

Is Foreign Direct Investment Sensitive to the Environmental Regulation: Firm Level Evidence from China

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Abstract: At the center of pollution haven debate is whether foreign investments are impacted by environmental regulations of the developing countries. Most empirical studies try to provide evidences from aggregated data, while fairly lacking direct evidences from micro-level. To fill this gap, this paper tests the intra-country pollution haven effect by estimating the determinants of foreign direct investment in China, using a large firm level panel data sample. Evidence from this study supports the existence of pollution havens within China in certain cases. However, the sensitivity of foreign investments to environmental regulations varies a lot across different sources of investors, sizes of investments, and industrial features.

Keywords: Foreign direct investment, Environmental regulation, Pollution haven, China

I. Introduction

Research in the environmental economics and international business literature has paid increasing attention to the role of environmental regulation on foreign investment. The famous “pollution haven hypothesis” says foreign investments are attracted by the weak environmental regulations of developing countries. As this would mean developing countries could make environmental pollution as their special kinds of comparative advantage in international trade. Then, these countries can race to the bottom of environmental standards for competing for foreign investments. Despite the appealing argument, previous studies have provided mixed findings. Some studies have found that stricter environmental regulation cause the less amount or the less possibility of foreign investment. Others, however, have found only weak or no significant evidence of the deterrent effect of environmental regulation.

Most empirical studies on this issue have focused on aggregated level data. These studies helped to offer some valuable insights to the current debate. It is more difficult, we argue below, to infer structural links between environmental regulations and foreign investment in existing studies. Our interest in investigating the structural links stems from a desire to consider the diversification of foreign investment. For this aim, this paper takes a first step towards investigating this by examining the determinants of individual foreign investment.

Among developing countries, China is the largest country for receiving foreign direct investment. There are substantial variations of environmental regulations across different regions in China. So, China offers an ideal case for testing the intra-country pollution haven effect. Our study is based on a large firm level panel dataset, which

probably is the first one adopted among China related research in the area of environmental regulation and foreign investment. The results show some support for the existence of a pollution haven in China in certain cases. However, the sensitivity of foreign investments to environmental regulations varies a lot across different sources of investors, sizes of investments, and industrial features.

The reminder of the paper is as the followings. The next section reviews the literature. Section 3 presents the data sources and the regression model. In Section 4, we perform several estimations. Finally, Section 5 concludes the paper.

II. Literature review

So far, the debate of Pollution haven hypothesis has attracted many researchers to join and stimulated different research evidences. To show the trend, we first review the literature based on the macro-level data, and then the literature based on the micro-level data. Possible causes for the mixed results from the methodological side are finally presented and discussed in the end of this section.

As for the macro-level studies, (Xing and Kolstad 2002) tests the relationship between the capital outflow of several US industries and the environmental policy of the destination country, using a semi-log linear model of FDI determination for six US industries. They find there exists a significant negative linear relationship between FDI of the US chemical and metal industries and the stringency of environmental regulation in a foreign host country. Hence, in general, lax environmental policy tends to attract more capital inflow from the US for pollution intensive industries. (Zhang and Fu 2008) examine whether differences in the stringency of environmental regulations affect the choice of location for FDI in China, using a five-year panel dataset for 30 provinces in China. The results suggest that environmental stringency has a significant and negative effect on FDI, leading them to conclude that, *ceteris paribus*, FDI prefers to locate into regions with relatively weak environmental regulations. However, in contrast to the views of (Xing and Kolstad 2002) and (Zhang and Fu 2008), (Eskeland and Harrison 2003) finds no robust correlation between environmental regulation in industrialized countries and foreign investment in developing countries. The evidence that foreign investors locate in sectors with high levels of air pollution, is weak at best. They suggest the relationship between investment and regulation depends on a number of factors, not as simple as assumed in a naive model.

One drawback of these macro-level studies is that the use of aggregated data can confound differences in environmental standard (Brunnermeier, 2004). On one hand, jurisdictions that attract more polluting plants will have higher abatement costs than jurisdictions with a cleaner industrial composition, even if the environmental standard faced by individual plants is identical across jurisdictions. On the other,

newer plants have to comply with more stringent environmental standard than existing plants. Thus, jurisdictions with relatively more new plants may report higher compliance costs than jurisdictions with older plants even if their regulations are the same. Thus, one would need to adjust reported pollution abatement costs to capture the difference in industrial composition of the jurisdiction itself. Both the two sides arguments above are big challenges for researchers with aggregated data.

Using firm establishment level data from US, (Arik 1996) examines the effect of state environmental regulations on new manufacturing plant locations. There seems to be little evidence that stringent state environmental regulations deter new plants from opening. The explanation may be that firms manufacturing products in a variety of jurisdictions find it most cost effective to operate according to the most stringent regulations, eliminating the necessity of designing a different production process for each location. Different from (Arik 1996), (List and Co 2000) also uses US data to estimate the effect of environmental regulation on investment, but with a focus on multinational corporations. Certain empirical results support that environmental stringency and attractiveness of a location are inversely related. Moreover, the effects are found to be quite large, as comparable estimates from the domestic firm location literature. However, with the assessment of impact of environmental regulation in host countries on Japanese FDI decision-making, (Kirkpatrick and Shimamoto 2008) does not support that weak environmental regulations in a host country may attract inward FDI by firms seeking to circumvent regulatory compliance. On the contrary, inward Japanese FDI appears to have been attracted to countries which have committed themselves to a transparent and stable environment regulatory framework.

Among the few cases on China, (Di 2007) examine whether potential pollution abatement cost savings influence the location choices of FDI, using data from 4 industries. The results show that pollution-intensive FDI firms are responsive to higher pollution levy charges, while non-polluting FDI firms are not, suggesting the existence of domestic pollution havens in China. (Dean, Lovely et al. 2009) examines pollution haven behavior by estimating the determinants of location choice for equity joint ventures (EJVs) in China. Their results show that weak environmental standards attract EJVs in highly-polluting industries funded through ethnically Chinese sources such as Hong Kong, Macao, and Taiwan, while they do not significantly attract EJVs funded from non-ethnically Chinese sources regardless of the pollution intensity of the industry.

It should be noticed that these investment location choice studies, although also using micro-level data, are quite different with our research. We focus on the determinants of the amount of foreign investment, while these studies only examine the possibility of opening new plants. As stated by Di (2007), these studies are still based on cross-sectional data. Moreover, Di (2007) suggests a fixed-effects model would be ideal if longitudinal disaggregate flow data are available, and if there is

sufficient variation in regulatory stringency over time.

A few studies of the controversy surrounding the pollution haven hypothesis have reviewed papers to methodologically explain what may cause different empirical results. Researchers, such as (Jeppesen and Folmer 2001; Brunnermeier 2004), both argued that two important reasons should not be ignored. First, environmental regulations and foreign investments may be endogenous, that is, there are causal relationships running in both directions. For example, if greater foreign investments lead to higher income, and higher income leads to greater demand for environmental quality, then environmental regulations could be a function of foreign investments. Second, regulatory stringency has been proxied in a variety of ways in the literature. Some measures have obvious drawbacks. For examples, environmental indices are easy targets for criticism because of their subjectiveness. The use of objective, quantitative data on pollution levels or pollution costs can be more convincing.

Considering the concerns above, this study seeks to clarify the relationship between foreign investments and environmental regulations. Using a large firm level panel data sample, it is able to investigate the relationship based on the rich diversification of foreign investments, meanwhile well dealing the endogeneity issues.

III. Methodology

IV. Empirical results

V. Conclusion

This paper uses firm level panel data to examine whether the foreign investment is more or less likely to be attracted to Chinese provinces with stringent environmental regulations. Evidence from this study supports the existence of pollution havens within China in certain cases. However, the sensitivity of foreign investments to environmental regulations varies a lot across different sources of investors, sizes of investments, and industrial features.

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