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Does it pay for cities to be green? An investigation of FDI inflows and environmental sustainability

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Abstract

Recent years have seen growing interest in a leading role for cities in addressing major environmental sustainability challenges including cleaner air and water. While geographers have long studied urban governance responses, international business (IB) scholars have embraced city-level analyses only in the past decade, primarily to examine multinationals' location strategies. Thus far, IB has not studied cities' environmental sustainability in relation to foreign direct investment (FDI) inflows. Our paper does so by analyzing whether it 'pays' to be green for cities in attracting FDI inflows, using a comprehensive sample of Chinese cities of different sizes over a 7-year period comprising 918 city-year observations. A fixed-effects panel data estimation shows that it indeed pays for cities to be green, specifically considering air quality and waste water treatment, two key locational factors exposing different mechanisms. Implications for green urban and business policies and for IB research are discussed.

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INTRODUCTION

With growing attention for the need to address environmental sustainability issues, such as water and air pollution, scarcity of clean water and energy, and the overarching problem of global climate change, cities have become foci of both academic and practitioner interest. More than half of the world's population lives in urban areas, a share that is expected to grow further, and the importance of cities has thus been widely acknowledged, also from a policy perspective (UN, 2016). In his book 'If Mayors Ruled the World,' Benjamin Barber (2013) even asserted that cities should take the lead in tackling major contemporary challenges including the energy transition, terrorism, poverty, and narcotics trafficking. Regardless of how optimistic one may be about this overall ability, the relevance of cities in the environmental sustainability realm, sometimes as part of the phenomenon of 'smart cities,' has also been noted in the press (e.g., The Economist, 2016), and reflected in a rapid growth of a range of local initiatives (Neirotti et al., 2014).

In academic research, especially geographers and environmental scientists have long studied urban governance responses, initially particularly in relation to climate change (e.g., Bulkeley, 2010). Their scholarly investigations have mostly focused on environmental sustainability transitions, multi-level systems of governance, and transnational networks of municipalities (see, e.g., earlier work by Betsill & Bulkeley, 2006; Collier, 1997; and Simmons et al., 2018, for a recent study). This stream of literature has elucidated the driving forces behind urban governance and helped explain its development over time (cf. Meijer & Bolívar, 2016), thus furthering our understanding of the impacts of policies adopted by cities to reduce greenhouse emissions and enhance urban resilience (Bulkeley, 2010). However, and despite calls by environmental sustainability scholars for greater insight into the responses by different actors (Farla et al., 2012; Markard, Raven, & Truffer, 2012) and especially firms (Geels, 2014), international business (IB) research has, to date, not really considered so-called 'green cities'.[1] This absence reflects broader observations by scholars in the field (e.g., Buckley, Doh, & Benischke, 2017; Doh, 2015; Kolk, 2016) that, compared to other disciplines, IB has been relatively slow in adopting phenomenon-based research, including on important issues related to water and air, and in urban areas.

This paper aims to help fill this gap by linking a key dimension of the field, i.e., the inflows of foreign direct investment (FDI), to cities' environmental sustainability dimensions, examining whether it 'pays' to be green for cities in attracting FDI inflows. Our study relates to and builds on the recent interest by IB scholars in city-level analyses, especially with regard to multinational enterprises' (MNEs) location strategies (e.g., Blanc-Brude et al., 2014; Goerzen, Asmussen, & Nielsen, 2013). While understanding the drivers of FDI has represented a focal area of IB research for almost four decades – with the seminal work by Johanson and Wiedersheim-Paul (1975) and Dunning (1980) being regarded as foundational contributions to this literature – prior studies have mostly adopted a country-level analysis, thus investigating why MNEs prefer to invest in one country over another (e.g., Ang, 2008; Quazi, 2007). More recent publications have pointed at the importance of embracing the city level for investigating FDI flows (Beugelsdijk & Mudambi, 2013) and thus offered insights into why firms select certain global cities (Goerzen et al., 2013), but to date no research has considered the influence of environmental sustainability. If it would really pay for cities to be green, this is an additional important factor for urban sustainability efforts, and firms' location decisions within and across countries.

Our foundational argument is that MNEs prefer to invest in greener cities because of their commitment to employees' well-being and to bolster their corporate reputation in times of increasing environmental awareness and stakeholder pressure. Thus, our main expectation is that the greener a city, the greater its FDI inflows. We specifically focus, within this generic hypothesis, on air quality and waste water treatment, two key green locational factors subject to different mechanisms. As explained further in the theory section below, the first aspect is particularly important from the perspective of employees, while the second relates to lower water treatment/usage costs as well as growth and innovation potential for firms. We tested these hypothesized relationships on a comprehensive sample of Chinese cities over a 7-year period comprising 918 city-year observations. Different from the IB literature thus far, with regard to both earlier empirical studies on China and those focused on cities, we included not only the largest (first-tier or global) cities, but also a considerable number of smaller ones. The results of our fixed-effects panel data estimation showed that it indeed pays for cities to be green for attracting FDI inflows, considering both air quality and waste water treatment, with effect sizes pointing at substantial economic relevance.

Our study makes several contributions. To start with, it enhances the understanding of the specific impact of a city's sustainability on its capacity to attract foreign investments. We illustrate how this may set in motion a virtuous cycle of sustainability-related FDI growth, with environmental regulation attracting further investments from abroad in what could be labeled as a 'race to the top.' This has important policy implications for urban governance as we show that it is economically beneficial for cities to expand their environmental protection, with substantial effects for both air and water pollution control. We also contribute by responding to the call for more phenomenon-driven IB insights, especially in urban settings, which are so important for helping address environmental sustainability issues. Additionally, our empirical focus on China tackles a gap identified in a 30-year review of research on FDI to China in which Fetscherin, Voss, and Gugler (2010: 240) highlight that, “for the case of China, there is an increasing need for research on so-called ‘second- and third-tier cities’ to identify their locational (dis-)advantages and attractiveness for MNEs.” Furthermore, we follow their suggestion to investigate FDI in relation to environmental issues.

At the same time, as also pointed out in other studies (e.g., Gaur, Ma, & Ding, 2018; Luo, Xue, & Han, 2010) and in the general press (e.g., The Economist, 2018; The Wall Street Journal, 2004), we recognize that China is not a fully functioning market economy and characterized by a top–down government structure. This may represent a limitation to the generalizability of our findings to other country settings in which the level of state direction is not as high as in China. Having said that, previous work has suggested as well that over time the Chinese central government has granted considerable discretion to local governments in relation to a broad spectrum of activities and policy implementation (e.g., Li, Cui, & Lu, 2014). For instance, China has a decentralized system for environmental regulation, as empirically shown by earlier research on divergent car-regulation policies at local versus central levels, and concomitant tensions (Kolk & Tsang, 2017). Therefore, while being aware of the peculiarities of the Chinese context, we think our findings are also relevant for other contexts in which cities have room for maneuver in setting environmental policies and exhibit regulatory differences compared to, for example, the federal or regional government. Moreover, it ties into the broader debate concerning the need for more government intervention in the EU and elsewhere given the urgency to take steps in the environmental sustainability realm. We discuss the implications of our research further in the concluding section of the paper.

THEORY AND HYPOTHESES

To be able to answer our research question regarding FDI inflows in relation to cities’ environmental sustainability, it is important to first discuss relevant insights from the literature that lead to our subsequent hypotheses. Below we will first pay attention to FDI location choice, and then to environmental sustainability and FDI inflows.

FDI Location Choice

While FDI location choice research was at first primarily conducted at the country level, IB scholars have more recently adopted finer-grained levels of analysis to examine variations in subnational regional and local contexts (cf. Beugelsdijk & Mudambi, 2013; McCann & Mudambi, 2005; see Nielsen Asmussen, & Weatherall, 2017, for a recent review). It should be noted that the IB field has also examined the role of supranational regional characteristics in determining FDI location choices, building on the seminal contribution by Rugman and Verbeke (2004) (see, e.g., Arregle et al., 2013; Gilbert & Heinecke, 2014; Mataloni, 2011). Despite its relevance, for the purpose of this paper we focus here on the fundamental distinction between studies that use between-country variation (and that use country-level data to study location choice among a set of host countries) and those that use within-country variation (which take subnational regional-level data to examine choice among different locations within a given country, most recently including global cities) as this has been the primary distinction in this body of research (cf. Nielsen et al., 2017).

The fundamental question of FDI location research at the country level is why some countries attract more FDI inflows than others. Countries are characterized by distinctive physical, economic, and political attributes that can influence the success of a given foreign direct investment (Lipsey, 1999). A range of country factors have been identified, including market size (Ang, 2008; Asiedu, 2006; Jaspersen, Aylward, & Knox, 2000; Quazi, 2007), quality of infrastructure (Ang, 2008; Asiedu, 2006; Khadaroo & Seetanah, 2010; Quazi, 2007), labor costs (Loree & Guisinger, 1995; Schneider & Frey, 1985; Wheeler & Mody, 1992), trade openness (Ang, 2008; Wheeler & Mody, 1992), taxes (Ang, 2008; Lipsey, 1999), corruption (Cuervo-Cazurra, 2006; Globerman & Shapiro, 2003), human capital (Groh & Wich, 2012; Jiménez, 2011; Mukim & Nunnenkamp, 2012), and institutional factors (Groh & Wich, 2012; Mukim & Nunnenkamp, 2012; for a recent review on institutional factors determining FDI attractiveness at the country level, see Bailey, 2018).

Despite the extensive scholarly work on this topic, there is some inconsistency concerning the effects of the above-mentioned factors. For example, while Wheeler and Mody (1992) found labor costs to be positively and significantly related to

FDI inflows, Loree and Guisinger (1995) did not find a significant correlation, and Schneider and Frey (1985) found a negative and significant correlation in case of FDI inflows into less developed countries. However, as also synthesized by Nielsen et al. (2017), the vast majority of empirical research supports the claim that a country's market size, infrastructure quality, institutional development, trade openness, and human capital attract FDI inflows; conversely, the greater the political instability, taxes, and tariffs of a given country, the lower its ability to attract FDI inflows.

One of the strongest criticisms of country-level research is its neglect of the significant subnational regional variations within a given country that impact FDI location choice (Beugelsdijk, McCann, & Mudambi, 2010; Meyer, Mudambi, & Narula, 2011), based on the assumption that certain subnational regions within a country possess unique characteristics that provide distinct comparative advantages for MNEs' FDI location choice (cf. Chadee, Qui, & Rose, 2003; Ma, Tong, & Fitza, 2013). Subnational regional differences are particularly relevant in large countries such as China and India and thus IB research has examined why MNEs prefer certain provinces over others (Amiti & Javorcik, 2008; Chadee et al., 2003). Intensified scholarly efforts to explain investment variations at the subnational regional level have highlighted novel drivers of FDI inflows, including agglomeration effects (Tan & Meyer, 2011; Zhao, Chan, & Chan, 2012), cultural links (Zhao et al., 2012), economic and administrative distance (Blanc-Brude et al., 2014), and preferential investment policies (Sethi et al., 2011). This research at the subnational regional level has also contributed to a further clarification of the boundary conditions of previously identified factors, elucidating how the effects of market size, labor costs, and infrastructure quality vary across provinces within a given country (Liu, Daly, & Varua, 2012).

Furthermore, Sethi et al. (2011) posit that FDI location choice literature applies various FDI determinants uniformly to all industries although these determinants have varying degrees of importance across industrial groupings that should be taken into account. Studies at the subnational regional level also contributed to providing further empirical evidence in support of some of the key factors identified when comparing the FDI attractiveness of countries, namely market size (Blanc-Brude et al., 2014; Coughlin & Segev 2000; Fung, Lizaka, & Parker, 2002), infrastructure quality (Fung et al., 2002; Sethi et al., 2011; Zhao et al., 2012), and trade openness (Blanc-Brude et al., 2014; Zhao et al., 2012).

Similar to the shift from the country to the subnational regional level, the shift from the subnational regional to the city level has brought about novel drivers and further clarified the boundary conditions of established factors. For example, agglomeration was found to be most relevant for domestic firms (Lamin & Livanis, 2013) and firms with product differentiation strategies (Nachum & Wymbs, 2005) when examining FDI location choices at the city level. Global cities – cities with a high degree of interconnectedness to local and global markets, a cosmopolitan environment, and high levels of advanced producer services – were shown to be preferred to non-global cities (Blevins et al., 2016; Goerzen et al., 2013). Furthermore, IB scholars have demonstrated that economic and administrative distance predicts FDI location choice at the city level. For instance, prefecture cities are more likely to attract FDI inflows if they are economically and administratively close to alternative locations (Blanc-Brude et al., 2014). Table 1 summarizes IB articles dealing with FDI location choice at the city level.

Environmental Sustainability and FDI Inflows

According to a recent comprehensive review (Pisani et al., 2017), international business/management research has devoted only very limited attention to environmental sustainability. Moreover, while it still accounted for 7.5% of all articles that they identified as pertaining to the international corporate social responsibility (CSR) literature in 31 journals over a period of 31 years, only 2.2% of these sampled articles focused on FDI (Pisani et al., 2017: 596–597), corroborating the notion that extremely few studies within the international CSR literature have to date examined the combination of these two topics. We performed an additional search using the same set of journals used by Pisani et al. (2017) but restricted to fewer keywords (beyond "environment* sustainab*" also used by Pisani et al., 2017, we also considered "environment* protection" and "environment* regulation"). The results we obtained show that of the nearly 50,000 articles in these journals, only 213 – less than 0.5% – mentioned one of the three abovementioned keywords in the title, abstract, and/or keywords. Additionally, out of these 213 studies only four also mentioned either "FDI" or "foreign direct investment" in the title, abstract, and/or

Table 1 FDI research at the city level

Authors	Year	Setting	Key findings
Belderbos, Du, & Goerzen	2017	48 global cities	While the geographic distance of a global city to the MNE's regional affiliates diminishes the likelihood that a given city is chosen, these distance effects disappear when the global city is highly connected. Well-connected global cities, furthermore, attract investment in regional headquarters (RHQs) by MNCs from more distant countries of origin. On average, city connectivity is a more important characteristic for RHQs that have an entrepreneurial role
Nielsen, Asmussen, & Weatherall	2017	Literature review	A systematic review of the quantitative empirical literature pertaining to FDI location choice spanning four decades and published in a variety of journals across disciplines suggests that our understanding of the drivers of FDI location choice is still somewhat limited due to data source limitations and empirical as well as methodological challenges, which render conclusive evidence that is mixed at best
Blevins, Moschieri, Pinkham, & Ragozzino	2016	European Union	Institutional changes in Europe, EU membership, and global cities all shape the governance (entry mode) choices of MNEs
Jain, Kothari, & Kumar	2016	Literature review	A vast amount of literature on FDI catalogues a long list of determinants that try to explain FDI by multinational companies in a particular location. Location determinants can be organized into two broad categories: firm-related determinants and host-city-specific determinants
Blanc-Brude, Cookson, Piesse, & Strange	2014	China	The attractiveness of FDI locations within the selected host country depends not only upon location-specific attributes but also upon their proximity to alternative locations. Economic and administrative distance, rather than geographic distance, explain FDI subnational location choices
Ma, Delios, & Lau	2013	China	An MNE's location choice for its host-country headquarters (HCHQ) in the geographic space of the host country is determined by the interplay between the strategic roles of HCHQ in the MNE's organizational space and the institutional space external and internal to the MNE
Lamin & Livanis	2013	India	Domestic firms have a stronger preference than foreign firms for cities characterized by high agglomeration
Goerzen, Asmussen, & Nielsen	2013	Japan	MNEs have a strong propensity to locate within global cities and these choices are associated with a nuanced interplay of firm- and subsidiary-level factors, including investment motives, proprietary capabilities, and business strategy
Wang, Gu, Tse, & Yim	2013	China	FDI is a double-edged sword: it enhances the host-city's economic growth, labor productivity, and innovation but it also causes employment reduction and pollution in host cities. Moreover, the host-city's institutional development is found to enhance the positive impacts of FDI and reduce its negative ones
Beugelsdijk & Mudambi	2013	Literature review	IB research examining the spatial dimension has serious weaknesses, stemming from its traditional assumption of the country as the location unit of analysis. The complex firms that IB scholars study typically include multiple units within the same country, so that a complete analysis requires considering both subnational distance effects as well as international border effects
Nachum & Wymbs	2005	London & NY	There is a significant association between product differentiation and the preferences of firms for proximity to other firms in their industry. This implies that the value of agglomeration varies for firms pursuing different product differentiation strategies
Chadee, Qiu, & Rose	2003	China	The duration of the equity joint venture (EJV) agreement, the origin of the foreign investor, and the type of business activity are related to the location of the EJVs' business activities within China. Significant differences are noted in the locations of ventures in the manufacturing and service sectors, and there is evidence of an increasing preference for MNEs to locate their activities in China's large, metropolitan cities

keywords (Bu & Wagner, 2016; Fetscherin et al., 2010; King & Shaver, 2001; Madsen, 2009), further corroborating the dearth of prior IB scholarship on the intersection of these two important topics.[2] This assessment of the literature led to further insights into the state of the field, especially with regard to the recent focus of IB scholars on the effect of environmental protection on investments (Bu & Wagner, 2016; Madsen, 2009), which we will discuss below as precursor to our main hypothesis.

Despite the relatively limited number of articles published on environmental sustainability within the broader international CSR literature according to Pisani et al. (2017) and as also found in an earlier review piece focused on the environment only (see Holtbrügge & Dögl, 2012, who labeled it 'corporate environmental responsibility'), our additional search does show that there is ongoing and also forthcoming work, meaning that the observation about the 'embryonic' state is starting to be addressed. Most important for the subject of this paper is that, interestingly, fields other than mainstream IB have offered substantive insights. Similar to a recent review on business in Africa in which economic journals turned out to contain very relevant articles (Kolk & Rivera-Santos, 2018), we found, for example, that the Cambridge Journal of Economics published a review of the impact of MNEs on economic and human rights in developing countries (Giuliani & Macchi, 2014). Although this is the reverse relationship, i.e., not about FDI location choice but rather the implications once MNEs have selected countries, it focused our attention to this body of literature.

Specifically, developmental economists have long studied the so-called pollution haven hypothesis (PHH), which in general states that MNEs relocate to countries characterized by relatively weaker environmental regulation to avoid the cost of implementing expensive pollution control measures in what has been labeled as a 'race to the bottom' (e.g., Cole, 2004; Eskeland & Harrison, 2003; He, 2006). In the IB and management field we found only four studies on the PHH (Bu & Wagner, 2016; Madsen, 2009; Li & Zhou, 2017; Siegel, Licht, & Schwartz, 2013), which focus on different elements of environmental sustainability as explicated below.

Madsen (2009) showed that institutional distances between the home and host countries reduce the probability that an MNE will invest in the focal country. Moreover, firms' environmental capabilities moderate the effect of the severity of a country's environmental regulation and the likelihood and magnitude of firms' investments in that country. His study illustrates that environmental regulation indeed has a significant effect on investment, but the relationship resides at the firm rather than the industry level. It should be noted that environmental regulation is not measured directly but proxied (through residualized and transformed country sulfur dioxide (SO_2) emissions; industrial SO_2 emissions is the air pollution type studied).

Using environmental performance and regulatory regime indices, Siegel et al. (2013) explored the effects of cultural egalitarianism and found, among other things (and controlling also for country wealth and rule of law effects), that FDI flows from countries with strict environmental regulation to countries with lax environmental regulation. More recently, a study with US panel data on trade, production, and pollution (toxic emissions released), showed that US plants emit less toxic chemicals if their parent firm imports from developing countries (Li & Zhou, 2017). Furthermore, goods imported by US firms from developing countries more often come from pollution-intensive industries. Overall, their findings support the notion that US firms tend to offshore pollution-heavy industries to developing countries. Although there are limitations in terms of measurement, these particular studies thus essentially corroborate the PHH.

Having said that, an earlier meta-analysis by Jeppessen, List, and Folmer (2002) illustrates that evidence on the PHH is mixed. To corroborate this, Bu and Wagner (2016), in a China study on water, waste and air pollution in the 1992–2009 period, found that firms' heterogeneities in environmental capabilities and sizes affect their investment patterns, showing that firms with greater environmental capabilities are more likely to invest in regions with more stringent environmental regulation. Conversely, firms with lower environmental capabilities are more likely to avoid these regions. These results suggest the presence of a paradox – FDI is capable of facilitating both a race to the bottom and a race to the top depending on firm characteristics (cf. Kolk, 2016). In essence, the result may be a vicious cycle of pollution or a virtuous cycle of sustainable growth.

The PHH concerns the relationship between environmental regulation and FDI inflows and is therefore very relevant for the purpose of our work. However, there are three crucial differences between our study and the literature that has addressed the PHH to date. First, the PHH tends to focus on the country level (cf. Jeppessen et al., 2002), while our work is at the level of individual cities. Second, the PHH essentially examines investments flowing from developed countries to developing and/or emerging countries. However, our study concentrates on global flows that thus go beyond the developed-developing flow of FDI. Third, the focal point of the PHH tends to be pollution-intensive industries (cf. Madsen, 2009). Conversely, we are interested in examining a city's overall ability to attract FDI inflows, regardless of any specific focus on geographies or industrial settings.

We expect greener cities to attract more FDI inflows for several reasons. First, as explained further below, MNEs, once they have decided to invest in a given country, are more likely to prefer cities with higher environmental protection because employees of these firms prefer greener cities and such locations can be less costly and have better growth potential. Moreover, it behooves the corporate reputation of these firms to locate in clean cities as opposed to polluted cities; interestingly, such growing environmental awareness also applies to countries like China (Kolk, Van Dolen, & Ma, 2015; Wang, Wijen, & Heugens, 2018) and not just to 'traditional' stakeholder-oriented settings. Second, our argument does not specifically consider the country of origin but rather looks at all FDI flows. We therefore do not expect that, once we go beyond the focus on developed-developing flows, a race to the bottom is likely to emerge. This is because a consistent portion of investments flowing into developing countries originates from other developing countries characterized by similar environmental regulation. Finally, previous studies were conducted at the country level and, as a result, present a relatively crude image of environmental protection and investment flows. Differences between countries may arise but a city-level analysis within a country provides a much more nuanced and accurate perspective on the PHH. Specifically, we expect that city-level investments in environmental protection are more likely to initiate a virtuous cycle of sustainability-related FDI growth, hence generating a race to the top rather than to the bottom.

Hypothesis 1: The greener a city, the greater its FDI inflows.

As indicated above, employees are expected to be a direct stakeholder group preferring greener cities, thus affecting firms' location choice. Air quality stands out in this regard. A case in point is that ECA International, which annually assesses the overall quality of living in many cities around the world, includes air quality as important factor in its Location Ratings System. In its most recent survey, air quality was explicitly mentioned in relation to low(er) rankings for expat quality of life in various cities. ECA (2018) noted, for instance, that Hong Kong "continues to suffer from long-term air quality and pollution issues which has seen it stay in the low position in the rankings", and that "one of the main causes" for Kuala Lumpur's "drop in the rankings" in the last 5 years was "that whilst other locations have improved their air quality, the high levels of pollution in Kuala Lumpur, coupled with relatively high rates of petty crime, have seen the city slip down the rankings."

The importance of air quality for physical and mental well-being has been widely documented in the literature, especially focused on the negative implications of pollution, which is what people want to avoid. For example, noting the existence of a range of studies on the bad effects of air pollution on various physical ('tangible') health indicators, Zhang, Zhang, and Chen (2016) used longitudinal data to assess the impact on mental health and subjective well-being, which they found to be 'understated' given that 'a dirty sky' turned out to increase hedonic unhappiness and the rate of depressive symptoms. They also made 'back-on-the-envelope calculations' showing rather substantial increases in happiness with declining air pollution and 'willingness to pay' for higher air quality. Such willingness to pay for decreased air emissions was already shown by Roe et al. (2001) in relation to green electricity.

Interestingly, Menz (2011) moved beyond assessing the impact of 'current' air quality by also considering the influence of 'past' pollution levels. Using a so-called 'life satisfaction approach to environmental valuation', with a dataset of 48 European and South American countries (plus Japan) from 1990 to 2006, he found that people do not get accustomed to air pollution. Perhaps even more important for our study, given that we also consider time lags, is the result that this lack of habituation applies to past pollution as well. This signifies a profoundly negative impact of air pollution on life satisfaction, which is to be considered by firms in their location decisions, particularly with regard to their employees as well as other stakeholders who care about the quality of the local environment. Hence, this first specification of our main hypothesis leads us to expect the following:

Hypothesis 1a: The greater the air quality of a city, the greater its FDI inflows.

Another important aspect of a green city relates to water quality. However, as Marques and Lima (2011) observe, air pollution is more pervasive, directly affecting individuals in a wider area, with a greater negative sensorial and stressful impact on psychological health, than water pollution. At the same time, scarcity and pollution of water can impede development and growth, an issue likely to be most prevalent in cities, and potentially constrain the firms located there. China is one of the countries where the tensions between urbanization and water availability has come to the fore, thus leading to attention for waste water treatment and reuse (Lyu et al., 2016; Yi et al., 2011). Accordingly, we expect foreign firms to prefer, in their location decision, cities that are better equipped in dealing with waste water as they are likely to be more capable in addressing future growth-inhibiting issues in this realm.

Beyond this more generic advantage of 'greener water' cities, firms may profit in other ways. Firms may save production costs if reclaimed waste water (instead of 'new' water) is available for industrial use, for example, as cooling and washing water, boiler feed water, and for processing. Specific for China, Yi et al. (2011) note that the government has promoted the reuse of waste water for such purposes. According to a 2006 study (published in Chinese) that they quote, industrial use then already amounted to 50 to 80% of total urban water consumption (Yi et al., 2011: 1586). Interestingly, and relevant for our study as well, utilization targets differ across provinces (Zhu & Dou, 2018).

To locate foreign activities in a city with greater percentages of waste water treatment may also mean that firms are more likely to have access to innovative waste-reduction solutions and new technologies. Furthermore, the presence of such environmental sustainability policies and programs may signal a supportive context for concomitant corporate activities, with the potential to improve firms' performance and competitive advantage, thus making them more attractive to green customers, investors and the wider public (e.g., Ambec & Lanoie, 2008; Khanna, 2001). Based on these arguments, we expect the following regarding the second specification of our main hypothesis:

Hypothesis 1b: The greater the proportion of waste water treated in a city, the greater its FDI inflows.

METHODOLOGY

Data Sources and Sample

For our sample, we took 185 Chinese cities. China has a total of 663 cities, of which more than 100 have over 1 million inhabitants as of 2017 (The Guardian, 2017). Based on the administrative divisions of China, there are four distinct tiers used to group cities: four large municipalities (Beijing, Chongqing, Shanghai, Tianjin), two special administrative regions (Hong Kong and Macau), 294 prefectural-level cities and 363 county-level cities. The prefectural- and county-level cities are also grouped into 22 provinces (Anwei, Fujian, Gansu, Guangdong, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, and Zhejiang) and five autonomous regions (Guangxi Huang, Inner Mongolia, Ningxia, Tibet, and Xinjiang) (Blanc-Brude et al., 2014). In our sample, we included the four municipalities together with the largest 181 prefectural-level cities located in the above-mentioned 22 provinces. To obtain the data, we relied on two sources. The first is the China City Statistical Yearbook compiled on a yearly basis by the National Bureau of Statistics of China and published by China Statistics Press. Widely reputed as a leading source of statistical data in China, the China City Statistical Yearbook contains a variety of census and survey data for each Chinese city.[3]

The second source we used is the Urban China Database compiled by the Urban China Initiative (UCI), a professional think tank co-founded by McKinsey & Company, Columbia University, and Tsinghua University in 2010. UCI's mission has been to convene leaders from the public and private sectors to promote sustainable urbanization and economic growth in China. UCI has compiled the Urban China Database, a large multi-year dataset used to create an Urban Sustainability Index (USI) that ranks Chinese cities of varying size according to 23 metrics which cover four key categories – economy, society, resources, and environment.[4] For the purpose of our study, we used these two sources to collect data on the above-mentioned 185 Chinese cities and considered the years from 2005 until 2012.[5]

It was impossible to retrieve complete data for all 185 cities, as the information we needed for our study – in particular the one related to city-level annual FDI inflows – was not readily available for all cities. We describe the steps we took to account for these limitations as a potential source of bias in the 'additional analyses' sub-section (included below in the results, after the main analysis). After having excluded all cities with missing data, the final sample we used for our analysis comprises 918 observations. The final list of 134 cities considered in our study can be found in Table 6 in Appendix.

Methodology and Measures

Through econometric analysis, we aimed to estimate the influence of a city's air quality and percentage of waste water that is treated on its FDI inflows. Even though we theorize that the above-mentioned variables precede a city's ability to attract FDI inflows, we cannot fully rule out the possibility that our explanatory variables may be influenced by prior levels of FDI inflows. To account for this issue, we introduced a 1-year lag between our independent and dependent variables (Golovko & Valentini, 2011) so that the explanatory variables in our model precede FDI inflows by 1 year. The introduction of a 1-year lag is justified insofar as the previous year's level of air quality and percentage of waste water that is treated are likely to affect the FDI inflows in a given year. Therefore, we opted for this lag structure to ensure that our explanatory variables temporally precede the dependent variable. In the following paragraphs, we present the variables used in our analysis.

Our dependent variable is the *FDI inflows* absorbed by each city in a given year. This data is reported by the China City Statistical Yearbook. The three main categories of the aggregate measure of FDI adopted by the Chinese Ministry of Commerce and thus reported in the Yearbook are wholly foreign-owned enterprises, Sino-foreign equity joint ventures, and Sino-foreign cooperative joint ventures. Of these three categories the first two constitute most of the FDI inflows into Chinese cities and their relevance has been increasing over time. For instance, for the city of Shanghai – one of the cities for which complete data on the different FDI categories are available – nearly 91% of the FDI inflows in 2000 and up to 98% in 2010 consisted of wholly foreign-owned enterprises and Sino-foreign equity joint ventures. Thus, our dependent variable *FDI inflows* essentially captures the investment made by foreign entities into either wholly or partially owned enterprises based in China. To control for differences in the economic size of the cities included in our sample and to offer a relative rather than absolute measurement of the ability of a given city to attract foreign investments, we divide the FDI inflows (in million USD) absorbed in a given city and year by the GDP (in million USD) of the city in the same year and multiply the result by 100 to have the variable scaled in percentage points. As a result, our construct measures, in percentage points, the weight of FDI inflows in a given city's economy relative to its GDP and thus well captures its overall FDI attractiveness.[6]

Our key explanatory variables are operationalized as follows. *Green_Air qualified days* corresponds to the percentage of days in which air quality reaches the national standard in a given city and year,[7] while *Green_Waste water treatment* measures the percentage of waste water that is treated in a given city and year. Both metrics closely reflect the environmental sustainability level of a given city, representing a consistent operationalization of our two key theoretical constructs.

We also included a number of control variables in our model to account for other factors that may affect the relationships under scrutiny. First, given that prior research has shown that market size significantly and positively affects FDI inflows at both the country (e.g., Ang, 2008; Asiedu, 2006; Quazi, 2007) and subnational regional levels (e.g., Blanc-Brude et al., 2014; Fung et al., 2002), we control for a city's market size in our model estimation. This is because a relatively larger market comprises better economic conditions and more potential demand for a firm's products or services in a given city. Thus, we need to account for the fact that, all else being equal, foreign firms are expected to prefer larger cities over smaller cities. To do so, we included the variable *Market size*, which corresponds to the size of a given city and we use its yearly GDP in units of 10 billion USD to proxy it.

Furthermore, infrastructure quality has also been identified as having a positive and significant correlation to FDI inflows at both the country (e.g., Ang, 2008; Asiedu, 2006; Khadaroo & Seetanah, 2010; Quazi, 2007) and subnational regional levels (e.g., Broadman & Sun 1997; Fung et al., 2002; Sethi et al., 2011; Zhao et al., 2012). Thus, based on the expectation that a particular city is more likely to attract foreign investments if the quality of its infrastructure is higher, we control for different levels of infrastructure quality that characterize the cities in our sample. To proxy a city's infrastructure quality, we rely on two distinct measures. *Infrastructure quality_Public transit* corresponds to the average number of public transit used per urban person in a given city and year. We use this metric based on the assumption that the higher the quality of the public infrastructure in a given city, the higher the average usage of public transit by its inhabitants. Our second operationalization, *Infrastructure quality_Internet usage*, corresponds to the number of households using internet divided by the total number of households in a given city and year, which captures the different level of technological infrastructures characterizing the cities in our sample.

We also included a variable that corresponds to the overall investment in fixed assets. *Investment in fixed assets* is proxied using the total investment in fixed assets (in million USD) in a given city and year divided by the GDP (in million USD) of the city in the same year. Fixed-asset investment includes capital spent on property, machinery, and other physical assets such as land and buildings, furniture, motor vehicles, and plants. In China, roughly two-thirds of such investment is private. Thus, fixed-asset investment is often used to proxy the ability of a given city or region to attract private investors and is generally considered a reliable indicator of how much investment is occurring in a given location and time period (China Daily, 2012, 2016). Then we included two variables (*Primary sector* and *Secondary sector*), which correspond to the GDP in the respective sector divided by the total GDP of a given city in a given year. Their inclusion allowed us to control for the specific focus that a city may have on each of the three sectors used to segment the economic activity as this may have an influence on the overall FDI inflows that a given city is able to attract.[8]

In addition, we included control variables associated with the economic development of a city (*Employment rate* and *Disposable income per capita*) as these may also have a significant impact on the level of FDI inflows absorbed by a given city in a given year. Furthermore, we included two variables – *Access to education* and *Urban health coverage* – that proxy the level of education and health coverage in a city to account for different levels of social welfare characterizing the cities in our sample as these may be additional relevant factors determining FDI inflows. Finally, we accounted for potential time effects and thus included year dummies in all our model estimations. Table 2 provides an overview of the variables we used in the empirical analysis and their operationalization.

RESULTS

Main Analysis

Table 3 contains the descriptive statistics and the pairwise correlations between the variables. We examined variance inflation factors (VIFs) to assess potential multicollinearity. The VIFs values are all well below the severest limit of 5.3 proposed by Hair et al. (1998). Thus, we do not expect issues of multicollinearity to affect our results.

We tested our hypotheses via econometric analysis. As discussed in the preceding section, previous empirical studies have considered the relationship between FDI and environmental sustainability efforts at different levels of analysis (Bu & Wagner, 2016; Eskeland & Harrison, 2003; He, 2006; Li & Zhou, 2017; Madsen, 2009; Siegel et al., 2013). Such works relied on longitudinal data and used fixed-effects corresponding to their key level of investigation. Thus, for instance, Eskeland and Harrison (2003) used fixed-effects at the country level, Bu and Wagner (2016) and He (2006) at the province level, and Li and Zhou (2017) at a firm's individual plant level. As anticipated earlier, we also employed longitudinal data and focused on the city level, with most cities in our dataset observed over 7 years. Accordingly, we used panel data techniques to relate the FDI inflows with the set of explanatory variables that we defined in the previous section. The Breusch and Pagan Lagrangian multiplier test for random effects suggests that the null hypothesis, according to which all effects are not different from zero, can be rejected ($\chi^2(1) = 1{,}330.27$; p value = 0.00). This result thus points to the fact that a random-effects estimation model is preferred over a pool cross-sectional analysis. In the fixed-effects estimation, the F test for city fixed effects shows that the null hypothesis stating that these effects are not different from zero can also be rejected ($F(133, 766) = 22.74$; p value = 0.00). To select a fixed- or random-effects estimation in our main analysis we ran the Hausman test. The result of the test illustrates that the null hypothesis that the two estimates are identical can be rejected ($\chi^2(17) = 93.45$; p value = 0.00). Based on this result, we performed our main model estimation using fixed-effects.

We opted to use fixed-effects in our main analysis building also on Bettis et al.'s (2014) recommendation to use fixed-effects estimation to control for the correlation between independent variables and omitted variables in the error term. Additionally, we made this choice in view of the specific characteristics of our empirical setting as FDI inflows into a city can change significantly from one year to the other and the same can be said for the key explanatory variables in our model. Whereas a fixed-effects estimation does not allow for the analysis of the impact of time-invariant, city-specific factors (for instance the geographic location of a given city in a particular subnational region within China), we consider that this restriction does not limit the implications of our results. On the contrary, it reinforces the reliability of our analysis as it also offers further control for endogeneity issues associated with unobserved city heterogeneity (Golovko & Valentini, 2011). Having said that, to offer a comprehensive assessment of our model estimations and precisely in view of the fact that, as mentioned above, fixed-effects only model within-city variance and thus prevent us from gaining any insights about between-city relationships (Certo et al., 2017), in the additional analyses sub-section below, we also report the results obtained running our fully specified model using random-effects. Additionally, to further ensure the empirical validity of our results, we also performed robustness tests using random-effects that specifically allowed us to directly account for time-invariant characteristics of sample cities such as their administrative status and geographical location. These additional model estimations all support the findings obtained in the main analysis presented in this sub-section, thus corroborating the robustness of our findings to these additional model specifications.

We report the results of the fixed-effects panel data regression analysis in Table 4. Model 1 only includes the control variables, while Models 2 and 3 contain our key explanatory variables separately. Model 4 corresponds to our fully specified model, in which all explanatory variables are included together with all control variables in one single

Table 2 Operationalization of variables in the model

Variable	Operationalization
Dependent variable	
FDI inflows	Annual FDI inflow as % of GDP in percentage points (0 to 100) = (Foreign investment (in million USD) absorbed in a given city and year/Total GDP (in million USD) of the city in the same year) × 100
Independent variables	
Green_Air qualified days	Percentage of days in which air quality reaches national standard in a given city and year in percentage points (0 to 100)
Green_Waste water treatment	Percentage of waste water that is treated in a given city and year in percentage points (0 to 100)
Control	
Market size	Gross domestic product (in 10 billion USD) of a given city in a given year
Infrastructure quality_Public transit	Average number of public transit used per urban person in a given city and year
Infrastructure quality_Internet usage	(Number of households using internet in a given city and year/Total number of households of the city in the same year) × 100
Investment in fixed assets	Total investment in fixed assets (in million USD) in a given city and year divided by the total GDP (in million USD) of the city in the same year
Primary sector	GDP in the primary sector (in billion USD) divided by the total GDP of the city in a given year (in billion USD)
Secondary sector	GDP in the secondary sector (in billion USD) divided by the total GDP of the city in a given year (in billion USD)
Employment rate	Percentage of the population that is employed in a given city and year
Disposable income per capita	Disposable income per capita (in thousands USD) in a given city and year
Access to education	Number of middle and high school students divided by the urban population from 0 to 24 years in a given city and year
Urban health coverage	Number of people with healthcare security divided by the total urban population in a given city and year

Table 3 Pairwise correlations among variables

		N	Mean	SD	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13
FDI inflows	1	918	2.48	2.06	0.00	12.96	1.00												
Green_Air qualified days	2	918	90.79	8.85	42.63	100.00	0.12*	1.00											
Green_Waste water treatment	3	918	69.85	21.95	0.04	100.00	0.17*	0.09*	1.00										
Market size	4	918	2.59	3.28	0.10	28.79	0.30*	− 0.07*	0.32*	1.00									
Infrastructure quality_Public transit	5	918	108.63	71.29	0.15	523.77	0.22*	− 0.18*	0.18*	0.32*	1.00								
Infrastructure quality_Internet usage	6	918	31.91	21.76	0.00	100.00	0.18*	0.10*	0.26*	0.39*	0.21*	1.00							
Investment in fixed assets	7	918	0.56	0.19	0.04	1.39	0.13*	0.08*	0.25*	− 0.13*	0.06*	0.09*	1.00						
Primary sector	8	918	0.11	0.11	0.00	1.00	− 0.25*	0.15*	− 0.24*	− 0.33*	− 0.35*	− 0.19*	0.00	1.00					
Secondary sector	9	918	0.51	0.11	0.06	0.86	− 0.07*	0.02	0.13*	− 0.09*	− 0.08*	0.02	0.00	− 0.25*	1.00				
Employment rate	10	918	0.17	0.16	0.03	0.76	0.27*	0.08*	− 0.02	0.49*	0.05*	0.30*	− 0.34*	− 0.21*	0.03	1.00			
Disposable income per capita	11	918	15.78	5.67	5.87	39.51	0.26*	0.18*	0.46*	0.66*	0.21*	0.52*	0.03	− 0.38*	0.10*	0.43*	1.00		
Access to education	12	918	0.24	0.10	0.06	0.68	− 0.25*	0.10*	0.24*	− 0.16*	− 0.05	− 0.01	0.30*	0.11*	0.16*	− 0.21*	0.03	1.00	
Urban health coverage	13	918	0.29	0.16	0.02	0.94	0.23*	0.03	0.31*	0.38*	0.36*	0.28*	0.04	− 0.36*	0.27*	0.27*	0.51*	0.20*	1.00

$^*p < 0.10$.

regression. The results relative to our fully specified model (Model 4) show that the coefficients of both *Green_Air qualified days* and *Green_Waste water treatment* are positive and significant, therefore providing empirical support for both our Hypotheses 1a and 1b.

To better visualize the size of the effects of our key variables associated with a city's environmental sustainability on the annual FDI inflows, we plotted the key results of our fully specified model (Model 4) in two figures. Specifically, for Figure 1 we plotted the average marginal effect of *Green_Air qualified days* on the full range of *FDI inflows*, highlighting the effect at − 1 and + 1 standard deviation of *Green_Air qualified days* (corresponding to a low and a high *Green_Air qualified days*, respectively). Figure 1 shows that, all else equal, when cities move from a low to a high percentage of air qualified days in a year, they see an increase in their expected annual FDI inflows as a percentage of GDP from 2.30% to nearly 2.65%. For the average city in our sample, the expected positive effect on the annual FDI inflows of 0.35 percentage points of GDP illustrated in Figure 1 corresponds to nearly 90 million USD. For a city like Shanghai, the expected positive effect of 0.35 percentage points of GDP corresponds to an increase in annual FDI inflows of more than 1 billion USD.

For Figure 2 we plotted the average marginal effect of *Green_Waste water treatment* on the full range of *FDI inflows*. As done in Figure 1, we highlighted the effect at − 1 and + 1 standard deviation of *Green_Waste water treatment* (corresponding to a low and a high *Green_Waste water treatment*, respectively). Figure 2 shows that, all else equal, when cities move from a low to a high percentage of waste water treated in a year, they see an increase in their expected annual FDI inflows as a percentage of GDP from 2.35% to nearly 2.60%. For the average city in our sample, the expected positive effect on the annual FDI inflows of 0.25 percentage points of GDP shown in Figure 2 corresponds to nearly 65 million USD. Again, taking Shanghai, the expected positive effect of 0.25 percentage points of GDP corresponds to an increase in annual FDI inflows of nearly 750 million USD. Thus, Figures 1 and 2 clearly illustrate the economic significance of the effect sizes associated with our key explanatory variables.

Among the control variables included in our fully specified model (Model 4 in Table 4), we find a positive and significant effect of both *Market Size*

Table 4 Fixed-effects panel data regression model

Variables	Model 1		Model 2		Model 3		Model 4	
	Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Independent variables								
Green_Air qualified days			0.02**	0.01			0.02**	0.01
Green_Waste water treatment					0.01**	0.00	0.01**	0.00
Control								
Market size	0.10**	0.04	0.09**	0.04	0.10**	0.04	0.09**	0.04
Infrastructure quality_Public transit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Infrastructure quality_Internet usage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Investment in fixed assets	1.38***	0.37	1.40***	0.36	1.34***	0.37	1.37***	0.36
Primary sector	1.01	2.67	1.37	2.66	1.45	2.67	1.83	2.66
Secondary sector	2.14**	1.01	1.82*	1.01	1.98*	1.01	1.65	1.01
Employment rate	1.42	1.04	1.58	1.04	1.40	1.04	1.56	1.03
Disposable income per capita	− 0.06*	0.03	− 0.06*	0.03	− 0.06*	0.03	− 0.06*	0.03
Access to education	0.98	0.62	0.89	0.62	1.04	0.62	0.95	0.62
Urban health coverage	0.32	0.37	0.26	0.37	0.25	0.37	0.19	0.37
Year dummies	Included		Included		Included		Included	
Constant	0.65	0.85	− 0.93	0.98	0.41	0.85	− 1.21	0.98
Fixed- or random-effects	Fixed		Fixed		Fixed		Fixed	
Number of observations	918		918		918		918	
Number of groups	134		134		134		134	
F value	3.82***		4.23***		3.87***		4.29***	

*$p < 0.10$.
**$p < 0.05$.
***$p < 0.001$.

and *Investments in fixed assets* on *FDI inflows*. Our results also show a negative and significant relation between *Disposable income per capita* and *FDI inflows*. This may be due to the fact that foreign investment into China has been significantly driven by the willingness to leverage labor cost differences (Demirbag & Glaister, 2010; Pisani & Ricart, 2016) and thus, all else equal, cities reporting a lower disposable income per capita may have been the ones benefiting relatively more from FDI.

Additional Analyses

To check the robustness of our findings, we performed a number of additional analyses. First, we note that our working sample includes cities of widely varying size. To control for this, our fully specified model included a control variable to account for the different magnitude of the cities comprised in our sample. Having said that, we performed additional checks to test whether the effect we obtained was not due to the presence of a few very large cities in our sample. To do so, we reran our fully specified model (Model 4 in Table 4) excluding the two largest cities in our sample – Shanghai and Beijing – as these are the two Chinese cities comprised in the list of 48 global cities in the world according to Belderbos et al. (2017). The results obtained (reported in Model 1 in Table 5) are entirely aligned with the ones presented in our main analysis, thus corroborating that our findings are not impacted by the presence of these two very large cities in our sample.

Second, as discussed in the previous sub-section, the results obtained in the Hausman test prompted us to use fixed-effects in our main model estimations reported in Table 4. Having said that, the use of fixed-effects allowed us to model within-city variance exclusively, therefore preventing us from gaining any insights about between-city relationships (Certo et al., 2017). Following these considerations, in Model 2 of Table 5 we also reported the results obtained when running our fully specified model using random-effects, thus considering not only within-city but also between-city variance that is automatically discarded when using fixed-effects. As shown in Model 2, the results obtained using

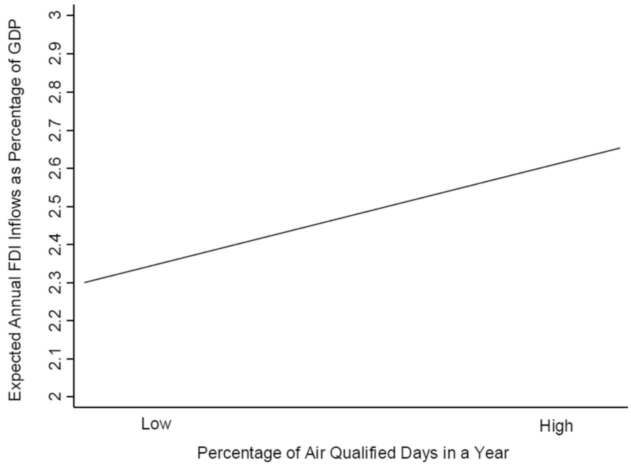

Figure 1 Average marginal effect of a city's percentage of air qualified days in a year on its annual FDI inflows.

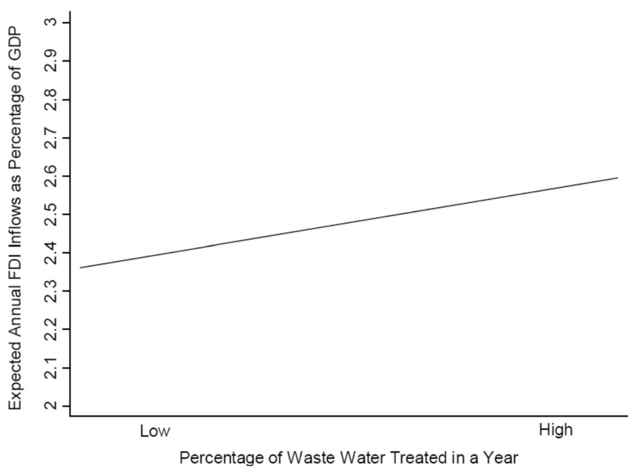

Figure 2 Average marginal effect of a city's percentage of waste water treated in a year on its annual FDI inflows.

random-effects are entirely aligned with the ones reported in our main analysis.

Moreover, we ran additional analyses using random-effects as this model estimation gives the opportunity to specifically account for the role of important time-invariant characteristics of cities such as their administrative status and geographical location. Accordingly, in Table 5 – Models 3 to 6 – we added four sets of control variables to our fully specified model considered while using fixed-effects. These additional control variables are then all included together in one single regression, reported in Model 7. First, we controlled for the different administrative status of Chinese cities and, consequently, included dummies so as to categorize sampled cities distinguishing between prefectures, provincial and sub-provincial capitals, and municipalities. The inclusion of the municipality dummy identifying the four largest cities in our sample – Shanghai, Beijing, Tianjin, and Chongqing – provided the opportunity to further control for the role that very large cities may have in our model estimation.

Second, the central government in China has been putting increasing pressure on cities to improve their air quality and waste water management while also furthering economic development throughout the last two decades.[9] This pressure has thus come from a centralized source and it has been pushed into a highly hierarchical system consisting of different tiers. Despite strong centralization forces in China, prior research has suggested that, while Chinese provinces are subservient to the central government, provincial officials have considerable discretion with respect to policy (Blanc-Brude et al., 2014; Bu & Wagner, 2016; Zhu & Dou, 2018). Specifically, Bu and Wagner (2016) have posited that most variation in terms of the application of policies aimed at regulating pollution is at the provincial level. Thus, building on their results, we constructed a variable to control for the varying level of environmental regulation stringency characterizing Chinese provinces. To do so, we categorized each city in our sample based on the environmental regulation stringency of its province, distinguishing between four categories (very high, high, medium, and low).[10]

Third, we controlled for the geographic location of cities in our sample and thus included dummies differentiating between five different subnational regions in China – North, East, West, Central, and South. Finally, in view of the fact that most FDI inflows in China has historically been concentrated in coastal cities (Blanc-Brude et al., 2014), we also included a dummy to account for the proximity to the sea of some of the cities in our sample. The main results associated with our key explanatory variables are robust to the inclusion of all these additional control variables – which are added separately to our fully specified model in Models 3 to 6 and then all together in one single regression in Model 7 in Table 5 – thus strongly corroborating the robustness of our findings to these additional model specifications. In Table 7 in Appendix, we also report the robustness tests to dropped control variables that we performed in relation to our fully specified model using fixed-effects – thus, repeating the model estimation reported in Model 4 in Table 4 excluding the control variables one by one.

Table 5 Additional analyses

Variables	Model 1 Fixed-effects Excluding global cities		Model 2 Random-effects		Model 3 Random-effects Additional controls		Model 4 Random-effects Additional controls		Model 5 Random-effects Additional controls		Model 6 Random-effects Additional controls		Model 7 Random-effects Additional controls	
	Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Independent variables														
Green_Air qualified days	0.02**	0.01	0.02***	0.01	0.02***	0.01	0.02***	0.01	0.02***	0.01	0.02***	0.01	0.02***	0.01
Green_Waste water treatment	0.01**	0.00	0.01**	0.00	0.01**	0.00	0.01**	0.00	0.01**	0.00	0.01**	0.00	0.01**	0.00
Control														
Market size	0.09**	0.04	0.10**	0.03	0.08**	0.03	0.10**	0.03	0.11**	0.03	0.10**	0.03	0.08**	0.03
Infrastructure quality_Public transit	0.00	0.00	0.002*	0.00	0.00	0.00	0.002*	0.00	0.003**	0.00	0.002*	0.00	0.00	0.00
Infrastructure quality_Internet usage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Investment in fixed assets	1.37***	0.37	1.94***	0.34	1.87***	0.34	1.90***	0.34	1.82***	0.34	1.94***	0.34	1.71***	0.34
Primary sector	1.92	2.68	– 2.08*	1.21	– 1.50	1.22	– 2.42*	1.23	– 2.02	1.24	– 2.21*	1.21	– 1.64	1.26
Secondary sector	1.64	1.02	0.12	0.80	0.37	0.80	0.05	0.81	– 0.01	0.81	0.08	0.80	0.27	0.82
Employment rate	1.52	1.05	2.62***	0.69	2.46**	0.72	2.60***	0.70	2.32**	0.76	2.30**	0.70	1.90**	0.82
Disposable income per capita	– 0.06*	0.03	0.00	0.03	0.00	0.03	– 0.01	0.03	– 0.03	0.03	– 0.02	0.03	– 0.04	0.03
Access to education	0.94	0.62	0.39	0.61	0.45	0.60	0.40	0.61	0.43	0.60	0.41	0.60	0.51	0.60
Urban health coverage	0.21	0.37	0.54	0.36	0.51	0.36	0.53	0.36	0.50	0.36	0.48	0.36	0.44	0.36
Year dummies	Included		Included		Included		Included		Included		Included		Included	
Administrative status categories														
Prefecture (Reference category)														
Provincial and sub-provincial capital					1.40**	0.44							1.45**	0.46
Municipality					0.50	0.88							0.93	1.06
Environmental regulation stringency categories														
Low (Reference category)														
Medium							– 0.59	0.66					– 0.16	0.83
High							– 0.29	0.30					– 0.15	0.33
Very high							– 1.14	0.69					– 0.69	0.78
Subnational regional dummies														
Northern (Reference category)														
Eastern									0.89**	0.39			0.71	0.45
Western									– 0.80	0.52			– 0.79	0.58
Central									– 0.22	0.39			– 0.20	0.47
Southern									0.59	0.42			0.59	0.47

Table 5 continued

Variables	Model 1 Fixed-effects Excluding global cities		Model 2 Random-effects		Model 3 Random-effects Additional controls		Model 4 Random-effects Additional controls		Model 5 Random-effects Additional controls		Model 6 Random-effects Additional controls		Model 7 Random-effects Additional controls	
	Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Coastal city dummy											0.71**	0.27	0.16	0.38
Constant	– 1.26	0.99	– 1.49*	0.79	– 1.72**	0.79	– 1.08	0.83	– 1.03	0.82	– 1.42*	0.79	– 1.09	0.90
Fixed- or random-effects	Fixed		Random		Random		Random		Random		Random		Random	
Number of observations	904		918		918		918		918		918		918	
Number of groups	132		134		134		134		134		134		134	
F value	4.23***													
Wald Chi-square			129.02***		141.11***		132.19***		144.96***		136.28***		157.40***	

*$p < 0.10$.
**$p < 0.05$.
***$p < 0.001$.

The results obtained are entirely aligned with the ones reported in the main analysis, thus lending additional empirical support to our findings.

As mentioned in the methodology section, our analysis may suffer from a potential sample selection bias due to the fact that city information, especially in relation to the FDI inflows absorbed every year, is not always available. As discussed, missing data contributed to a reduction of the size of our working sample. If missing values are non-random, i.e., that unobservable variables determine the availability of data, our empirical findings may be biased as a result of a sample selection. To address the potential selection bias in our analysis, we followed common procedure and used Heckman's (1979) two-stage estimation procedure. In the first stage, we estimated the selection equation as follows. For our dependent variable, we used a dummy that specifies whether the data for the given city and year was available and thus allowed for its inclusion (*dummy_included*). The set of control variables, as included in the models reported in Table 4, corresponds to the set of explanatory variables for the first stage. In this first stage, we used a dummy as our main exclusion variable that scores 1 when the UCI was able to gather information on the air pollution in a given city – i.e., the concentration of NO_2 downtown – and 0 otherwise (*dummy_air pollution info*). We found this dummy to be related to the availability of exhaustive information on the city (Pairwise correlation = 0.75) and not related to the overall FDI inflows (Pairwise correlation = – 0.02), thus satisfying the exclusion restriction of Heckman's (1979) two-stage estimation procedure. In the second stage, we used the same dependent and independent variables included in our full specification model as reported in Model 4 (Table 4) and added the vector of inverse Mills ratio (IMR) from the selection equation estimated in the first stage. The IMR coefficient is found to be not significant and the results are again fully in line with those obtained without this correction, thus offering strong evidence that our results do not suffer from sample selection bias.

DISCUSSION AND CONCLUSION

This paper examined a key area of IB research, i.e., MNEs' location choice, in relation to urban environmental sustainability, an issue of rapidly growing public interest that has already received attention from geographers and environmental scientists, but without a business focus. Our study took a new perspective by combining these two themes, asking the question of whether it pays to be green for cities for attracting FDI inflows. Our analysis, based on a fixed-effects panel data estimation using a comprehensive data set of 918 city-year observations from China over a 7-year period, focused on two key aspects of environmental sustainability in the urban context, air quality and waste water treatment, which expose different mechanisms of firms' green location choice. Our empirical analysis resulted in an affirmative answer for both dimensions – reducing air and water pollution has a direct, positive, and economically meaningful impact on a city's ability to attract foreign investments. The contributions to the literature and the implications for city and business policies, as well as for further research, will be discussed next.

While understanding the factors driving FDI location choice has been a focal area within IB research, empirical studies have mostly been conducted at the country and subnational regional levels, and only more recently, and to a relatively limited extent, at the city level, concentrated on global cities (cf. Nielsen et al., 2017). Our study makes specific contributions in this regard. Fetscherin et al. (2010) pointed at the need for further research, in the case of China, beyond the four largest cities, so we respond to their call by also including 'smaller' cities in considering the link between environmental sustainability and FDI inflows. Our results show that it indeed pays for cities to be green, empirically validating a positive effect associated with both air quality and waste water treatment. The additional analysis of the effect sizes highlights the economic relevance of the relationships we posited. A number of robustness tests lend additional support to our conclusions.

A key contribution is the identification of a 'race to the top' at the city level. Cities appear to compete based on a virtuous cycle of sustainability-related FDI growth, in which better environmental protection leads to further private investments from abroad. This stands in stark contrast to the 'race to the bottom' noticed at the country and supranational regional levels (cf. Becker & Henderson, 2000), according to which the environment is sacrificed, with lax regulation attracting polluting industries and firms from (higher-standard) countries. Interestingly, Bu and Wagner (2016) showed, also for China, that if firms' environmental capabilities are accounted for, a 'race to the bottom' can turn into a 'race to the top' among those firms characterized by relatively higher environmental capabilities. Building on this, our study further shows that a finer-grained analysis focused on the city rather than country or supranational regional levels and on two key aspects of environmental sustainability – air quality and waste water pollution – corroborates the presence of a 'race to the top.' In other words, even if one expects a race to the bottom at the country or supranational regional level, the opposite might occur within a given country when looking at cities. Future studies could explore cities in relation to business policy in other countries beyond China to see whether a race to the top at a city level is confirmed.

The findings are very important for policymakers who seek to attract more investments to their city. Previous FDI location choice studies with urban centers as their unit of analysis (e.g., Goerzen et al., 2013) acquired and analyzed data at the firm level. Although there is no intrinsic advantage to either firm- or city-level data, there is a substantial difference in their policy significance. While firm-level data gives researchers the opportunity to guide and inform strategic decision-making by MNEs, city-level data also allows us to guide and inform public policy. As such, we recommend municipal governments to increase the intensity of their environmental regulation and enforcement to realize improvements thereof. Specific urban policies should direct citizens and firms inside city boundaries to abide by maximum thresholds of the range of emissions in their respective activities and ensure that significant portions of energy consumption and production originate from clean sources. Moreover, cities could themselves invest in reducing air and water pollution and consider subsidizing firms and citizens who exceed environmental norms substantially. Additionally, promoting and facilitating the reuse of waste water also seems to be a good strategy.

Our study has further implications for firms as well. Fetscherin et al. (2010: 342) noted that "MNEs may have a self-interest in supporting and enforcing strict environmental regulation," also in view of global harmonization of their quality standards and approaches. Hence, the finding that firms prefer to invest in greener cities abroad may represent a signaling effect by MNEs that prefer not just a cleaner location but also one that relates better to their image and ambitions, further reinforcing urban sustainability regulation. This is certainly an area for future research given that we did not have firm-level data to which FDI and city environmental sustainability measures could be linked. As a result, we were unable to control for the geographical and industrial sources of the FDI inflows, and make inferences about which countries or industries invested in our sample of cities. Additionally, while using an aggregate measure of FDI inflows as dependent variable, similar to previous studies, we note that the effects identified through our analysis may be different when considering selected types of FDI investments – for instance restricting the focus to equity joint ventures or distinguishing between greenfield investments and acquisitions.

While data availability is definitely an issue, it would be very interesting if future studies could take these factors into account to elucidate which firms, from which home countries, and through which specific types of FDI investments, prefer greener cities. Another limitation that opens up avenues for further research is that, as common for studies focused on FDI flows, we have no data on the FDI deals that were not made in a given city and thus were able to focus only on FDI inflows actually realized in the time period we considered. Having said that, a fruitful area for investigation might be to adopt approaches from the finance field and gather data for each FDI deal announced in the press of a given city and then observe which deals among the announced ones are completed and relate this information to how green the city is and, specifically, with respect to which dimension. What we were able to assess is that FDI inflows are sensitive to air and water quality, which we measured. While these are crucial aspects to assess how green a city is, illuminating different mechanisms, a recommended direction for follow-up research would be to use further dimensions of environmental sustainability to examine whether our results hold.

As already mentioned in the introduction, China is specific in that it does not have a fully functioning market economy, and firms thus operate in a "highly institutionalized" (cf. Tian, Hafsi, & Wu, 2009), government-dominated context. While this affects generalizability to other countries in which state direction in the economy and in society is less prominent, we note the following. First, previous publications have pointed at the increasing room for maneuver for local governments over time, allowed by the central government, in a range of policy areas (e.g., Li et al., 2014), including environmentally related ones (e.g., Kolk & Tsang, 2017). This implies that our findings, while originating from the Chinese context, can also be relevant for other countries in which cities have some discretion in the environmental field. Second, given the severity and urgency of environmental sustainability issues, greater and more direct policy interventions may also be considered or become necessary in (Western) market economies. Such a scenario of market-directed green change may bear considerable resemblance with the context of this paper, and is therefore worthwhile considering from that perspective as well. Third, our study focused on China opens up for future research that covers multiple countries in which an augmented model that also considers cross-country differences in government intervention is tested.

Overall, China is therefore an excellent context for the topics of our study for multiple reasons. First, recent estimates suggest that the country will have 221 cities with 1 million inhabitants by 2025, a number that is now over 100 already (The Guardian, 2017). Moreover, out of the 31 megacities in 2016 (with a population of more than 10 million), four were located in China; these figures are expected to rise to six out of the 41 by 2030 (UN, 2016: 4). Environmental sustainability in general and the various forms of pollution in particular are major concerns for policy-makers, citizens and firms given that they are so noticeable; a peculiarity that already applies to urban areas elsewhere and may increase and spread further in the years to come. Moreover, as discussed above, the country has a decentralized system of governance, which was implemented in the past decades. Although economic incentives play a key role in the central government's evaluation of local officials, which seem to negatively affect some environmental policies adopted at the lower levels (shown, e.g., in the case of small-car policies, Kolk & Tsang, 2017; and in a more generic study that included actor perceptions, Wang et al., 2018), air and water pollution are so obvious that they do matter, also for municipal authorities. We were able to show this given that we did not use indirect measures (e.g., Wang et al., 2018) or policies (Kolk & Tsang, 2017), but directly assessed them.

This means that, although our study certainly also has its limitations, as indicated above, our findings do have relevance beyond the specific setting, and for situations in which there is room for maneuver and sufficient 'autonomy' for local governments vis-à-vis higher levels. For example, if cities are willing and able to deviate from less environmentally friendly policies by provincial and/or federal governments with the aim to be 'greener,' as happened in the case of climate change where many have been frontrunners (Bulkeley, 2010), such approaches may have additional benefits in terms of attracting FDI inflows. As noted already, Chinese policy attention to environmental sustainability has increased over the years. Interestingly, Tsang and Kolk (2010: 187) quote a statement from the chairman of the EU Chamber of Commerce in China, who already in 2007 said that "In the environmental sector we see Chinese legislation that is even stricter than European law, yet implementation is sometimes non-existent". Given that 5-year plans adopted since then have emphasized monitoring and enforcement, China may not be that different per se from other countries in terms of the implications of our study. Furthermore, consumer research has shown that the long-standing CSR construct originating from Western settings also turned out to hold in China (Kolk et al., 2015). Individuals' perceptions of firms' CSR behavior appeared to be comparable across regions in China as well. This provides an additional justification for generalization to other settings. Regardless of such possibilities for further broadening, our study has shed light on the international business policy dimensions of urban governance, thus adding to non-business disciplines that have considered other dimensions of cities' environmental sustainability. We hope that our work may encourage IB scholars and geographers and environmental scientists to open a more extensive dialogue concerning the intersection between environmental sustainability research and FDI location choice. Such a conversation has the potential to inspire research that is of great academic and practical significance.

NOTES

[1]This paper uses the term 'environmental sustainability' rather than sustainability (or sustainable development) in general given that we do not focus on (or operationalize) the social and/or economic dimensions (as would be required when pursuing the broader notion of 'people, planet, profit', or the triple bottom line). Likewise, we use green cities (rather than sustainable cities) as issues related to social resilience (and communities, as in the Sustainable Development Goals) are not included. In addition, as noted by Andersson (2016: 2000), "the green city concept has become firmly established in the research community".

[2]In this study we elaborate on three of the four articles identified in this combined search. The only one that we do not discuss further is King and Shaver (2001). This is because the main purpose of their research was to compare the extent to which foreign- versus US-owned establishments generate and manage waste in the United States. Hence, they do not really focus on FDI location choices, which is central in our study.

[3]For additional information, see www.stats.gov.cn.

[4]For additional information, see www.urbanchinainitiative.org.

[5]We restricted the data collection to these years because data from the Urban China Database was available from 2005 until 2012 (for a further discussion about limitations and generalizability, see the final section of this paper).

[6]When comparing the aggregate measure of FDI adopted by the Chinese Ministry of Commerce and thus employed in our study vis-à-vis the one utilized in other countries, for instance the one developed by OECD, there are some differences. For instance, while OECD FDI flows consist of not only equity transactions but also equity reinvestment of earnings and intercompany debt transactions (OECD, 2008), the data reported in the China City Statistical Yearbook do not include information on reinvested earnings and intercompany debt transactions. However, this is not an issue for our study as we restrict our analysis to Chinese cities and thus do not aim for a comparison of FDI inflows across countries and/or regions in which FDI measurements may not be so easily comparable. By only relying on data provided by the China City Statistical Yearbook, widely reputed as the leading source of statistical data in China, we ensure that our analysis is based on high-quality data points that are comparable among themselves. The adoption of aggregate measures of FDI to proxy a given city's attractiveness for foreign investment in prior studies – see for example the studies of Bu and Wagner (2016) and Blanc-Brude et al. (2014) both focused on China – further corroborates the appropriateness of this operationalization for the purpose of our work.

[7]Air qualified days are defined as days in which the Air Pollution Index (API) is at either Level 1 or Level 2. API was used in China to describe the air quality until 2012; it was then replaced by an updated Air Quality Index (AQI) in early 2012. API

was calculated on the basis of several variables associated with air pollution data and there existed six different levels (Levels 1 to 6, with 1 being the highest in terms of air quality and 6 being the lowest). Level 2 means that air quality is generally acceptable to the public, except for particularly sensitive individuals.

[8]According to the National Bureau of Statistics of China, the primary sector includes agriculture, forestry and fisheries. The secondary sector encompasses, inter alia, mining, manufacturing, production and supply of electricity, and construction. The tertiary sector refers to all others, hence primarily service-related ones. Additional information is available at http://data.stats.gov.cn/english/easyquery.htm?cn=B01.

[9]We note that the 10th, 11th, and 12th 5-year plans, issued by the central government in 2001, 2006, and 2011 respectively, all explicitly mentioned the pressing need for cities to reduce both air and water pollution. For instance, one of the sections of the 11th 5-year plan focused on the need to improve the environmental sustainability of Chinese cities, explicitly supporting the adoption of measures aimed at reducing the total emission volume of major pollutants and increasing the percentage of waste water treated (State Council, 2006). Furthermore, environmental awareness has gradually increased in China over the years. Earlier studies found, for example, that waste water collection and treatment and the related recycling of reclaimed waste water started already in the 1980s (Lyu et al., 2016; Yi et al., 2011).

[10]To gauge the strictness of a province's environmental regulation, Bu and Wagner (2016) operationalized environmental regulation stringency as the sum of pollution discharge fees normalized by the added value created in the manufacturing industry. In their article they reported the average environmental stringency for each Chinese province in the 1992–2009 period, grouping provinces in four distinct categories (0.00–20.24; 20.24–28.76; 28.76–46.72; 46.72–66.22) which are the same ones as we used to categorize provinces, and in turn cities, in our dataset.

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APPENDIX

See Tables 6 and 7.

Table 6 Sampled Chinese cities by region

Region	Cities
Northern region	Anshan, Baoding, Baotou, Beijing, Benxi, Changchun, Changzhi, Chifeng, Daqing, Dalian, Datong, Fushun, Handan, Huhehaote, Jinzhou, Langfang, Linfen, Mudanjiang, Qinhuangdao, Shenyang, Shijiazhuang, Shizuishan, Songyuan, Taiyuan, Tangshan, Tianjin, Wulumuqi, Xingtai, Yangquan, Yinchuan
Eastern region	Anqing, Changzhou, Chuzhou, Dongying, Hangzhou, Hefei, Huzhou, Jiaxing, Jinan, Lianyungang, Nanjing, Nantong, Ningbo, Qingdao, Rizhao, Shanghai, Shaoxing, Taian, Tongling, Weifang, Weihai, Wenzhou, Wuhu, Wuxi, Xuancheng, Xuzhou, Yangzhou, Yantai, Zaozhuang, Zhenjiang, Zhoushan, Zibo
Western region	Chengdu, Kunming, Luoyang, Luzhou, Mianyang, Panzhihua, Qujing, Xining, Yuxi
Central region	Anyang, Baoji, Changde, Changsha, Chongqing, Ezhou, Hengyang, Huanggang, Huangshi, Jiaozuo, Jingzhou, Kaifeng, Lanzhou, Leshan, Loudi, Shangluo, Tianshui, Tongchuan, Weinan, Wuhan, Xi'an, Xiangtan, Xianning, Xianyang, Xiaogan, Xinxiang, Xuchang, Yichang, Yiyang, Yueyang, Zhangjiajie, Zhengzhou, Zhuzhou
Southern region	Beihai, Chaozhou, Dongguan, Fangchenggang, Foshan, Guangzhou, Guilin, Haikou, Jiangmen, Jieyang, Jingdezhen, Jiujiang, Liuzhou, Nanchang, Nanning, Ningde, Putian, Qinzhou, Quanzhou, Sanya, Shantou, Shanwei, Shaoguan, Shenzhen, Xinyu, Yingtan, Zhangzhou, Zhaoqing, Zhongshan, Zhuhai

Table 7 Robustness to dropped control variables

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Independent variables										
Green_Air qualified days	0.02**	0.01	0.02**	0.01	0.02**	0.01	0.02**	0.01	0.02**	0.01
Green_Waste water treatment	0.01**	0.00	0.01**	0.00	0.01**	0.00	0.01**	0.00	0.01**	0.00
Control										
Market size			0.09**	0.04	0.09**	0.04	0.07*	0.04	0.10**	0.04
Infrastructure quality_Public transit	0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00
Infrastructure quality_Internet usage	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00
Investment in fixed assets	1.20**	0.36	1.37***	0.36	1.38***	0.36			1.34***	0.36
Primary sector	2.52	2.65	1.66	2.65	2.01	2.64	0.64	2.66		
Secondary sector	1.40	1.01	1.61	1.01	1.66	1.01	2.04**	1.01	1.45	0.97
Employment rate	1.60	1.04	1.58	1.03	1.58	1.03	0.91	1.03	1.59	1.03
Disposable income per capita	− 0.03	0.03	− 0.05*	0.03	− 0.05*	0.03	− 0.06**	0.03	− 0.06*	0.03
Access to education	0.80	0.62	0.98	0.62	0.94	0.62	1.16*	0.62	0.99	0.62
Urban health coverage	0.24	0.37	0.22	0.37	0.17	0.37	0.20	0.37	0.21	0.37
Year dummies	Included		Included		Included		Included		Included	
Constant	− 1.25	0.99	− 1.11	0.98	− 1.24	0.98	− 0.45	0.97	− 0.86	0.84
Fixed- or random-effects	Fixed		Fixed		Fixed		Fixed		Fixed	
Number of observations	918		918		918		918		918	
Number of groups	134		134		134		134		134	
F value	4.13***		4.49***		4.52***		3.64***		4.51***	

Table 7 continued

Variables	Model 6		Model 7		Model 8		Model 9		Model 10	
	Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows		Dependent variable: FDI inflows	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Independent variables										
Green_Air qualified days	0.02**	0.01	0.02**	0.01	0.02**	0.01	0.02**	0.01	0.02**	0.01
Green_Waste water treatment	0.01**	0.00	0.01**	0.00	0.01**	0.00	0.01**	0.00	0.01**	0.00
Control										
Market size	0.09**	0.04	0.09**	0.04	0.07**	0.03	0.09**	0.04	0.09**	0.04
Infrastructure quality_Public transit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Infrastructure quality_Internet usage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Investment in fixed assets	1.43***	0.36	1.28***	0.36	1.41***	0.36	1.42***	0.36	1.37***	0.36
Primary sector	0.58	2.55	2.03	2.66	1.73	2.66	2.19	2.65	1.97	2.64
Secondary sector			1.63	1.01	1.94*	1.00	1.60	1.01	1.63	1.01
Employment rate	1.53	1.03			1.52	1.03	1.62	1.03	1.52	1.03
Disposable income per capita	− 0.06**	0.03	− 0.06*	0.03			− 0.06*	0.03	− 0.06*	0.03
Access to education	0.92	0.62	0.98	0.62	1.04*	0.62			0.98	0.61
Urban health coverage	0.16	0.37	0.15	0.37	0.22	0.37	0.24	0.37		
Year dummies	Included		Included		Included		Included		Included	
Constant	− 0.25	0.79	− 0.91	0.97	− 1.93**	0.90	− 1.10	0.98	− 1.19	0.98
Fixed- or random-effects	Fixed		Fixed		Fixed		Fixed		Fixed	
Number of observations	918		918		918		918		918	
Number of groups	134		134		134		134		134	
F value	4.37***		4.40***		4.33***		4.39***		4.53***	

*$p < 0.10$.
**$p < 0.05$.
***$p < 0.001$.

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