (53%) from countries with more stringent environmental protection. U.S. firms account for over 61.5% of our sample with an average $Foresale^{HIGH}$ of 12% and an average of $Foresale^{LOW}$ of 8%. On average, among the firms from the different countries in our sample, Danish (Greek) firms engage the most (least) in green technology development.

Insert Table 2 about here

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4. Empirical Results

4-1) Green technology developments

Christmann (2004) proposes two competing hypotheses on the role of MNCs in protecting the natural environment. On the one hand, MNCs are incentivized to exploit different environmental standards across countries by manufacturing "dirty" products in foreign countries with lax environmental regulations. On the other hand, faced with a different level of social pressure from stakeholders such as customers, MNCs are perhaps motivated to be proactive in protecting the environment and perhaps even to benefit from positively influencing public perception.

As such, we first test whether the structures of foreign sales, $Foresale^{HIGH}$ and $Foresale^{LOW}$, promote or demote MNCs' green innovation development. To measure a firm's green innovation activities, we count the number of applied patent applications related to environmental protection[15] (Carrion-Flores and Innes, 2010; and others) and use it by log-transforming its value plus one, $Ln(GreenPat)_{t+N}$ ($N=1, 2, 3$).

Table 3 reports the detailed results. From Column (1) to (3), the coefficients of $Foresale^{HIGH}$ are all positive and significant at the 1% level. More specifically, a one standard deviation increase in $Foresale^{HIGH}$ corresponds to an increase of about 3.35 (3.98)% in green patent applications at year t+1 (t+3). The result supports the viewpoint that MNCs actively engage in green technology development if they have many clients in countries with high environmental standards. We find opposite results with $Foresale^{LOW}$. The coefficients of $Foresale^{LOW}$ are all negative and statistically significant at the 1%

[15] Some examples on the patent applications associated with environment are as follows: 1) A process for the desulfurization of a sulfurous acid gas-containing waste gas by blowing the waste contact into an absorbing liquid through a plurality of sparger pipes is disclosed, wherein various operation conditions are specifically… (class:423); 2) The invention relates to a process for *ex situ* presulfurization of porous particles of a hydrocarbon hydroconversion catalyst that contains at least one metal or metal oxide, comprising bringing catalytic particles … (class:502); and 3) A refuse recycling system, which recycles municipal waste as energy, includes a shredder for shredding the waste and removing rejects via a feed pipe to a circulating fluidized bed reactor, the reactor producing flue gases. The reactor includes (class:110)

level suggesting that MNCs are less likely to engage in green innovation if a high percentage of their customers reside in countries with lax environmental requirements. Moreover, MNCs' green technology development increases with capital expenditures (i.e., manufacturing firms) and trading volume and also when the MNCs' home countries have high quality of rule and legal system, high spending on R&D education, and domestic stringency of environmental policies. These findings imply that the most significant determinants of corporate green innovation are institutional [also see Carlsson (2006)] rather than firm-specific factors, which contrast the findings in Francis *et al.* (2018).

Insert Table 3 about here

4-2) Effect of green innovation on firm value

In this section, we test whether and how MNCs' green innovation is translated into firm value. More specifically, we construct the following model:

$$TobinQ_{adj} = \alpha + Firm_i + Year_t + \beta_1 ForeSale(\%)^{HIGH\ or\ LOW} + \beta_2 Ln(GpatStock)_{[t-N,1]} + \beta_3 ForeSale(\%)^{High\ or\ Low} \text{ x } Ln(GpatStock)_{[t-N,t]} + \beta_4 X + \varepsilon_i \quad (1)$$

where *i* still denotes a firm, and *t* denotes a year. To capture a firm's short- and long-term green innovation development, we construct green innovation stocks at the firm level by accumulating granted patents during the past 1, 3, 5, or 7 years, $Ln(GpatStock)_{[t-N,\ t]}$ (*N=1, 3, 5, 7*). We then regress the interaction term between *Foresale* and $Ln(GpatStock)_{[t-N,\ t]}$ on firm value to see the effect of green innovation conditioning on the type of foreign sale, $Foresale^{HIGH}$ or $Foresale^{LOW}$, on firm value. Extant literature has documented the source of value creation for corporate internationalization if MNCs hold intangible assets that give a firm a competitive advantage in foreign markets (e.g., Morck and Yeung, 1991). To control for general innovation, we also include the interaction term of *Foresale* and

$Ln(NGpatStock)_{[t-N,t]}$, where $Ln(NGpatStock)_{[t-N,t]}$ is the log-transformed cumulative number of nongreen patents from year *t-N* to year *t*. Table 4 provides the detailed results.

Insert Table 4 about here

In the models shown in Columns (1) to (4), we use $Foresale^{HIGH}$ interacted with green (and nongreen) innovation to see its influence on firm value. In Column (1), we find that the coefficient of the interaction term between $Foresale^{HIGH}$ and $Ln(GpatStock)_{[t-1,\ t]}$ is -0.232, indicating that green technology coupled with foreign sales that occur in countries with high environmental standards is associated with lower firm value. However, innovation may not have an immediate effect on firm value but take some time to have an impact. To address time effect, we construct variables that capture 3-, 5-, and 7-year cumulative numbers of patents, $Ln(GpatStock)_{[t-3,t]}$, $Ln(GpatStock)_{[t-5,t]}$, and $Ln(GpatStock)_{[t-7,\ t]}$, respectively. Consistent with this view, when MNCs accumulate green technology up to seven years, we find that green technology adds value to MNCs. In Column (4), the coefficient of $Foresale^{HIGH}$ x $Ln(GpatStock)_{[t-7,\ t]}$ is 0.120. An increase by a standard deviation of $Ln(GpatStock)_{[t-7,\ t]}$ and $Foresale^{HIGH}$ for our average sample of firm leads to increase in Tobin's *q* by 0.351 (=0.12*0.17*1.72) in seven years. Overall, we find that green innovations coupled with exposure to strict environmental standards does not increase a firm's performance in the short run but in the long run, which is consistent with Derwall *et al.*'s view (2005). Notably, this significant effect is obtained after controlling for non-green innovation (i.e., *NGpatstock*) and research input (i.e., *R&D*). We also find that the coefficient of the interaction term $Foresale^{HIGH}$ x $Ln(NGpatStock)_{[t-N,t]}$ is positive but with a decreasing pattern. This pattern indicates that even MNCs' non-green innovation can create value in foreign markets with high environmental standards; however, the decaying pattern indicates that this effect is not sustainable in the long run. In Columns (5) to (8), we repeat our analyses with $Foresale^{LOW}$ and find mostly insignificant or somewhat opposite results. The coefficient of $Foresale^{LOW}$ x $Ln(GpatStock)_{[t-1, t]}$ is positive and significant in the short term; in the long term, however, the effect becomes statistically insignificant, as shown in Columns (6) to (8). Foreign sales that take place in countries with less-stringent environmental regulations do not generate any long-term value with either green or non-green innovation.

4-3) Subsample analysis

In this section, we investigate whether a firm's industry membership as well as its headquarter (home) country's innovation infrastructure (proxied by measures of institutional governance quality, government effectiveness, and economic growth) matters for our results.

We begin by splitting our sample of firms into firms in polluting industries and nonpolluting industries to account for the degree of environmental pressure the firm is facing from doing business in certain industries (e.g., lead-acid-battery manufacturing industry) known to have been contributing to environmental pollution more than others. For the purpose of polluting industries' classification, we obtain toxic-chemical-release data from the U.S. Environmental Protection Agency[16] and calculate the total amount of toxic chemical release per industry, where industry is defined based on four-digit SIC codes.[17] We classified all industries into two groups: 1) polluting industries if the amount of toxic chemical releases by establishments in a given industry is in the top tercile ranking based on the amount of toxic chemical releases by establishments of all industries each year; 2) nonpolluting industries. Consequently, our sample of firms belongs to either polluting or nonpolluting industries. We then repeat our analyses separately via polluting and nonpolluting industries' subsamples in Panel

[16] https://www.epa.gov/toxics-release-inventory-tri-program/tri-basic-data-files-calendar-years-1987-2017

[17] The rationale for this classification scheme is the following: if U.S. firms in a certain industry are more likely to pollute, non-U.S. firms in a given industry are also more likely to pollute, which is rooted on the idea of Rajan and Zingales (1998) who measure both U.S. and non-U.S. firms' external financial dependence based on U.S. industry characteristics.

A of Table 5. We find that, in polluting industries, green patent stocks in conjunction with expanding operations in countries with high environmental standards yield long-term value. In addition, non-green patent stocks are associated with value creation when accumulated in conjunction with an expansion of foreign operations, regardless of whether this expansion is in countries with high or low environmental standards. This pattern is somewhat consistent with our prior findings, as shown in Table 4. When we repeat the test for the subsample of firms in nonpolluting industries, we find no significant effects. In short, our findings from Panel A of Table 5 suggest that green innovation is more valuable to firms in polluting industries than nonpolluting industries, i.e., when environmental pressure becomes more binding.

Insert Table 5 about here

Next, we examine three factors that can be important in the way the MNC is pursuing innovation. First, we recognize that corporate social activities (e.g., developing green technology) offer a host of opportunities for a manager to misuse shareholders' wealth (Friedman, 1970). Kruger (2015) also finds that market reactions on the announcement of CSR news associated with agency problems are on average negative. Therefore, we investigate the co-effect of the type of foreign involvement and green technology knowhow on firm value by institutional governance quality. To measure quality of institutional governance, we use the legal origin of the corporate headquarters' home country. Liang and Renneboog (2017) show that the legal origin is one the most influential factors that determines corporate social commitment. La Porta, Lopes-de-Silanes, and Shleifer (1998) demonstrate that common-law countries offer better legal protections of shareholders than civil-law countries. If better investor protection is associated with lower agency costs, we then expect that MNCs from common-law countries would pursue innovation in a more sustainable and long-term value enhancing manner.

Panel B of Table 5 presents the valuation results by civil-law vs. common-law countries' subsamples. We find that the combined effect of green innovation with *Foresale*^{HIGH} on firm value in civil-law countries is not significantly associated with firm value. We interpret this result as consistent with the view that corporate social responsibility may be subject to agency problems and, thus, is not directly value relevant. However, we find a positive and significant effect of green innovation with *Foresale*^{HIGH} on firm value in common-law countries, which is consistent with the notion that innovation efforts are less likely to be hampered by agency issues rooted in the degree of shareholders' rights protection.

Furthermore, Christmann (2004) show that social pressure from corporate external stakeholders, such as governments, improves the quality of internal corporate environmental management. Accordingly, we expect the effect of green innovation to be better reflected in firm value when there is a higher level of effectiveness in implementing a government's policies. To test if the valuation effects we focus on vary by the degree of the MNC's home government effectiveness, we repeat our tests for subsamples of firms from countries of high and low government effectiveness, as shown in Panel C of Table 5. All countries are classified into one of two groups (i.e., countries with more effective and less effective government) based on the median value of worldwide governance indicators (WGI) score that measures each country's government effectiveness every year. We find that the positive association between green innovation with *Foresale*^{HIGH} and firm value is more evident for MNCs headquartered in countries with high government effectiveness scores. Similar to Table 4, the combined effect of green innovation with *Foresale*^{HIGH} on firm value turns positive, once a firm accumulates at least three years of green technology knowhow. However, the valuation effect is much weaker for MNCs from countries with low government effectiveness than for MNCs from countries with high government effectiveness. Our result suggests that the MNCs' home country government plays an important role in determining the quality of its corporate environmental strategies. Overall, our findings are consistent with the viewpoints found in the existing studies (e.g., Christmann, 2004; Kim *et al.*, 2019).

Finally, according to the technology life-cycle model (Abernathy and Utterback, 1978), technology development (or innovation) within the firm takes place at different rates as the firm grows. The risk associated with innovation could be mitigated when the firm's life cycle reaches its peak point. Russo and Fouts (1997) show evidence in line with the technology life-cycle model, i.e., a relation between corporate environmental performance and financial performance is more pronounced for firms in high-growth industries than low-growth industries. Similarly, we investigate whether the country-level GDP growth[18] exacerbates or alleviates the association between green innovation and firm value. Countries hosting firms with higher-quality patents have higher economic growth (Hasan and Tucci, 2010). Accordingly, we re-run the valuation regressions used in Table 4 by splitting our sample into firms headquartered in high vs. low GDP countries based on the median value of the GDP growth rate each year. In Panel D of Table 5, we show that the positive association of green innovation and firm value only appears for firms in high GDP countries, whereas we find little relation among firms in countries with low GDP. This finding corroborates with Hasan and Tucci (2010) and indicates that the MNC home country economic growth provides a springboard for long-term accumulation of economic rents from pursuing green innovation.

4-4) Empirical identification

Up to this point, we show that green technology development increases firm value, particularly when MNCs have a high percentage of foreign sales in countries with strict environment standards.

[18] We obtained the annual gross domestic products from the OECD website (https://data.oecd.org/gdp/gross-domestic-product-gdp.htm) and calculate a growth rate as ($GDP_{i,t}$- $GDP_{i,t-1}$)/ $GDP_{i,t-1}$, where *i* represents a country and *t* represents year.

However, our results cannot completely rule out an omitted variables criticism, e.g., the case that some unobservable factor(s) other than environmental regulation may encourage firms to be innovative and profitable. To mitigate this endogeneity concern, we design a difference-in-differences regression around the time of a structural shift in the environmental regulations' compliance costs in the European Union as follows. The European Union Emissions Trading System (EU ETS) was launched in 2005 and is the cornerstone of the European environmental policy geared toward reducing green gas emissions. By exploiting the launching of EU ETS as an exogenous shock that resulted in externally strengthening environmental regulations, we compare green innovations' effect on firm value between two groups of U.S. firms in the years surrounding 2005. The first group (i.e., treatment group) consists of U.S. firms that have a high percentage of European foreign sales (i.e., whose European foreign sales are greater than the median value of European foreign sales among our sample of firms each year), and the other group (i.e., control group) includes U.S. firms that have no foreign sales.[19] Our testing window spans the three years before, on, and after 2005, the year the EU ETS is launched. We then investigate how this heightened environmental regulation affects firm value association with corporate green technology knowhow.

Insert Table 6 about here

Table 6 reports the detailed results of our analysis. We find that green patent stocks increase firm value, especially for the treatment group after the enforcement of the EU ETS. The long-term nature of this effect is reflected in that the positive effect becomes statistically significant when the

[19] We drop U.S. firms that have a low percentage of European foreign sales (i.e., whose European foreign sales are less than the median value of the European foreign sales) and European firms that have cleaner treatment and control groups for our test.

firm accumulates green technology knowhow over five years or more. In nontabulated results, we find no significance when we conduct the same set of tests with non-green patents stocks. Calel and Dechezlepretre (2016) show that European firms increased low-carbon patenting after 2005, the enforcement year of the EU ETS. Overall, we conclude that the pursuit of green technology development adds value to MNCs when environmental regulations in the MNCs' foreign markets become tighter.

4-5) Sensitivity analyses

As a last set of tests, we use alternative variables to measure firm value. Specifically, instead of the industry-adjusted version of Tobin's *q*, we now use the raw measure (*Tobin's Q*) as well as the excess value (*ExcessVal*). Panel A of Table 7 shows that the coefficient of $Foresale^{HIGH}$ is negative and significant, indicating that internationalization into foreign countries with environmental standards is higher than that of the firm's home country and hurts firm value. However, the coefficient of $Foresale^{LOW}$ is positive and insignificant. In Panel B, the relation among green patent stocks, foreign sales, and firm value still exists and exhibits a similar pattern, as shown in Table 4. We conclude that our findings are robust to potential measurement errors that could exist in our value-based measures of firm performance.

Insert Table 7 about here

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5. Conclusion

We investigate how the geographic scope and corporate environmental strategy of MNCs combine into generating economic rents. We find that a high exposure to foreign markets with more (less) stringent environmental regulations stimulates (stymies) MNCs' green patent applications. A large percentage of sales in foreign markets with more (less) stringent environmental regulations is associated with lower (higher) market valuation. MNCs' environmental competitive advantage obtained through green innovation activities increases firm value when pursued in conjunction with foreign involvement in countries with strict environmental standards. This effect is more profound for firms operating in polluted industries than in non-polluted industries and when the MNC's home country institutions and economic conditions support the adoption of sound policies of technology development. Overall, our study highlights that green technology development is at the core of multinationality's effect on corporate valuation.

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Table 1
Descriptive Statistics

This table presents descriptive statistics on 30,881 firm-year observations for this study. *TobinQ_adj* is industry-adjusted Tobin's *q,* computed as the sum of market value of equity, the liquidating value of preferred stock, and the value of debts divided by the book value of assets (Chung & Pruitt, 1994). *ExcessVal* is computed as the market value of equity minus book value of equity divided by sales. *Foresale* is the percentage of foreign sales for firm *j* in a given year. $Foresale^{HIGH}$ (or $Foresale^{LOW}$) is the percentage of foreign sales that incur sales in countries whose environmental stringency is higher (or lower) than that of corporate home country. $Ln(GreenPat)_{t+N}$ is the log-transformed number of green patents plus one applied in a given year at $t+N$ (N=1, 2, and 3) (Carrion-Flores and Innes, 2010). $Ln(GpatStock)_{[t-N,t]}$ ($Ln(GpatStock)_{[t-N,t]}$) is the log-transformed cumulative number of green (or nongreen) patents plus one from year t-N (N=1, 3, 5, and 7) to year t (Furman, Porter, and Stern, 2002). HHI^{PROD} is the Herfindahl index based on sales of a firm *j*'s top-five products. *Ln(MkCap)* is the U.S. dollar denominated market value of equity at the end of year. *ROA* is earnings before interests and taxes divided by assets. *Cash* is cash divided by assets. *Leverage* is long-term debts plus debts in current liabilities divided by assets. *Tangibility* is the net amount of property, plant, and equipment divided by asset. *R&D* is R&D expenditure divided assets. HHI^{IND} is the Herfindahl index based on sales across the first two digit of SIC code. *Ln(GDPpa)* is log-transformed GDP per annum. *Trade* is imports minus export divided by GDP. *RuleLaw* is the index that measures quality of domestic laws. *EPS* is environmental stringency index. *PPindex* is intellectual property protection index. *Educ* is public spending on R&D educations divided by GDP.

	N	Mean	Median	SD	25th Pctl	75th Pctl
TobinQ_adj	29,991	0.36	-0.03	1.38	-0.33	0.51
ExcessVal	29,912	2.15	-0.03	12.11	-0.36	0.62
Foresale	29,991	0.28	0.17	0.30	0.00	0.48
$Foresale^{HIGH}$	29,991	0.13	0.06	0.17	0.00	0.19
$Foresale^{LOW}$	29,991	0.15	0.04	0.23	0.00	0.20
$Ln(GreenPat)_{t+1}$	24,234	0.16	0.00	0.60	0.00	0.00
$Ln(GreenPat)_{t+2}$	18,338	0.16	0.00	0.61	0.00	0.00
$Ln(GreenPat)_{t+3}$	14,048	0.15	0.00	0.60	0.00	0.00
$Ln(GpatStock)_{[t-1,t]}$	29,991	0.13	0.00	0.55	0.00	0.00
$Ln(GpatStock)_{[t-3,t]}$	29,991	0.28	0.00	0.86	0.00	0.00
$Ln(GpatStock)_{[t-5,t]}$	29,991	0.40	0.00	1.07	0.00	0.00
$Ln(GpatStock)_{[t-7,t]}$	29,991	0.50	0.00	1.21	0.00	0.00
$Ln(NGpatStock)_{[t-1,t]}$	29,991	0.30	0.00	0.93	0.00	0.00
$Ln(NGpatStock)_{[t-3,t]}$	29,991	0.58	0.00	1.34	0.00	0.00
$Ln(NGpatStock)_{[t-5,t]}$	29,991	0.77	0.00	1.57	0.00	0.69
$Ln(NGpatStock)_{[t-7,t]}$	29,991	0.90	0.00	1.72	0.00	0.00

HHI^{PROD}	29,991	0.72	0.74	0.27	4.76	7.62
Ln(MkCap)	29,991	6.20	6.15	2.07	0.01	0.11
ROA	29,991	0.03	0.06	0.20	0.04	0.27
Cash	29,991	0.19	0.12	0.20	0.02	0.32
Leverage	29,991	0.20	0.16	0.20	0.08	0.37
Tangibility	29,991	0.26	0.19	0.22	0.48	1.00
R&D	29,991	0.04	0.00	0.10	0.00	0.04
HHI^{IND}	29,991	0.16	0.09	0.18	0.06	0.18
Ln(GDPpa)	29,991	4.47	3.87	1.59	3.85	3.90
Trade	29,991	-2.32	-3.43	3.64	-4.96	0.45
RuleLaw	29,991	1.54	1.57	0.19	1.45	1.63
EPS	29,991	2.19	2.34	0.73	1.67	2.68
PPindex	29,991	4.77	4.88	0.16	4.67	4.88
Educ	29,991	0.42	0.39	0.10	0.36	0.42

Table 2
Sample Distribution by Country

This table shows the mean value of *EPS*, *Foresale*, $Foresale^{HIGH}$, $Foresale^{LOW}$, and *Ln(GreenPat)* by country. The time-varying EPS index score is obtained from the OECD website (https://stats.oecd.org/Index.aspx?DataSetCode=EPS).

Country	N	*EPS*	*Foresale*	$Foresale^{HIGH}$	$Foresale^{LOW}$	*Ln(GreenPat)*
AUT	81	3.09	0.64	0.11	0.54	0.04
AUS	884	2.44	0.26	0.16	0.10	0.01
BEL	145	2.45	0.63	0.44	0.19	0.16
CAN	1,268	3.04	0.46	0.04	0.42	0.08
CHE	229	3.03	0.71	0.15	0.55	0.09
DEU	955	2.87	0.48	0.14	0.34	0.17
DNK	113	3.56	0.77	0.08	0.69	0.29
ESP	165	2.82	0.39	0.13	0.26	0.03
FIN	171	3.14	0.64	0.12	0.52	0.07
FRA	838	3.09	0.52	0.09	0.43	0.08
GBR	1,243	2.74	0.49	0.23	0.26	0.03
GRC	81	2.13	0.25	0.20	0.05	0.00
IRL	90	2.05	0.70	0.53	0.19	0.16
ITA	281	2.68	0.42	0.21	0.21	0.08
JPN	4,216	1.88	0.23	0.11	0.13	0.17
NLD	216	3.24	0.63	0.10	0.53	0.19
NOR	164	2.93	0.62	0.21	0.41	0.09
PRT	51	2.41	0.41	0.33	0.10	0.00
SWE	345	3.11	0.67	0.18	0.50	0.03
USA	18,455	2.00	0.20	0.12	0.08	0.14

Table 3
Internationalization and Green Innovation

The table presents OLS results where the dependent variable is $Ln(GreenPat)_{t+N}$, the log-transformed number of green patents at year $t+N$ (N=1, 2, and 3). $Foresale^{HIGH}$ (or $Foresale^{LOW}$) is the percentage of foreign sales (in total sales) that incur sales in countries whose environmental stringency is higher (or lower) than that of corporate home country. All regressions include firm and year fixed effects. The numbers shown in parentheses are t-statistics clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: $Ln(GreenPat)_{t+N}$					
	N=1	N=2	N=3	N=1	N=2	N=3
$Foresale^{HIGH}$	0.194***	0.231***	0.230***			
	(4.72)	(4.38)	(3.88)			
$Foresale^{LOW}$				-0.292***	-0.259***	-0.430***
				(-6.04)	(-4.75)	(-6.26)
HHI^{PROD}	-0.021	0.030	0.031	-0.020	0.029	0.030
	(-0.68)	(0.79)	(0.72)	(-0.68)	(0.78)	(0.70)
Ln(MkCap)	0.006	0.008	0.011	0.005	0.008	0.011
	(1.06)	(1.14)	(1.28)	(0.94)	(1.11)	(1.35)
ROA	-0.005	-0.059	-0.100**	-0.001	-0.057	-0.094**
	(-0.16)	(-1.55)	(-2.19)	(-0.04)	(-1.50)	(-2.08)
Cash	-0.056	-0.040	0.018	-0.063*	-0.049	0.006
	(-1.48)	(-0.88)	(0.33)	(-1.67)	(-1.08)	(0.12)
Leverage	-0.018	0.045	0.092*	-0.021	0.044	0.092**
	(-0.52)	(1.18)	(1.95)	(-0.60)	(1.14)	(1.96)
Tangibility	0.124**	0.043	0.063	0.118**	0.037	0.051
	(2.27)	(0.63)	(0.81)	(2.19)	(0.56)	(0.65)
R&D	-0.087	-0.129	-0.047	-0.094	-0.137	-0.055
	(-0.93)	(-1.30)	(-0.32)	(-1.00)	(-1.38)	(-0.36)
HHI^{IND}	0.095	0.328	0.731**	0.093	0.329	0.698**
	(0.47)	(1.23)	(2.12)	(0.46)	(1.23)	(2.00)
Ln(GDPpa)	0.802	-3.462**	-6.299**	0.711	-3.447**	-6.213**
	(1.23)	(-2.07)	(-2.46)	(1.09)	(-2.06)	(-2.43)
Trade	0.018***	0.028	-0.020	0.018***	0.028	-0.023
	(3.41)	(1.26)	(-0.67)	(3.30)	(1.25)	(-0.76)
RuleLaw	0.614***	0.607*	-0.126	0.600***	0.590*	-0.162
	(2.68)	(1.95)	(-0.49)	(2.63)	(1.90)	(-0.62)
EPS	0.109***	0.126***	0.093**	0.125***	0.132***	0.129***
	(4.03)	(3.49)	(2.05)	(4.42)	(3.61)	(2.85)
Ppindex	-1.036	0.060	-0.167	-0.986	0.101	-0.133
	(-1.36)	(0.05)	(-0.12)	(-1.31)	(0.09)	(-0.10)
Educ	0.720	1.758**	0.152	0.680	1.783**	0.098
	(1.61)	(1.97)	(0.09)	(1.52)	(1.99)	(0.06)
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Firm Clustering	YES	YES	YES	YES	YES	YES
Observations	24,234	18,338	14,048	24,234	18,338	14,048
Adj. R-squared	0.612	0.607	0.574	0.612	0.607	0.576

Table 4
Green Innovation and Firm Performance

This table presents OLS results where the dependent variable is *TobinQ_adj*, industry-adjusted *Tobin's Q*. Columns (1) to (4) use $Foresale^{HIGH}$ as a proxy for foreign sales. Columns (5) to (8) use $Foresale^{LOW}$ as a proxy for foreign sales. $Ln(GpatStock)_{[t\text{-}N,t]}$ (or $Ln(NGpatStock)_{[t\text{-}N,t]}$) is the cumulative number of green (nongreen) patents from year *t-N* (*N*=1, 3, 5, and 7) to year *t* and log-transformed after adding one (Furman, Porter, and Stern, 2002). All regressions included firm and year fixed effects, but coefficients are omitted to report. The numbers shown in parentheses are t-statistics clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$Foresale^{HIGH}$				$Foresale^{LOW}$			
	Dependent variable: *TobinQ_adj*							
	N=1	N=3	N=5	N=7	N=1	N=3	N=5	N=7
Foresale	-0.262***	-0.317***	-0.320***	-0.309***	0.170***	0.135*	0.158**	0.157**
	(-3.77)	(-4.33)	(-4.28)	(-4.13)	(2.61)	(1.90)	(2.30)	(2.27)
$Ln(GpatStock)_{[t\text{-}N,t]}$	0.029	-0.016	-0.050	-0.063	-0.073**	-0.051	-0.035	-0.050
	(0.72)	(-0.41)	(-1.32)	(-1.35)	(-2.01)	(-1.20)	(-0.88)	(-1.05)
Foresale x $Ln(GpatStock)_{[t\text{-}N,t]}$	-0.232*	-0.086	0.114***	0.120***	0.273**	0.117	0.006	0.027
	(-1.78)	(-0.82)	(3.30)	(3.71)	(2.41)	(0.88)	(0.15)	(0.66)
$Ln(NGpatStock)_{[t\text{-}N,t]}$	-0.024	-0.025	-0.038	-0.061	0.064**	0.016	-0.022	-0.052
	(-0.99)	(-0.86)	(-1.10)	(-1.42)	(2.46)	(0.49)	(-0.63)	(-1.19)
Foresale x $Ln(NGpatStock)_{[t\text{-}N,t]}$	0.235***	0.170**	0.068**	0.041*	-0.192***	-0.058	-0.028	-0.035
	(2.79)	(2.41)	(2.42)	(1.70)	(-3.04)	(-0.61)	(-0.61)	(-0.76)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm Clustering SD	YES	YES	YES	YES	YES	YES	YES	YES
Observations	29,991	29,991	29,991	29,991	29,991	29,991	29,991	29,991
Adj. R-squared	0.644	0.644	0.644	0.644	0.644	0.644	0.644	0.644

Table 5
Subsample Analysis

This table presents the results of subsample analyses. Reported are OLS regression results where the dependent variable is *TobinQ_adj*, industry-adjusted *Tobin's Q*. $Ln(GpatStock)_{[t-N,t]}$ (or $Ln(NGpatStock)_{[t-N,t]}$) is the cumulative number of green (nongreen) patents from year *t-N* (*N*=1, 3, 5, and 7) to year *t* and log-transformed by adding one (Furman, Porter, and Stern, 2002). All regressions include the same set of control variables used in Table 3, firm and year fixed effects, but coefficients are not reported. Columns (1) to (4) use $Foresale^{HIGH}$ as a proxy for foreign sales. Columns (5) to (8) use $Foresale^{LOW}$ as a proxy for foreign sales.

Panel A shows the analysis for subsamples formed based on the industry level of pollution: polluting vs. nonpolluting industries. To measure the industry level of pollution, we use the total amount of toxic chemical release per industry where industry is defined based on four-digit SIC codes from the U.S. Environmental Protection Agency. Industries are classified as polluting industries if the amount of toxic chemical releases by establishments in a given industry in is in the top tercile ranking based on the amount of toxic chemical releases by establishments in all industries each year, and nonpolluting industries otherwise.

Panel B presents subsamples formed on the basis of the legal system in the MNC's home country. The subsamples are thus those of MNCs from common law and from civil law countries.

Panel C presents subsamples formed based on the MNC home country's government effectiveness score. We distinguish between high (above median) and a low (below median) government effectiveness subsamples based on the median value of worldwide governance indicators (WGI) score that measures each country's government effectiveness score every year.

Panel D presents subsamples based on MNC home country economic (GDP) growth. We obtained the annual gross domestic products from the OECD website (https://data.oecd.org/gdp/gross-domestic-product-gdp.htm) and calculate a growth rate as $(GDP_{i,t}-GDP_{i,t-1})/GDP_{i,t-1}$, where *i* represents a country and *t* represents year. The number shown in parentheses are *t*-values clustered at the firm level. ***, **, and * indicate significance at the 1% 5%, and 10% levels, respectively.

Panel A. Polluting vs. Nonpolluting Industry

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Foresale^{HIGH}				*Foresale*^{LOW}		
				Polluting Industries				
	N=1	N=3	N=5	N=7	N=1	N=3	N=5	N=7
Foresale	-0.242*	-0.386**	-0.389**	-0.344**	0.164	0.176	0.189	0.163
	(-1.77)	(-2.53)	(-2.43)	(-2.15)	(1.28)	(1.29)	(1.36)	(1.16)
$Ln(GpatStock)_{[t-N,t]}$	0.002	-0.000	-0.006	-0.003	-0.041	-0.040	0.009	0.012
	(0.05)	(-0.00)	(-0.10)	(-0.05)	(-1.00)	(-0.79)	(0.15)	(0.16)
Foresale x $Ln(GpatStock)_{[t-N,t]}$	-0.179	-0.103	0.137***	0.137***	0.026	0.106	0.017	0.022
	(-1.22)	(-0.83)	(3.78)	(3.70)	(0.30)	(1.38)	(0.44)	(0.56)
$Ln(NGpatStock)_{[t-N,t]}$	-0.002	-0.061	-0.130**	-0.206***	0.020	-0.049	-0.127**	-0.208***
	(-0.05)	(-1.30)	(-2.21)	(-2.89)	(0.58)	(-1.14)	(-2.17)	(-2.92)
Foresale x $Ln(NGpatStock)_{[t-N,t]}$	0.227**	0.231**	0.102**	0.058	0.124*	0.156***	0.083**	0.052
	(2.07)	(2.53)	(2.56)	(1.64)	(1.80)	(2.96)	(2.07)	(1.38)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm Clustering	YES	YES	YES	YES	YES	YES	YES	YES
Observations	10,006	10,006	10,006	19,985	10,006	10,006	10,006	10,006
Adj. R-squared	0.600	0.600	0.600	0.675	0.600	0.600	0.600	0.601
				Nonpolluting Industries				
	N=1	N=3	N=5	N=7	N=1	N=3	N=5	N=7
Foresale	-0.281***	-0.287***	-0.289***	-0.293***	0.118*	0.108	0.128*	0.122*
	(-3.76)	(-3.81)	(-3.77)	(-3.75)	(1.78)	(1.60)	(1.93)	(1.82)
$Ln(GpatStock)_{[t-N,t]}$	0.068	-0.017	-0.072	-0.091	-0.041	-0.058	-0.060	-0.079
	(1.03)	(-0.29)	(-1.42)	(-1.50)	(-0.84)	(-1.13)	(-1.13)	(-1.25)
Foresale x $Ln(GpatStock)_{[t-N,t]}$	-0.317	-0.073	0.074	0.088	0.221	0.161	-0.009	0.007
	(-1.28)	(-0.37)	(0.98)	(1.35)	(1.33)	(1.62)	(-0.22)	(0.17)
$Ln(NGpatStock)_{[t-N,t]}$	-0.038	0.010	0.033	0.049	-0.015	0.015	0.039	0.051
	(-1.14)	(0.26)	(0.84)	(0.96)	(-0.55)	(0.48)	(0.99)	(1.00)
Foresale x $Ln(NGpatStock)_{[t-N,t]}$	0.248*	0.102	0.035	0.026	0.126	0.073	0.004	0.007
	(1.77)	(0.83)	(0.65)	(0.60)	(1.36)	(1.05)	(0.06)	(0.13)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm Clustering	YES	YES	YES	YES	YES	YES	YES	YES
Observations	10,006	10,006	10,006	19,985	19,985	19,985	19,985	19,985
Adj. R-squared	0.675	0.675	0.675	0.675	0.674	0.674	0.674	0.674

Panel B. Civil vs. Common Law Countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Foresale^{HIGH}					*Foresale*^{LOW}	
				Civil-Law Countries				
	N=1	N=3	N=5	N=7	N=1	N=3	N=5	N=7
Foresale	-0.098	-0.134	-0.116	-0.095	0.134	0.119	0.135	0.133
	(-1.29)	(-1.57)	(-1.35)	(-1.16)	(1.63)	(1.37)	(1.58)	(1.58)
Ln(GpatStock)$_{[t-N,t]}$	-0.013	-0.002	-0.009	-0.037	-0.042	0.025	0.032	-0.006
	(-0.26)	(-0.06)	(-0.25)	(-0.66)	(-1.55)	(0.52)	(0.77)	(-0.10)
Foresale x *Ln(GpatStock)*$_{[t-N,t]}$	-0.048	-0.057	0.035	0.018	0.054	-0.111	-0.107**	-0.079**
	(-0.29)	(-0.44)	(1.11)	(0.59)	(0.57)	(-0.73)	(-2.57)	(-1.97)
Ln(NGpatStock)$_{[t-N,t]}$	0.000	-0.021	-0.029	-0.053	0.034*	-0.029	-0.046	-0.067
	(0.00)	(-0.68)	(-0.72)	(-1.14)	(1.84)	(-0.62)	(-1.06)	(-1.41)
Foresale x *Ln(NGpatStock)*$_{[t-N,t]}$	0.056	0.073	0.010	-0.003	-0.063	0.065	0.066	0.051
	(0.42)	(0.71)	(0.38)	(-0.11)	(-1.02)	(0.55)	(1.40)	(1.11)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm Clustering	YES	YES	YES	YES	YES	YES	YES	YES
Observations	8,051	8,051	8,051	8,051	8,051	8,051	8,051	8,051
Adj. R-squared	0.792	0.792	0.792	0.792	0.792	0.792	0.792	0.792
				Common-Law Countries				
	N=1	N=3	N=5	N=7	N=1	N=3	N=5	N=7
Foresale	-0.325***	-0.383***	-0.393***	-0.382***	0.185**	0.145	0.174*	0.171*
	(-3.40)	(-3.92)	(-3.97)	(-3.88)	(2.12)	(1.56)	(1.94)	(1.89)
Ln(GpatStock)$_{[t-N,t]}$	0.052	-0.031	-0.072	-0.081	-0.099**	-0.077	-0.065	-0.071
	(0.90)	(-0.56)	(-1.56)	(-1.49)	(-2.23)	(-1.52)	(-1.33)	(-1.26)
Foresale x *Ln(GpatStock)*$_{[t-N,t]}$	-0.322*	-0.071	0.164***	0.192***	0.590***	0.322	0.142*	0.140*
	(-1.78)	(-0.46)	(2.89)	(3.60)	(2.62)	(1.60)	(1.82)	(1.79)
Ln(NGpatStock)$_{[t-N,t]}$	-0.024	-0.026	-0.042	-0.063	0.069**	0.023	-0.018	-0.049
	(-0.81)	(-0.75)	(-1.04)	(-1.26)	(2.30)	(0.63)	(-0.44)	(-0.98)
Foresale x *Ln(NGpatStock)*$_{[t-N,t]}$	0.255***	0.187**	0.078*	0.036	-0.253***	-0.105	-0.090	-0.083
	(2.58)	(2.13)	(1.66)	(0.88)	(-2.95)	(-0.83)	(-1.31)	(-1.23)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm Clustering	YES	YES	YES	YES	YES	YES	YES	YES
Observations	21,940	21,940	21,940	21,940	21,940	21,940	21,940	21,940
Adj. R-squared	0.631	0.631	0.631	0.631	0.631	0.631	0.631	0.631

Panel C. High vs. Low Government Effectiveness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Foresale^{HIGH}				*Foresale*^{LOW}		
				More Effective				
	N=1	N=3	N=5	N=7	N=1	N=3	N=5	N=7
Foresale	-0.572***	-0.598***	-0.578***	-0.566***	0.334***	0.299**	0.336***	0.334***
	(-4.70)	(-4.80)	(-4.71)	(-4.67)	(2.97)	(2.48)	(2.87)	(2.83)
Ln(GpatStock)$_{[t-N,t]}$	0.070	-0.045	-0.115*	-0.091	-0.096*	-0.127*	-0.119*	-0.094
	(0.88)	(-0.68)	(-1.82)	(-1.27)	(-1.76)	(-1.89)	(-1.79)	(-1.27)
Foresale x *Ln(GpatStock)*$_{[t-N,t]}$	-0.433**	-0.243	0.128**	0.147**	0.486**	0.242	0.113	0.109
	(-2.07)	(-1.34)	(2.06)	(2.31)	(1.98)	(1.00)	(1.64)	(1.59)
Ln(NGpatStock)$_{[t-N,t]}$	-0.053	-0.016	-0.003	-0.050	0.061	0.050	0.034	-0.023
	(-1.21)	(-0.31)	(-0.05)	(-0.76)	(1.48)	(0.85)	(0.56)	(-0.36)
Foresale x *Ln(NGpatStock)*$_{[t-N,t]}$	0.345***	0.256**	0.074	0.038	-0.302***	-0.143	-0.137*	-0.120
	(3.15)	(2.31)	(1.32)	(0.74)	(-2.90)	(-0.89)	(-1.79)	(-1.62)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm Clustering	YES	YES	YES	YES	YES	YES	YES	YES
Observations	13,910	13,910	13,910	13,910	13,910	13,910	13,910	13,910
Adj. R-squared	0.614	0.614	0.614	0.614	0.620	0.620	0.620	0.620
				Less Effective				
	N=1	N=3	N=5	N=7	N=1	N=3	N=5	N=7
Foresale	-0.000	-0.009	-0.005	0.020	0.015	-0.060	-0.081	-0.093
	(-0.00)	(-0.10)	(-0.05)	(0.22)	(0.14)	(-0.51)	(-0.67)	(-0.75)
Ln(GpatStock)$_{[t-N,t]}$	-0.010	-0.020	0.002	-0.008	-0.025	0.003	0.025	0.008
	(-0.24)	(-0.47)	(0.05)	(-0.12)	(-0.65)	(0.06)	(0.50)	(0.12)
Foresale x *Ln(GpatStock)*$_{[t-N,t]}$	0.003	0.088	0.069**	0.037	0.054	-0.057	-0.105**	-0.086*
	(0.02)	(0.71)	(1.99)	(1.11)	(0.51)	(-0.49)	(-2.22)	(-1.73)
Ln(NGpatStock)$_{[t-N,t]}$	0.007	-0.008	-0.058	-0.090	0.010	-0.034	-0.083*	-0.114**
	(0.24)	(-0.25)	(-1.32)	(-1.61)	(0.37)	(-1.00)	(-1.83)	(-2.00)
Foresale x *Ln(NGpatStock)*$_{[t-N,t]}$	-0.012	-0.043	-0.018	-0.029	-0.019	0.100	0.132**	0.120**
	(-0.10)	(-0.45)	(-0.60)	(-1.10)	(-0.27)	(1.18)	(2.51)	(2.23)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm Clustering	YES	YES	YES	YES	YES	YES	YES	YES
Observations	16,081	16,081	16,081	16,081	16,081	16,081	16,081	16,081
Adj. R-squared	0.723	0.723	0.723	0.723	0.723	0.723	0.723	0.723

Panel D. High vs. Low GDP growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		$Foresale^{HIGH}$				$Foresale^{LOW}$		
				High GDP Growth				
	N=1	*N=3*	*N=5*	*N=7*	*N=1*	*N=3*	*N=5*	*N=7*
Foresale	-0.545***	-0.578***	-0.576***	-0.574***	0.353***	0.353***	0.376***	0.386***
	(-4.36)	(-4.65)	(-4.66)	(-4.58)	(3.07)	(2.84)	(3.18)	(3.23)
Ln(GpatStock)$_{[t-N,t]}$	0.018	-0.044	-0.113*	-0.082	-0.139***	-0.135**	-0.116*	-0.085
	(0.24)	(-0.70)	(-1.82)	(-1.14)	(-2.59)	(-2.17)	(-1.77)	(-1.14)
Foresale x *Ln(GpatStock)*$_{[t-N,t]}$	-0.400**	-0.186	0.123**	0.152***	0.555**	0.382	0.133*	0.136*
	(-2.02)	(-1.14)	(2.22)	(2.68)	(2.26)	(1.60)	(1.84)	(1.86)
Ln(NGpatStock)$_{[t-N,t]}$	-0.046	-0.021	-0.024	-0.046	0.057	0.054	0.016	-0.013
	(-1.16)	(-0.43)	(-0.40)	(-0.65)	(1.48)	(1.00)	(0.27)	(-0.18)
Foresale x *Ln(NGpatStock)*$_{[t-N,t]}$	0.351***	0.242**	0.102**	0.069	-0.271***	-0.203	-0.133*	-0.131*
	(3.38)	(2.49)	(2.04)	(1.51)	(-2.68)	(-1.29)	(-1.79)	(-1.77)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm Clustering	YES	YES	YES	YES	YES	YES	YES	YES
Observations	14,777	14,777	14,777	14,777	14,777	14,777	14,777	14,777
Adj. R-squared	0.651	0.651	0.651	0.651	0.651	0.651	0.651	0.651
				Low GDP Growth				
	N=1	*N=3*	*N=5*	*N=7*	*N=1*	*N=3*	*N=5*	*N=7*
Foresale	-0.111	-0.126	-0.104	-0.089	0.028	-0.034	-0.010	-0.028
	(-1.58)	(-1.63)	(-1.35)	(-1.17)	(0.35)	(-0.40)	(-0.12)	(-0.33)
Ln(GpatStock)$_{[t-N,t]}$	0.030	-0.004	0.023	0.003	-0.027	0.018	0.047	0.019
	(0.73)	(-0.10)	(0.54)	(0.05)	(-0.68)	(0.42)	(1.04)	(0.30)
Foresale x *Ln(GpatStock)*$_{[t-N,t]}$	-0.162	-0.022	0.063*	0.025	0.094	-0.112	-0.073	-0.063
	(-1.11)	(-0.21)	(1.92)	(0.79)	(0.88)	(-0.98)	(-1.40)	(-1.17)
Ln(NGpatStock)$_{[t-N,t]}$	-0.029	-0.005	-0.036	-0.061	0.042	-0.009	-0.044	-0.070
	(-1.03)	(-0.16)	(-0.90)	(-1.17)	(1.39)	(-0.24)	(-1.04)	(-1.30)
Foresale x *Ln(NGpatStock)*$_{[t-N,t]}$	0.196*	0.072	0.010	0.002	-0.107	0.083	0.051	0.055
	(1.79)	(0.84)	(0.39)	(0.07)	(-1.46)	(0.96)	(0.89)	(0.96)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm Clustering	YES	YES	YES	YES	YES	YES	YES	YES
Observations	15,214	15,214	15,214	15,214	15,214	15,214	15,214	15,214
Adj. R-squared	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.749

Table 6
Empirical Identification

This table presents OLS results, where the dependent variable is *TobinQ_adj*, industry-adjusted *Tobin's Q*. *Treated* is a dummy variable that takes a value of 1 if the firm is with high foreign sales in countries affected by the European Union Emissions Trading System (EU ETS) and zero for a single-nation firm without European sales. High foreign sales are defined as if firms' average European foreign sales are greater than the median value of the entire European foreign sales during 2002–2004. *Post* is a dummy variable that takes value of one if years fall in 2005–2007 and zero if years fall in 2002–2004. $Ln(GpatStock)_{[t-N,t]}$ (or $Ln(NGpatStock)_{[t-N,t]}$) is the cumulative number of green (nongreen) patents from year *t-N* (*N*=1, 3, 5, and 7) to year *t* and log-transformed it after adding one (Furman, Porter, and Stern, 2002). All regressions include firm and year fixed effects, but coefficients are omitted. The numbers shown in parentheses are *t*-statistics clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	Dependent variable: *Tobin's Q_adj*			
	N=1	N=3	N=5	N=7
$Ln(GpatStock)_{[t-N,t]}$ × *Treated* × *Post*	0.095	0.054	0.058**	0.053**
	(0.71)	(1.26)	(2.05)	(2.01)
Post × *Treated*	0.189***	0.179***	0.169***	0.175***
	(2.99)	(2.82)	(2.65)	(2.75)
$Ln(GpatStock)_{[t-N,t]}$ × *Post*	-0.125	-0.057	-0.052*	-0.047*
	(-0.95)	(-1.36)	(-1.76)	(-1.70)
$Ln(GpatStock)_{[t-N,t]}$ × *Treated*	-0.024	0.047	-0.063	-0.074
	(-0.14)	(0.34)	(-0.30)	(-0.31)
Treated	-0.507*	-0.511*	-0.482*	-0.478*
	(-1.87)	(-1.88)	(-1.83)	(-1.86)
$Ln(GpatStock)_{[t-N,t]}$	-0.037	-0.178	-0.104	-0.029
	(-0.22)	(-1.35)	(-0.53)	(-0.14)
$Ln(NGpatStock)_{[t-N,t]}$	0.024	0.084	0.037	-0.151
	(0.50)	(1.14)	(0.39)	(-1.39)
HHI^{PROD}	0.035	0.044	0.040	0.025
	(0.27)	(0.34)	(0.31)	(0.19)
Ln(MkCap)	0.007	0.006	0.008	0.008
	(0.16)	(0.15)	(0.18)	(0.18)
ROA	-0.065	-0.049	-0.058	-0.064
	(-0.18)	(-0.14)	(-0.16)	(-0.18)
Cash	1.581***	1.579***	1.574***	1.593***
	(5.97)	(5.95)	(5.93)	(6.04)
Leverage	0.063	0.066	0.076	0.079
	(0.28)	(0.29)	(0.33)	(0.35)
Tangibility	0.388	0.388	0.391	0.402

	(1.11)	(1.11)	(1.12)	(1.15)
R&D	1.383**	1.409**	1.389**	1.413**
	(1.99)	(2.04)	(2.01)	(2.04)
HHI^{IND}	0.638	0.649	0.603	0.570
	(1.35)	(1.38)	(1.29)	(1.23)
Ln(GDPpa)	0.552	0.092	-0.758	-0.708
	(0.19)	(0.03)	(-0.25)	(-0.24)
Trade	-0.023	-0.020	-0.022	-0.021
	(-0.61)	(-0.53)	(-0.59)	(-0.58)
RuleLaw	-0.132	-0.097	-0.096	-0.101
	(-0.28)	(-0.20)	(-0.20)	(-0.21)
EPS	-0.033	-0.035	-0.040	-0.043
	(-0.41)	(-0.42)	(-0.49)	(-0.53)
Ppindex	-0.077	-0.145	-0.135	-0.008
	(-0.15)	(-0.26)	(-0.26)	(-0.02)
Educ	2.052	2.034	2.053	1.931
	(0.95)	(0.94)	(0.96)	(0.91)
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Firm Clustering SD	YES	YES	YES	YES
Observations	8,382	8,382	8,382	8,382
Adj. R-squared	0.650	0.650	0.650	0.651

Table 7
Sensitivity Analyses

This table presents the results of robustness tests with alternative proxy variable of the firm value. *Tobin's Q* is computed as sum of market value of equity, the liquidating value of preferred stock, and the value of debts divided by the book value of assets *ExcessVal* is computed as market value of equity minus book value of equity divided by sales. Panel A reports OLS results that examine the relation between MNC's foreign sale and firm value. Panel B reports OLS results that examine the effect of green innovation interacted with foreign sales on firm value. All regressions included the same set of control variables used in Table 3, firm and year fixed effects, but coefficients are omitted to report. The number shown in parentheses are t-values clustered at the firm level. ***, **, and * indicate significance at the 1% 5%, and 10% levels, respectively.

Panel A. Foreign Sales and Firm Value

	(1)	(2)	(3)	(4)	(5)	(6)
		Tobin's Q			*ExcessVal*	
Foresale	-0.145			-2.395**		
	(-1.59)			(-2.03)		
$Foresale^{HIGH}$		-0.163**			-2.838***	
		(-2.56)			(-4.20)	
$Foresale^{LOW}$			0.039			0.950
			(0.60)			(1.00)
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Firm Clustering	YES	YES	YES	YES	YES	YES
Observations	29,991	29,991	29,991	29,912	29,912	29,912
Adj. R-squared	0.691	0.692	0.691	0.631	0.631	0.631

Panel B. Foreign Sales, Green Innovation, and Firm Value

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$Foresale^{HIGH}$				$Foresale^{LOW}$			
	Dependent variable: *Tobin's Q*							
	N=1	N=3	N=5	N=7	N=1	N=3	N=5	N=7
Foresale	-0.219***	-0.275***	-0.289***	-0.285***	0.089	0.058	0.080	0.072
	(-3.29)	(-3.93)	(-4.00)	(-3.90)	(1.30)	(0.76)	(1.07)	(0.95)
$Ln(GpatStock)_{[t\text{-}N,t]}$	0.029	-0.000	-0.039	-0.052	-0.072*	-0.039	-0.031	-0.044
	(0.72)	(-0.00)	(-1.04)	(-1.12)	(-1.94)	(-0.90)	(-0.79)	(-0.93)
Foresale x $Ln(GpatStock)_{[t\text{-}N,t]}$	-0.278**	-0.130	0.087***	0.107***	0.229**	0.094	0.024	0.042
	(-2.13)	(-1.26)	(2.66)	(3.52)	(2.01)	(0.69)	(0.63)	(1.04)
$Ln(NGpatStock)_{[t\text{-}N,t]}$	-0.015	-0.019	-0.033	-0.059	0.079***	0.026	-0.010	-0.044
	(-0.61)	(-0.66)	(-0.95)	(-1.37)	(2.98)	(0.82)	(-0.30)	(-1.01)
Foresale x $Ln(NGpatStock)_{[t\text{-}N,t]}$	0.257***	0.194***	0.086***	0.059**	-0.198***	-0.065	-0.051	-0.048
	(3.06)	(2.75)	(3.12)	(2.52)	(-3.09)	(-0.66)	(-1.12)	(-1.09)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm Clustering	YES	YES	YES	YES	YES	YES	YES	YES
Observations	29,991	29,991	29,991	29,991	29,991	29,991	29,991	29,991
Adj. R-squared	0.691	0.692	0.692	0.691	0.691	0.691	0.691	0.691
	Dependent variable: *ExcessVal*							
	N=1	N=3	N=5	N=7	N=1	N=3	N=5	N=7
Foresale	-2.947***	-2.855***	-3.127***	-3.225***	0.829	0.921	0.705	0.624
	(-4.13)	(-3.81)	(-4.00)	(-4.06)	(0.81)	(0.83)	(0.60)	(0.53)
$Ln(GpatStock)_{[t\text{-}N,t]}$	0.173	-0.900*	-0.872**	-0.872*	0.188	-0.771*	-0.834*	-0.848
	(0.43)	(-1.87)	(-2.00)	(-1.71)	(0.55)	(-1.80)	(-1.82)	(-1.60)
Foresale x $Ln(GpatStock)_{[t\text{-}N,t]}$	-0.530	1.570	0.636**	0.527**	-0.553	0.969	0.246	0.278
	(-0.50)	(1.62)	(2.28)	(2.08)	(-0.71)	(1.43)	(0.78)	(0.69)
$Ln(NGpatStock)_{[t\text{-}N,t]}$	-0.206	0.606*	0.448	-0.030	-0.198	0.574*	0.462	-0.022
	(-0.84)	(1.68)	(1.10)	(-0.08)	(-0.90)	(1.77)	(1.13)	(-0.06)
Foresale x $Ln(NGpatStock)_{[t\text{-}N,t]}$	0.457	-0.685	0.092	0.133	0.481	-0.423	0.042	0.060
	(0.75)	(-1.09)	(0.39)	(0.62)	(0.88)	(-0.93)	(0.12)	(0.15)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm Clustering SD	YES	YES	YES	YES	YES	YES	YES	YES
Observations	29,912	29,912	29,912	29,912	29,912	29,912	29,912	29,912
Adj. R-squared	0.631	0.631	0.632	0.631	0.631	0.631	0.631	0.631

Appendix A
Internationalization and Firm Performance

This table presents OLS results where the dependent variable is *TobinQ_adj*, industry-adjusted *Tobin's Q*. $Foresale^{HIGH}$ (or $Foresale^{LOW}$) is the percentage of foreign sales (in total sales) that incur sales in countries whose environmental regulations are more stringent (or less stringent) than those of corporate home country. All regressions include firm and year fixed effects. The number shown in parentheses are t-statistics clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: *TobinQ_adj*					
Foresale	-0.140**			-0.084		
	(-2.40)			(-0.96)		
$Foresale^{HIGH}$		-0.328***			-0.207***	
		(-4.08)			(-3.12)	
$Foresale^{LOW}$			-0.010			0.132**
			(-0.16)			(2.12)
HHI^{PROD}	0.358***	0.355***	0.359***	0.161**	0.163**	0.162**
	(7.19)	(7.13)	(7.20)	(2.18)	(2.21)	(2.19)
Ln(MkCap)	0.119***	0.121***	0.115***	0.047**	0.048**	0.048**
	(14.91)	(15.24)	(14.64)	(2.50)	(2.56)	(2.54)
ROA	-0.654***	-0.655***	-0.661***	-0.112	-0.117	-0.117
	(-3.47)	(-3.48)	(-3.51)	(-0.68)	(-0.71)	(-0.71)
Cash	1.631***	1.625***	1.632***	1.056***	1.058***	1.059***
	(13.89)	(13.83)	(13.88)	(6.95)	(6.96)	(6.97)
Leverage	0.447***	0.449***	0.446***	0.315**	0.316**	0.317**
	(4.25)	(4.27)	(4.24)	(2.45)	(2.46)	(2.46)
Tangibility	-0.225**	-0.230**	-0.214**	-0.088	-0.084	-0.082
	(-2.48)	(-2.54)	(-2.35)	(-0.53)	(-0.51)	(-0.49)
R&D	2.639***	2.640***	2.620***	2.979***	2.983***	2.977***
	(7.39)	(7.40)	(7.34)	(6.96)	(6.97)	(6.95)
HHI^{IND}	-0.047	-0.045	-0.052	0.014	0.029	0.020
	(-0.52)	(-0.50)	(-0.58)	(0.07)	(0.14)	(0.10)
Ln(GDPpa)	-1.185	-1.173	-1.202	-0.154	-0.187	-0.147
	(-1.46)	(-1.45)	(-1.49)	(-0.25)	(-0.30)	(-0.24)
Trade	-0.008	-0.008	-0.010	0.002	0.004	0.003
	(-0.80)	(-0.80)	(-0.98)	(0.34)	(0.49)	(0.41)
RuleLaw	0.763***	0.738***	0.756***	0.698***	0.659***	0.677***
	(3.01)	(2.91)	(2.97)	(3.79)	(3.58)	(3.67)
EPS	0.063**	0.031	0.049	0.057**	0.046*	0.050**
	(2.06)	(1.05)	(1.54)	(2.23)	(1.78)	(1.96)
Ppindex	0.260	0.225	0.222	-0.006	-0.009	-0.002
	(0.53)	(0.47)	(0.46)	(-0.02)	(-0.02)	(-0.00)
Educ	0.324	0.401	0.243	0.163	0.183	0.164

	(0.74)	(0.91)	(0.55)	(0.39)	(0.44)	(0.39)
Firm FE	NO	NO	NO	YES	YES	YES
Industry FE	YES	YES	YES	NO	NO	NO
Country FE	YES	YES	YES	NO	NO	NO
Year FE	YES	YES	YES	YES	YES	YES
Firm Clustering	YES	YES	YES	YES	YES	YES
Observations	29,991	29,991	29,991	29,991	29,991	29,991
Adj. R-squared	0.207	0.208	0.206	0.644	0.644	0.644

In this section, we investigate the link between internationalization and firm value from the perspective of the environmental standards that MNCs face in the course of foreign business. We thus construct the following baseline model:

$$TobinQ_{\_adj} = \alpha + \beta_1 ForeSale(\%) + \beta_2 X + \varepsilon_i \qquad (2)$$

The dependent variable, *TobinQ_adj*, measures the firm's long-term performance at year *t*. *Foresale* is the key variable of interest, representing the percentage of foreign sales at year *t*. To examine how foreign sales in countries with high and low levels of environmental stringency will affect firm value, we also construct and use $Foresale^{HIGH}$ and $Foresale^{LOW}$, respectively. *X* represents a vector of the firm and country control variables specified in Section 2.1. We use either an industry, country, and year fixed effects model or a firm and year fixed effects model, but the latter is used to report our results throughout the paper. Standard errors are clustered at the firm level to correct for within-firm correlation.

The Appendix A reports the detailed results of the baseline regressions. In column (1)-(3), we report OLS results with industry, country, and year effects. In column (1), we find that the coefficient of *Foresale* is negative and statistically significant at the 5% level. This result is consistent with the findings in Graham et al (2002), Campa and Kedia (2002), and Denis et al (2002), indicating a firm's geographical diversification is negatively associated with firm value. Economically speaking, an increase of one percent of a firm's foreign sale decreases Tobin's q by 0.14. In the next two columns, we split a firm's foreign sale into $Foresale^{HIGH}$ and $Foresale^{LOW}$ based on the strength of environmental policies in countries where foreign sales take place relative to that of those in the firm's home country. We find that the negative relation with performance only appears in the case of foreign sales in countries whose environmental standards are stronger than those in the firm's home country, but not in the case of foreign sales in countries whose environmental standards are weaker than those in the firm's home country. We interpret this result as driven by the extra compliance costs MNCs face when they want to penetrate into foreign markets with stricter environmental standards, resulting in a reduction in firm value. In columns (4)-(6), we repeat the analyses in columns (1)-(3) using the firm and year fixed effects model. In column (4), we find that the coefficient of *Foresale* is negative but insignificant. In column (5), the coefficient of $Foresale^{HIGH}$ is negative and significant at the 1% level, indicating that higher sales from countries with more stringent environmental protection are associated with lower firm values. However, in column (6), we show that the coefficient of $Foresale^{LOW}$ is positive and significant at the 5% level suggesting that the relation between geographic diversification and firm value is contingent on the level of environmental stringency.