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Analysis

Environmental regulation and French firms location abroad: An economic geography model in an international comparative study

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ABSTRACT

In this study, we re-examine the pollution haven hypothesis by a fresh take on both its theoretical and empirical aspects. The originality of our work is twofold. First, we apply an economic geography model with the aim of deriving a rigorous specification for the impact of environmental regulation on firms' location choice. Second, we test a conditional logit model using French firm-level data in an international comparative study. We confirm evidence of a strong pollution haven effect for our pooled sample of countries receiving French direct investments. However, through a sensitivity analysis, we validate this finding for developed countries and most of emerging economies and Central and Eastern European countries, but not for most countries of the Commonwealth of Independent States and developing countries, where a more stringent environmental regulation seems to attract investments. Furthermore, we highlight a forward looking behavior of firms, in terms of their location decision-making.

1. Introduction

Environmental regulation has notably been put in evidence by Copeland and Taylor (2004) through a simple model of specialization and trade, according to which the rich countries that protect their environment, should abandon their polluting activities to developing countries, whose environmental legislation and enforcement are not severe. This statement illustrates the commonly studied "pollution haven hypothesis (PHH)".

Generally, statistical studies show that the PHH cannot be clearly identified. Four potential problems in this literature require more empirical tests. First of all, most studies lack theoretical foundations for the construction of the equations to be tested, which often entails specification errors. Secondly, the absence of relative endowments of production factors in the explanation of foreign direct investment (FDI) can lead to omitted variable bias (Cheng and Kwan, 2000; Zhang and Markusen, 1999). Next, several studies use very aggregated data on FDI and proxies of the severity of the environmental policy that are far off the real variable to be taken into account, which generally results in bias induced from measurement-error (Smarzynska and Wei, 2004). Finally, Keller and Levinson (2002) and Levinson and Taylor (2008) emphasize the empirical importance of controlling for the unobservable characteristics of industries and locations.

In this study, we consider these various limits and try to remedy them. We present a classic theoretical model of economic geography, which supplies us a log-linearized specification for the determinants of firms' location choice, among which we distinguish the impact of the environmental regulation. As far as we know, at the moment, there is broadly no international empirical study on the PHH based on a theoretical model of economic geography. An exception is Jug and Mirza (2005), where authors derive a structural gravity equation to show that environmental regulation is a determinant of trade flows. However, authors focus on European counties only. Otherwise, economic geography models have been used in purely theoretical works (Conrad, 2005; Rauscher, 2005; Van Marrewijk, 2005), while the existing empirical studies on the PHH are most often based on standard international trade models. For the empirical work, we use firm-level data on French firms locating in heterogeneous countries. Most of studies in related literature focus on FDI locating in a single country, mainly in the United States, while only a few have attempted to examine this hypothesis for other countries (Dean et al., 2009; Smarzynska and Wei, 2004). However, the actual debate on the reality of pollution havens mainly concerns international issues: the fear that less regulated, poorer countries become pollution havens for polluting firms from more regulated, developed countries. Hence, the novelty of this study lies on its relevancy in the international debate

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regarding pollution havens, since it assesses the impact of environmental regulation on FDI in different countries. In order to take into account the specific characteristics of countries, the empirical estimations are performed controlling for different country groups (high-income Developed countries, Emerging countries, Transition CEEC, Transition countries of CIS and Developing countries). As regards the specific characteristics of industries, the estimation methods used control for firms and industry specific effects. We use the conditional logit model, which is a proven estimation method in the literature on location choice, providing high precision on estimated effects. Finally, to represent the environmental regulation's stringency, we create a complex and dynamic index, which assesses the relative severity of the environmental policy across countries.

2. Review of the Literature

One of the earliest articles on the PHH is Grossman and Krueger (1993) work, whose objective was to assess the environmental impacts of the North American Free Trade Agreement. Examining the impact of American industries' pollution abatement costs on the pattern of trade and investment between United States and Mexico, the authors show that traditional economic determinants of trade and investment were very important, while cross-industry differences in pollution abatement costs on U.S. imports from Mexico appeared to be small and statistically insignificant. They conclude that differences in the abatement costs do not play a significant role due to the weak weight of environmental costs comparatively to more considerable production costs.

Since then, articles on this subject followed without a consensus being established, while concerns abound over the effects of environmental standards on trade flows and FDI. Series of scientific studies did not manage to validate the assumption that environmental regulation affects trade or firms' investment decisions (e.g., Jaffe et al., 1995; Raspiller and Riedinger, 2008; Wheeler, 2001). To deal with the ambiguous results found in the literature, Jeppesen et al. (2002) investigate, through a meta-analysis of 11 studies, how the characteristics of empirical studies (empirical specification, data, definition of regulatory variable and other control variables) influence the empirical results of the environmental regulation impact on firms' location decision. Their results show that foreign firms are more sensitive to environmental regulations than domestic ones. They also indicate a larger impact of regulation when smaller geographical area is considered in the study and highlight the importance of taking into account the heterogeneity of firms. Ederington et al. (2005) also explain partially why previous studies did not confirm the PHH. They recall that international trade is essentially made between developed countries, whose regulation is quite similar. Nevertheless, if one examines only the flows between industrial nations and developing countries, the environmental standards have more pronounced effects on the trade structure: with the strengthening of the environmental regulation of the United States, imports from developing countries decrease. In fact, Ederington et al. (2005) notice that polluting industries are generally the least mobile geographically and thus, it becomes more expensive to establish production in countries that apply a less rigorous regulation. In another attempt to search for the PHH, Kahn (2003) tests whether the greatest dirty U.S. trade growth has taken place with poorer non-democratic countries. The author shows that poor nations and non-democratic nations are not major exporters of pollution intensive goods to the U.S.

Most of papers in this field use data on trade flows while studying PHH. Some relatively more recent papers examine PHH by using data on FDI. Eskeland and Harrison (2003) study the effect of the abatement cost and pollution intensity on FDI in Morocco, Cote d'Ivoire, Venezuela and Mexico, and find essentially no empirical support for the PHH. Besides, they find that the U.S. factories are more efficient in terms of energy use and employ “cleaner” types of energy than the domestic plants. In a group of 24 transition countries, Smarzynska and Wei (2004) find a relatively weak evidence for pollution havens. Dean et al. (2009) show that a less stringent regulation is a significant determinant for Chinese villages' attractiveness for joint ventures in highly polluting industries and with partners from Hong-Kong, Macao and Taiwan. On the contrary, they find that investors from industrial nations are not affected by higher standards, regardless of the industry pollution intensity. The authors suggest that this result could be explained by technological differences.

Other studies assert that environmental regulation influences the spatial allocation of capital. List and Co (2000), employing a conditional logit model and using four measures of regulatory stringency, show that heterogeneous environmental policies across states affect foreign multinational corporations' new plant location decisions. Another seminal paper in this literature is that of Keller and Levinson (2002), which uses panel data on inward FDI flows in the U.S. over a long period of time and employ an innovative measure of the relative abatement costs across the States. By applying standard parametric models on panel data, the authors find a robust result showing that abatement costs have moderate dissuasive effects on FDI. However, List et al. (2003b), by using a semi-parametric propensity score matching estimator allowing them to take advantage of the panel nature of data to control for time- and location-specific unobservables, suggest that the existing literature based on parametric estimates understates the impact of pollution regulations. Similarly, empirical results of List et al. (2003a) from models using both parametric and semi-nonparametric specifications on U.S. county level panel data show that air quality regulations influence the destination choice of relocating plants. However, when using a semi-parametric propensity score matching estimator while comparing the location decisions of foreign and domestic firms in the New York State, List et al. (2004) find that only domestic firms are sensitive to the stringency of environmental regulation. Moreover, their empirical results point out to a double-dividend from foreign investments: foreign plants induce economic development and are not unreasonably influenced by environmental regulation. More recently, the application to Keller and Levinson data of newly developed non parametric techniques (Henderson and Millimet, 2007) reveals two results: first, some of the parametric results are not robust, and second, the impact of relative abatement costs is generally of a smaller magnitude than previously suggested. At the opposite, Wagner and Timmins (2009), using panel data on outward FDI flows of various industries in the German manufacturing sector, accounting for externalities associated with the FDI agglomeration effect and employing a GMM estimator to control for endogenous time-varying determinants of FDI flows, find robust evidence of a pollution haven effect for polluting chemical industry.

Finally, Cole et al. (2006) show the existence of an inverse relationship between FDI and environmental regulation: it is FDI that influences the environmental policy, but this effect is a function of the degree of corruption in the host country.

In conclusion to this section, we recall Taylor (2004) who suggested that empirical work on the PHH had for a time been misleading because researchers were regularly considering a pollution haven effect (PHE) while analyzing the PHH. The common view in the related literature is that the PHH is a stronger version of the PHE. According to Copeland and Taylor (2004), the PHE states that differences in environmental regulation affect, at the margin, plant location decisions and trade flows. The PHH, on the other hand, predicts that under free trade, relocation of pollution-intensive production from countries with stringent environmental regulation, usually developed countries, to countries with lax regulation, usually developing countries, takes place because environmental regulation acts as the prevailing determinant factor in the location decision of polluting firms. The theoretical support for PHH is quite weak compared to PHE, since trade and FDI theory suggests that many other factors, in addition to environmental regulation, affect trade and FDI flows. Making a distinction between these two notions