



Analysis

FDI and pollution havens: Evidence from the Norwegian manufacturing sector

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ABSTRACT

This is an empirical study of the firm and country determinants of foreign direct investment (FDI) and how it is affected by the stringency of environmental regulations in host countries. We employ disaggregated data on sales by Norwegian multinationals' affiliates from 1999 to 2005 that allow such affiliates to be categorized as either efficiency-seeking (vertical) or market-seeking (horizontal) FDI. While the environmental stringency of a host country and its enforcement are found to have no effect on the average investment, we find a significant negative effect on multinationals with vertical motives. Compared to those located in lenient countries, the efficiency-seeking affiliates in more environmentally regulated countries receive less investment from their parent companies in terms of (i) equity capital, (ii) capital stock, and (iii) assets. We further find that the total exports from affiliates to parent companies in Norway decrease with the level of enforced environmental stringency in the host countries.

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1. Introduction

The pollution haven hypothesis (PHH) has for decades served as a rallying call for an assortment of constituencies involved in the trade-versus-environment debate. As barriers to international trade continue to fall, a country's environmental regulations may become an important influence on its comparative advantage. Assuming that firms are responsive to inter-jurisdictional differences in regulatory stringency, the PHH posits that pollution-intense production activities move to lenient countries, either through foreign direct investment (FDI) or through increased market share by lax countries' exporters. This paper examines the first strand of the PHH, investigating the likelihood of multinational firms' relocating to countries with weaker environmental standards where the costs of complying with environmental regulations are lower. The PHH focuses on the cost effect of environmental regulations on firms and presumes that production cost differentials are a sufficient stimulus for firms to relocate their production facilities. Rationalizations for this view generally come from the notion that a stricter regulatory regime for environmental standards will add to the costs of production. Such costs

may arise from the requirements for new equipment and the need to find alternative methods for disposal of waste due to rules against landfill or restrictions on particular inputs and outputs. In the absence of any other factors, it is in firms' interest to relocate their production activities to countries with less stringent environmental regulations.

Previous theoretical studies employ a general equilibrium framework to show that countries with lenient environmental regulations will enjoy a comparative advantage and may attract pollution-intensive industries.¹ Accordingly, multinational enterprises (MNEs) that already have international experience appear to be the most likely to reorganize their production activities in countries with lenient environmental standards through foreign direct investment (FDI). Despite the well-established economic rationale behind this hypothesis, the empirical evidence is not yet conclusive. PHH studies that focus on US inward FDI, such as those by List and Co (2000), Keller and Levinson (2002), or Kellenberg (2009) have arguably produced the most success in establishing an effect. However, from countries other than the US, the effects of pollution havens found in prior works have ranged from nil to marginally significant (see, for

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¹ See, for instance, Pethig (1976), Siebert (1977), McGuire (1982), and Copeland and Taylor (1994).

instance, Elliott and Shimamoto, 2008; Eskeland and Harrison, 2003; Javorcik and Wei, 2004; Manderson and Kneller, 2012; Waldkirch and Gopinath, 2008). Some studies even find that foreign investors tend to invest in areas with more stringent environmental regulation (Dean et al., 2009; Kirkpatrick and Shimamoto, 2008).

Although these studies have been illuminating, their shortcomings suggest that the question has not yet been fully answered. One limitation of previous studies is that they have been unable to decompose the flows of FDI according to the underlying motives. In sum, an MNE undertakes market-seeking or horizontal FDI in order to gain an advantage when supplying the local market. This type of FDI takes place between countries similar in factor costs and market size when exporting is costly. Conversely, efficiency-seeking or vertical FDI occurs between dissimilar countries in taking advantage of factor-price differences when trade costs are low. These imply that the sensitivity of FDI to the host countries' characteristics will vary according to the destination of production. Consistent with the theory of comparative advantage, the PHH is most likely relevant in the context of vertical FDI. Since the preponderance of evidence suggests that the comparative advantage motive for FDI is far less important than the market access motive in explaining the bulk of FDI, the missing pollution-haven effect should not be a surprise. This paper examines this concern by employing data that allow FDI to be disaggregated according to its motive.

Further, unlike most previous research which assumes that industries react homogeneously to changes in environmental regulation, recent studies have shown that firms' (and industries') reactions may vary with respect to their polluting intensity (Javorcik and Wei, 2004), energy intensity (Eskeland and Harrison, 2003), or geographical mobility (Ederington et al., 2005). Consequently, the underlying heterogeneity in the link between environmental regulation and FDI suggests that an improved investigation of PHH could be accomplished with micro-data.

This study empirically investigates the firm and country determinants of FDI and how it is affected by the stringency of environmental regulations in host countries. For testing the hypothesis that efficiency-seeking FDI are relatively more sensitive to the differences of environmental regulations between host countries, we use a register of outgoing FDI from Statistics Norway (SSB) for 1999–2005. This register gives financial information on overseas affiliates in addition to the transactions between them and their Norwegian parents. It also includes a large amount of information gathered domestically at the plant level. These features could be an advantage because the use of industry-level and even more aggregated data is prone to aggregation bias (Levinson and Taylor, 2008). Further, we exploit the panel aspect of the data and allow the inclusion of the year and firms' fixed effects to reduce the possibility of omitted variable bias.

Norway arguably represents an ideal country for a study of this kind for several reasons. First, the Norwegian economy is open and highly internationalized. During the period of analysis, its FDI abroad saw a significant rise. The total value of Norwegian outward direct investment flows was USD 5833 million in 1999. By the end of 2005, this value amounted to USD 21,966 million.² As a result, Norway is one of the countries with the highest stock of FDI abroad.³ Second, and more importantly, Norway has always been in the top ten of the world's most stringent countries in terms of environmental regulations and their enforcement (World Economic Forum et al., various editions). Evidently, between 1991 and 2004, Norway's proportion of environmental tax revenues in comparison to the total revenues from all types of taxes and the national insurance contributions was well above that of other

EU-15 countries (Smith, 2005).⁴ Moreover, firms in Norway spend relatively more on investments in environmental protection. For instance, the end-of-pipe investment for protecting the environment as a percentage of gross investment by firms in Norway was 5.2% in 2000, 3.5% in 2001, 7.8% in 2002, and 4.7% in 2003. Unsurprisingly, a closer look at the data reveals that for most Norwegian firms within industries such as pulp, paper and paper products, chemicals, and basic metals, the average ratio of investment for protecting the environment has been significantly higher than for firms in other industries. Further, data from Eurostat reveals that during the same period, the government of Norway was among the highest spenders (as a percentage of GDP) with regard to expenditure and investment for all activities aimed at the prevention, reduction, and elimination of pollution or any other degradation of the environment.⁵ These facts suggest that, all else being equal, pollution-intensive firms in Norway face stronger incentives to relocate abroad than they do in most other countries. Finally, it is interesting to note that during the period of our analysis, firms within these industries recorded the highest outward investment in terms of both value and growth. To the best of our knowledge, despite the abovementioned facts, no previous studies have considered whether there is a pollution haven effect from environmental regulation using Norwegian data.

The remainder of the paper is organized as follows: the next section discusses empirical specifications; Section 3 describes the data; Section 4 provides the results and discussion, and Section 5 concludes.

2. Empirical Model

We start with the conjecture that FDI flows are determined by the characteristics of the destination country that affect the profitability of the investment. Theories also suggest that the pattern of FDI should vary across country–firm pairs with the strength of market access and comparative advantage motives. The strength of the market access motive for FDI should vary with country–firm pair characteristics, such as transport costs, and country characteristics, such as market size and the country's openness.⁶ On the other hand, the strength of the comparative advantage motive also varies across countries and firms, depending on the importance of factor price differentials across countries and given a firm's production technology. Therefore, for each firm i , host country j , in year t , we assume that the function relating these characteristics to the volume of FDI can be approximated by

$$FDI_{i,j,t} = x'_{j,t}\beta + z'_{i,t}\gamma + \eta_{i,j,t}, \quad (1)$$

where $x_{j,t}$ is a vector of the time-varying attributes of country j ; $z_{i,t}$ is a vector of the time-varying attributes of the firm; and $\eta_{i,j,t}$ is an idiosyncratic disturbance that varies with time, country, and firm. The dependent variable, $FDI_{i,j,t}$, is a measure of the operations performed by a multinational firm j . Our regressions employ five different proxies as the dependent variable, each is separately run in Eq. (1) and, individually, provides an alternative perspective on the pattern of Norwegian

⁴ Norway was the first country in the world to have a ministry at cabinet level with special responsibility for environmental matters. In Europe, Norway is among the first to introduce various regulations to protect environment. The target limits of pollutant and waste have been controlled in Norway since 1981 through Act of 13 March 1981 No 6. In contrast, the counter-regulations in Europe have only been discussed recently, with target limits of pollutants were set into force, for example, in 2005 for sulphur dioxide and 2010 for nitrogen dioxide.

⁵ The same period also sees Norway in the second position for the average ratio of public investment for protecting the environment, with about 0.14% of its GDP, slightly below the Netherlands that spent about 0.16% of its GDP.

⁶ Since we have no access to firms' detailed transport costs, we apply the simplifying assumption that trade costs are associated with distance. Venables and Limao (2002), for instance, build on such an approach and find that trade costs rise with distance at an elasticity of 0.3.

² The values are in terms of current prices and exchange rates, and are taken from UNCTAD's foreign investment database.

³ The list is available online at <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2199rank.html> (accessed on December 20, 2012).

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