



Multinational production, exports and aggregate productivity



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ABSTRACT

This paper presents and estimates a dynamic model of multinational production (MP) and exports with heterogeneous firms. The model highlights the interaction between firms' location and export decisions and their effect on aggregate productivity. The model is structurally estimated using firm-level Indonesian manufacturing data. The results are broadly consistent with the pattern of productivity, exports and MP across firms. Counterfactual experiments suggest that there are substantial productivity gains due to international trade and MP. The implied changes in steady state real wages, however, are relatively small. The experiments emphasize that the nature of firm-level trade and MP interactions are crucial to determining the aggregate effects of trade and foreign direct investment policy.

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1. Introduction

It is well known that there are large differences in total factor productivity across developed and developing countries. Foreign direct investment (FDI) and export promotion are often encouraged to reduce these differences and, as such, both mechanisms represent key planks of development policy. Unfortunately, until very recently there has been relatively little quantitative research on the costs and benefits of these policies and their impact on policy relevant outcomes. We aim to fill this gap by rigorously examining the impact of trade and multinational production (MP) in Indonesia.

We begin by considering the impact of trade and MP on resource allocation across heterogeneous producers. We present a dynamic, empirical model of heterogeneous producers with endogenous exit, entry and export decisions across international markets. The model is developed to emphasize how trade and multinational production (MP) interact to determine firm-level location and export decisions across heterogeneous producers. We structurally estimate the model using detailed plant-level Indonesian manufacturing data. A key contribution of our work is to rigorously fit a quantitative model of trade and MP using firm-level information from an economy where these two features play prominent roles in its economic development. We find that our model broadly reproduces the pattern of productivity, exports and FDI across heterogeneous Indonesian producers. We then conduct a number of counterfactual experiments aimed at quantifying the impact of trade

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and MP on (a) resource allocation across heterogeneous producers, (b) measures of aggregate productivity and (c) changes in steady state real wages.

Our counterfactual experiments suggest that existing international trade and MP relationships account for a large portion of aggregate productivity in Indonesia. We find that if Indonesia was cut off from MP, aggregate manufacturing productivity would fall by 19.6 percent. Likewise, if Indonesia was not able to trade with neighboring countries we would find an 8.5 percent decline in aggregate manufacturing productivity. These experiments emphasize that firm-level trade and MP interactions are crucial determinants of the aggregate effects of trade and MP policy across industries since the incentives for trade or MP greatly affect the likelihood of the other activity. Further, we document that endogenous entry and exit decisions play an important role in determining aggregate productivity in Indonesia.

Research by Restuccia and Rogerson (2008) and Hsieh and Klenow (2009) suggests that the misallocation of resources across firms can have important effects on aggregate productivity, particularly in developing economies. Pavcnik (2002) and Trefler (2004) similarly find that increasing trade openness has induced resource reallocation and productivity gains in Chile and Canada, respectively. Not surprisingly, a number of recent papers have studied the potential gains associated with trade in goods (e.g. Eaton and Kortum, 2002; Alvarez and Lucas, 2007; Arkolakis et al., 2012; Waugh, 2010; Fieler, 2011), multinational production (e.g. Burstein and Monge-Naranjo, 2009; McGrattan and Prescott, 2009; Ramondo, 2011) or both (e.g. Feinberg and Keane, 2006; Ramondo and Rodríguez-Clare, 2010; Irarrazabal et al., 2010; and Arkolakis et al., 2012) across heterogeneous firms and countries.

We extend the international trade and MP framework of Helpman et al. (2004) by allowing firms to offshore production in a foreign country. In this environment, firms may set up plants in foreign countries for two reasons. First, as in Helpman et al. (2004), firms can set up plants solely to access the local market in foreign countries.² Second, in our model, firms may also set up plants in a foreign country to export back to the country of origin.³ This additional structure is motivated by the data; we often observe foreign owned plants Indonesia exporting heavily to markets from which most FDI is sourced. Thus, this paper constructs a parsimonious model that simultaneously allows firms to engage in MP for both market access and export-platform production. The model is used to empirically assess the influence of policy on firm-level decisions and provides a framework for evaluating the impact of economic policy on aggregate productivity, exports and MP.

Irrarrazabal et al. (2010) and Arkolakis et al. (2012) similarly study the interaction of trade and multinational production in closely related frameworks. Irrarrazabal et al. (2010) structurally estimate a model of multinational production and trade across OECD countries using multinational production decisions by Norwegian multinational firms. Their model also extends the Helpman et al. (2004) model to examine the nature of MP across a wide set of countries whereas our paper focuses on inward FDI within a developing country. In particular, Irrarrazabal et al. (2010) present a model that seeks to explain the gravity of FDI across geographically distant countries. Likewise, Arkolakis et al. (2012) develop a monopolistic competition model of trade and multinational production. In their model firms receive idiosyncratic productivity draws across locations and face a set of associated trade and investment costs. Their model is calibrated to match bilateral trade and FDI flows across countries. In contrast, we structurally estimate model parameters using individual firm-level decisions (rather than aggregate trade/FDI flows).

A key difference between our paper and similar papers which quantify the gains from openness to trade or MP, is that our paper provides rigorous estimates for a specific, developing country. Although Irrarrazabal et al. (2010) and Arkolakis et al. (2012) provide insightful estimates for the importance of trade and FDI flows across countries, they do not distinguish the differential impact of these flows across industries as we do in this context. Our study is able to provide disaggregated responses to changes in MP or trade policy. We document that the observed differences in gains from trade or MP depend crucially on industrial differences in trade and MP costs across industries. Further, our data allows us to pin down the entry and exit responses across both foreign and domestic firms to changes in the economic environment, rather than studying the decisions of multinationals alone. This key difference allows us to quantify the impact of MP and trade policy, while accounting for endogenous entry and exit across all firms in the Indonesian manufacturing sector.

Our methodology is most similar to that taken in several recent studies of firm-level exporting; we approach the firm-level decision to enter international markets through MP and exports by fitting a structural model to detailed firm-level information in Indonesia. This approach is similar to that taken by Das et al. (2007), Ruhl and Willis (2007), Eaton et al. (2011) and Kasahara and Lapham (2013) where model parameters are pinned down by capturing broad patterns in firm-level exporting in Columbia, France and Chile. Our objective, however, is to address a substantially different question. In particular, we are primarily interested in the trade-off between foreign MP and exports and the impact that these activities have on aggregate outcomes. To this extent, our model draws heavily on the MP and trade literature.

Previous research studying the impact of MP and trade on aggregate outcomes is decidedly mixed. On one hand, a number of papers find that MP can induce large increases in aggregate productivity and welfare (e.g. McGrattan and Prescott, 2009, or Ramondo and Rodríguez-Clare, 2010). This is not surprising since a large amount of empirical evidence suggests

² Chor et al. (2008) and Irrarrazabal et al. (2010) report that the majority of multinational affiliate sales are intended for the destination market and conclude that market access is a key motive for foreign direct investment. Earlier evidence can be found in Brainard (1997), Markusen and Maskus (2002) and Blonigen et al. (2003).

³ See Antras and Helpman (2004), Grossman et al. (2006) and Garetto (2010) for examples.

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