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Explaining asymmetries in bilateral FDI flows

Jinzhuo Z. Garrett *

Hampden-Sydney College, Department of Economics and Business, 868 Graham Hall, Hampden Sydney, VA 23943, USA

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ABSTRACT

This paper constructs a two-stage monopolistic competition model that explains the large number of zeros and missing bilateral FDI flows, as well as positive bilateral FDI flows we observe in the data. A Heckman two-step selection procedure is used to empirically estimate the model by employing data for 101 countries from 1995 to 2002. I show that certain characteristics previously considered important to determine FDI flows in traditional OLS estimations may only matter for multinationals selecting into FDI relationships, and in some cases, they may even negatively affect FDI flows.

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1. Introduction

When considering the flows of bilateral FDI, every country is potentially both a recipient and a source of FDI with more than one partner. Despite the record-breaking amount of worldwide FDI flows, a large number of country-pairs do not have FDI flows between them.[1] Even when only considering developed economies, which dominate both global inflows and outflows, nearly half of OECD countries' potential bilateral FDI pairs are not realized from over 50% of their FDI partners. This pattern of missing bilateral FDI is even more prevalent in other areas of the world.

In this paper, we set out to determine whether firm heterogeneity matters for understanding the aggregate pattern of multinationals' foreign direct investment activities, both theoretically and empirically — can this theory help explain the large number of missing bilateral FDI flows between country-pairs, and consequently provide an explanation as to why bilateral FDI is concentrated among few country pairs? As there are many missing or zero flows in FDI data, it is also important to consider how to accurately evaluate activities of a country's potential multinational enterprises. These zeros and missing entries could lead to biased results when left untreated. Heterogeneous firm theory developed by Melitz (2003) presents a model with productivity differences across firms to explain the stylized facts regarding diversity among multinational firms in the same exporting industry. Empirical evidence shows that only a tiny minority of firms engage in international trade and an even smaller fraction of firms own production facilities in more than one country. In this paper, I extend the Melitz-type heterogeneous firm theory and implement a Heckman two-stage selection procedure to account for the missing entries' effect on the bilateral FDI data, theoretically and empirically.

Helpman, Melitz, and Rubinstein (2008) extend the Metliz-type firm-level export model and show important implications on aggregate trade flow patterns and trading partners. In particular, the method explains the missing trade in international bilateral trade

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* Tel.: +1 434 223 6200; fax: +1 434 223 6504.
E-mail address: jzgarrett@hsc.edu.

[1] Or at least not observed.

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flows without assuming symmetry between trading countries. The authors emphasize that the estimation results are biased if the zeros are excluded. I extend the Helpman et al. (2008) type heterogeneous firm framework to provide theoretical foundations flexible enough to explain symmetric, asymmetric, or the zeros in the bilateral FDI data and to incorporate both firm productivity differences and the analysis of zeros in FDI data. I test the model using a two-stage estimation procedure to systematically account for observed FDI flows and adjust for unobserved flows.

The paper is organized as follows: section two provides a general overview of the relevant theoretical and empirical literature; section three sketches the baseline model; section four lays out empirical estimation procedures; section five discusses data sources; section six analyzes empirical results; and section seven concludes.

2. Literature review

A large number of empirical and theoretical studies have made strides in advancing our understanding of foreign direct investment: reasons why it is an attractive option to penetrate foreign markets and factors that affect the amount of FDI into the foreign market. The majority of the existing literature examines the determinants of FDI in a partial equilibrium setup, while a generation of recent general equilibrium models attempt to include important long-run factors that can affect FDI locations and decisions.

Melitz (2003) pioneered a theoretical model that uses firm productivity differences to explain the intra-industry effects of international trade. The Melitz model provides a theoretical foundation for stylized facts that firms exhibit a range of productivity levels within an industry, and the relatively more productive firms are more likely to export, while the majority of firms do not. Helpman, Melitz, and Yeaple (2004) incorporate intra-industry heterogeneity in a Melitz type model to explain why even fewer firms establish foreign affiliates, based on the proximity-concentration tradeoff hypothesis. Assuming the fixed costs of FDI are higher than export costs, Helpman, et al. find empirical evidence that supports the relationship between exports and FDI: the higher productivity dispersion in an industry, the higher the ratio of exports to FDI sales. Baldwin and Harrigan (2011) propose a quality-adjusted heterogeneous firm trade model to account for the number of export zeros, market size and export prices. Helpman et al. (2008) build a simple extension of the Melitz model, and by assuming firms are distributed on a truncated Pareto distribution, the authors are able to explain aggregate trade asymmetry and zero trade flows. Silva and Tenreyro (2006) also emphasize on the importance of correcting for the zeros in trade flow data, and they show heteroskedasticity is quantitatively and qualitatively important in the gravity equation, even after controlling for fixed effects. Silva, et al. recommend the Poisson pseudo-maximum-likelihood estimator to correct for the heteroskedasticity bias and to deal with observations of zero values, in place of the standard log linear OLS model.

Several recent studies explicitly examine the role of fixed cost in determining FDI flows. Razin, Rubinstein, and Sadka (2004) establish a model with “lumpy” setup costs that directly affect the flow of bilateral FDI. Based on the comparative advantages that technologically advanced countries have in setting up foreign affiliates, the authors build a model that generates two-way FDI flows for North–North and North–South countries. In this model, every country is treated as a potential source for FDI flows, and instead of one FDI partner, there is a range of potential host FDI partners. Meanwhile, this source country could host FDI flows from several origin countries. This is a unique feature, because it allows us to correctly evaluate aggregate bilateral flows, taking into consideration all possible county pairs for FDI activity, even if there is no observed data entry for flows. In fact, in the OECD dataset that Razin et al. (2004) employed, many country pairs indeed have zero flows between them. Razin, Sadka, and Tong (2008) use expanded data on countries to include non-OECD countries. The model employed is one with comparative advantage as well, and they find two effects that affect bilateral FDI flows in opposite directions: with the standard marginal profitability effect, a positive productivity shock in the host country tends to increase FDI flows; but with total profitability effect, the same shock may lower the likelihood of an FDI investment to occur. This is one of the first studies that examines FDI flow data at the aggregate level, and discovers the important productivity threshold barrier that is a source of conflicting effect of productivity change on bilateral FDI flows.

Davies and Kristjansdottir (2010) also examine the importance of fixed cost in analyzing FDI. Using Iceland aggregate FDI inflows data, the authors adopt a Heckman two-step procedure, to account for fixed costs and their impact on the aggregate investment patterns. The authors claim that most firms are involved in very few investment projects across the world, implying a dataset with predominately zero flows. The larger firms with existing advantages, such as in size, tend to make investments, which causes a natural sample selection bias. They find that contrary to the standard OLS approach, some of the variables that were believed to affect the quantity of FDI may play the most important role in determining whether FDI occurs in the first place.

Building on literature incorporating intra-industry firm heterogeneity into models of international investments, and incorporating geographic selection into the structure of U.S. multinational activity across industries and countries, Yeaple (2009) presents a micro-founded model that explains multinational activities. As an extension of Helpman et al. (2004), it focuses on heterogeneous firms serving consumers in foreign markets through exports or horizontal FDI. Important predictions from Helpman et al. (2004) are that only the most productive firms in a country engage in FDI; relatively less productive firms export; and the least productive firms only serve the domestic market. Using U.S. firm level data, Yeaple (2009) finds that the more productive U.S. firms indeed own affiliates in a larger number of countries and generate most revenue sales. Yeaple (2009) is closest to this paper in the way proximity-concentration trade-offs are set up. Using foreign affiliate sales data, Yeaple focuses on the productivity cutoff threshold and country characteristics' effect on the extensive margin of FDI. This paper, on the other hand, addresses the causes for a large number of zeros and missing FDI flows, as well as asymmetric FDI flows, in a heterogeneous firm framework.

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