



A model of demand, productivity and foreign location decision among Taiwanese firms[☆]

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ABSTRACT

We develop a theoretical framework to examine the relative importance of firm demand and productivity in firm decisions to export and where to locate foreign direct investments. The model shows that the equilibrium firm decision depends on product technology, consumer preference for product quality, fixed investment costs of establishing a foreign subsidiary, transportation costs and relative wages. Our empirical results confirm the predictions of the theoretical model. Firm-level demand and productivity components are important in explaining the decision to participate in foreign markets with their relative importance depending on the firm's organizational form (exports versus FDI) and the destination of the investments. In general, FDI firms are more productive than exporting firms regardless of FDI destinations. FDI firms also have a higher demand component than exporters and this demand component is stronger than productivity. Finally, among FDI firms, while those with a high demand index and productivity have a significantly higher propensity to invest in high-income countries, firm productivity is the sole determinant of firms undertaking FDI in low-income countries.

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1. Introduction

The last two decades have seen a dramatic rise in worldwide foreign direct investments (FDI) with volumes reaching US\$935 billion in 2010 from US\$198 billion in 1990. Similarly, the amount of outward foreign direct investment in Taiwan has increased sharply from US\$1.8 billion in 1990 to US\$10.1 billion in 2010, when 17% of the accumulated outward FDI flows ended up in high-income countries and 83% in low-income countries. China and the U.S. together account for about three-quarters of the total value of Taiwan's outward FDI since 2000. This paper focuses on firms' choices on how to serve a foreign market and the way in which this decision reflects underlying patterns of demand and productivity conditions.

Our theoretical model builds on the existing proximity-concentration tradeoff literature whereby in choosing how to serve a foreign market, a firm trades off between exploiting economies of scale through expansions into the export market and economizing on transport costs by undertaking FDI. Firms prefer FDI over exports in countries with large market size and where high transportation costs

are involved. More generally, in the presence of fixed costs of FDI, firms with productivity over a threshold level are more likely to overcome the disadvantages of the extra fixed costs incurred in setting up foreign subsidiaries to serve foreign markets. The productivity threshold level depends on these fixed costs, the market size and production costs of the destination countries as well as the trade costs of delivering products to the foreign market.¹

More recently, Fajgelbaum et al. (2011) extend the proximity-concentration tradeoff by introducing product quality in an attempt to explain the large FDI flows across countries with similar per capita income levels. In their model, consumers are characterized with non-homothetic preferences so that, in contrast to low-income countries, high-income countries demand more high quality products. In addition to the standard predictions of the "concentration-proximity" view, producers in high-income countries are more likely to specialize in high quality products and serve high-income foreign countries through FDI and low-income countries via exports. Their model shows that treating firms as heterogeneous in a single productivity dimension misses important insights about the role of demand side factors. We incorporate these features in our theoretical model.

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¹ Helpman et al. (2004) are among the first to provide a ranking of the productivity of multinational firms, exporters and domestic firms. They show that U.S. multinational firms are more productive than non-multinational exporting firms. More recent empirical evidence by Aw and Lee (2008) indicates that Taiwanese manufacturing firms with FDI in the U.S. have higher productivity levels compared to firms with FDI in China as well as non-FDI firms.

The success of Taiwanese manufacturing exports in the 1970s and 1980s followed by the success of moving production overseas in the form of FDI in the following decades are well known in the trade and development literature. What is less known are the underlying causes of these successes at the micro level. Firms that export and undertake FDI have been documented to have superior productivity performances relative to firms that do not undertake these activities. Given that rising input prices in Taiwan have limited further cost reductions by firms, identifying the separate roles of demand and cost (and thus productivity) heterogeneity appear crucial to the future success against other rapidly growing countries with more competitive wages such as China, Vietnam and India. Understanding the relative importance of demand versus cost factors in firms' decisions regarding where to locate production will guide investments in appropriate activities.

Until very recently, the bulk of the research on demand side factors uses output price as the proxy for product quality.² Given that a higher price may result from, among other things, higher product quality and/or lower firm productivity, this practice gives rise to misleading conclusions. Following Foster et al. (2008), Gervais (2011) and Roberts et al. (2012), our paper directly constructs the measure of demand side dimension based on the residuals of the estimated demand function.

The contribution of our paper is three-fold. First, we develop a theoretical model that incorporates firm-demand and productivity heterogeneity in order to generate predictions regarding the role of firm demand and productivity heterogeneity in explaining the export and FDI decisions of firms. Second, our theoretical model allows foreign countries to differ in their comparative advantage in the production of and taste for high and low quality products. Third, we test these predictions by exploiting the availability of product-level price and quantity information in the Taiwanese data to construct an index of firm demand based on the residuals of an estimated demand function. A firm has a higher demand index if consumers have stronger preferences for the firm's products relative to alternative varieties manufactured by its rivals. To our knowledge, this addition of the demand dimension is new in the empirical literature on the factors underlying multinationals' location choices.

The empirical results of our paper offer new evidence of sorting across FDI destinations on the basis of firm demand and productivity conditions and suggest that the relative importance of these two aspects of firm heterogeneity is likely to vary with both country characteristics and organizational mode. In general, firms undertaking FDI are more productive than exporters regardless of FDI destinations. In contrast, the relative importance of firm demand on the choice of engaging in FDI and exporting depends on firm FDI destinations. Firms manufacturing products with a high demand index are more likely to engage in FDI in countries with a strong preference for high quality products and comparative advantages in their production. For instance, if high demand index products are skill-intensive, then countries such as the U.S. and Japan which are abundant in skilled labor and sophisticated production technology have a comparative advantage in producing these products. In contrast, firms with high productivity but a low demand index are more likely to invest in low-income countries such as China which, in contrast to high-income countries, demand less high demand index products and where these products are more costly to produce.

In this paper, we test the theoretical predictions of the model we develop using information on firm domestic, export and FDI activities for the relatively short time period from 2000 to 2004. Our data series is

not long enough nor is there enough detailed information to make unequivocal causal statements regarding the relationship between FDI and productivity (and demand) or the relationship between specific forms of export and FDI activities. For instance, since more than 90% of firms that undertake FDI in the industries under consideration also export, it is difficult using this data, to distinguish the role of demand and productivity for the subgroup of pure FDI firms, especially if we disaggregate by industry. We focus on identifying the role of demand and productivity for firms that only export and those that export as well as undertake FDI. In addition, our data does not contain any information on export destinations nor the number of FDI destinations. Firms report only their primary FDI destinations. Indeed, if high-demand-index and/or high productivity firms own affiliates in both high and low-income countries but only report high-income country as their primary FDI destination, we will underestimate the importance of both the demand index and productivity in low-income countries.³

The remainder of this paper is organized as follows. Section 2 provides the literature review. A simple theoretical framework is introduced in Section 3. We describe the data set we use in Section 4, followed in Section 5 by the empirical specification and the empirical results. Section 6 contains the summary and conclusions.

2. Literature review

While the theory linking trade, as well as FDI, and demand side forces is well-established, the empirical implementation is less so because of the difficulty in the measurement of demand elements. However, the availability of more detailed data on firm-level output and input prices and quantities has encouraged the development of empirical models that incorporate both supply and demand elements to firm heterogeneity.

In particular, very recent papers have constructed a measure of product quality by modeling the demand side. Khandelwal (2010) adopts a nested logit demand model to estimate product quality across countries by using U.S. imports data. He finds evidence consistent with quality variation at the country level. Foster et al. (2008) and Gervais (2011) estimate a demand function for a sample of U.S. firms and show that, after controlling for firm-specific prices, a firm with a larger market share (or quantity of products sold) has larger demand shifters. Moreover, these demand-side shifters are shown to contribute more than productivity to firm selection into both the domestic and export markets and firm growth and survival, and explain most of the variations in the exporter's price premium. Taken together, these papers highlight the fact that both productivity and demand conditions affect firm decisions on market participation.

Empirical research on the role of demand side forces and more specifically, product quality has focused more on the decision of firms to continue production or enter the foreign market through exporting rather than through outward FDI. For example, the relationship between product quality and firm export participation has been recently studied by Hallak and Sivadasan (2009) and Manova and Zhang (2012). Manova and Zhang (2012) provide evidence based on Chinese firm-level data of higher prices for firms that export to more markets. Using firm-level data from the U.S. and India, Hallak and Sivadasan (2009) find that exporters charge higher prices than non-exporters within an industry and that the firm's unit value increases with firm size. The positive correlation between unit values and firm revenue in

² Verhoogen (2008), Foster et al. (2008, 2012), Gervais (2011) and Crozet et al. (2012) are exceptions. Verhoogen (2008) and Crozet et al. (2012) use ISO 9000 certification and producer rating on French wine as the quality measure, respectively, and Foster et al. (2008, 2012) and Gervais (2011) construct demand indexes from estimating the demand function. None of these papers focus on firms' decisions to locate their production operations overseas.

³ Yeaple (2009) finds that more-productive U.S. multinationals own affiliates in more foreign countries. Chen and Moore (2010) find that more productive FDI firms are more likely to be able to enter countries with high entry barriers for a sample of French manufacturing firms. More recently, Roberts et al. (2012) find that Chinese footwear firms with high demand and low cost indexes are more likely to export to more countries and to the less popular destinations.

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