



Firm heterogeneity, trade, multinationals, and growth: A quantitative evaluation☆



Tommy T. Wu *

Hong Kong Monetary Authority, 55/F Two International Finance Centre, 8 Finance Street, Central, Hong Kong

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ABSTRACT

In this paper I study and quantify the long-run effects of openness to trade and multinational production in a model of endogenous innovation with firm heterogeneity. When trade is liberalized, some multinationals find it more profitable to export and forgo the costs of maintaining capacities in foreign markets. I examine how this trade-off can have long-run effects on growth and welfare. The model emphasizes the importance of firms' ability to access multiple markets in providing incentives to innovate and highlights the role of the quality of technology in international technology spillovers for promoting growth. I find that by shutting down openness to both trade and multinational production with other OECD countries, the US would experience a welfare cost that is equivalent to a 39% drop in consumption, with the dynamic effect accounting for at least 40% of the estimated welfare cost. Since multinationals tend to use relatively high quality technology, trade liberalization alone can lead to an adverse effect on economic growth and consumer welfare by reducing the level of multinational production.

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1. Introduction

In this paper I study the long-run effects of openness to both trade and multinational production (MP) using a model of endogenous innovation with firm heterogeneity. I examine how the proximity-concentration trade-off between exports and outward MP can affect long-run growth and welfare gains. The model emphasizes the importance of firms' access to multiple markets in providing incentives to

innovate and highlights the role of the quality of technology in international technology spillovers for promoting growth. Using data from the United States and other OECD countries, I parameterize the model to quantify the gains from goods trade, the gains from MP, and the gains when both types of openness are present.

Much of the traditional literature on openness focuses on gains from trade. More recent research, however, focuses on broader measures of gains from openness through both trade and MP. MP is an important channel of openness. As documented by Navaretti and Venables (2004), multinational activities around the world, as measured by flows of inward foreign direct investment (FDI), have grown much faster than either trade or real GDP since the mid-1980s. They also document that FDI inflows go predominantly to advanced economies. Among OECD countries, total multinational sales of foreign affiliates were at least 20% more than export sales over the last decade. At the same time, international technology spillovers are significant sources of productivity gain, with evidence pointing to stronger spillovers through MP than trade. It is therefore important to include both trade and MP when measuring gains from openness.

Although the empirical literature suggests that welfare gains from openness can be significant, the size of these gains remains an open

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* Tel.: +852 2878 8070.

E-mail address: wu.t.tommy@gmail.com.

question.¹ Recent studies have developed theoretical frameworks to quantify the gains from openness. McGrattan and Prescott (2009) find large gains from openness across developed countries when MP acts as the channel of technology diffusion. Ramondo and Rodriguez-Clare (2013) observe large gains from openness through both trade and MP. Rodrigue (2014) uses Indonesian plant-level manufacturing data and also finds large static gains in productivity from openness through trade and MP. Although these studies measure gains using a broader definition of openness, their measures are based on static changes in consumption or productivity. Indeed, policies on openness not only have static effects on income and consumption, but can also exhibit dynamic effects. In this paper, I account for both the static and dynamic welfare effects from openness to trade and MP.

I also examine whether trade liberalization is welfare-improving in the presence of multinational enterprises (MNEs). Put differently, trade liberalization may not always be growth- and welfare-improving in the presence of the “proximity-concentration trade-off”. This trade-off refers to the situation where a firm establishes a foreign subsidiary rather than exporting to the foreign market when the gains from avoiding trade costs outweigh the costs of maintaining capacity in foreign markets. There is strong evidence of the crucial role of the proximity-concentration trade-off in US multinational activities, see for example Brainard (1997), Helpman et al. (2004), and Ramondo et al. (2013, 2014). In particular, Helpman et al. (2004) use US exports and MNE affiliates data to confirm that the proximity-concentration trade-off does exist, and find that MNEs are in general more productive than exporters.

Yet, recent studies have continued to pose challenges as to whether the proximity-concentration trade-off is at odds with the high degree of similarity observed between trade and MP. Studies based on gravity models such as Ramondo and Rodriguez-Clare (2013) and Irarrazabal et al. (2013) emphasize the role of geographical barriers in explaining the seemingly complementary patterns between trade and MP as observed in the data. In particular, the theoretical and quantitative/empirical models in these two studies rely on the assumption that affiliates must import some inputs from their parent companies, so that trade and MP both decline with gravity.²

However, as pointed out in Head and Ries (2004), it is necessary to control for the “statistical complementarity” in order to identify whether trade and MP are indeed characterized by “economic complementarity”. Statistical complementarity refers to the unobserved

factors, such as gravity, that can simultaneously affect market demand or the costs of both export and MP. One example is that while trade costs generally increase with gravity, the costs of coordination and information costs between parents and affiliates abroad also increase with gravity, as suggested in Giroud (2013). Another example is the cost of disembodied knowledge transfer, which is unobserved but matters for MP, also increases with gravity. Keller and Yeaple (2013) confirm this prediction using firm-level data on trade and sales of US MNEs. Ramondo et al. (2014) also use firm-level data of US MNEs and find that it is horizontal MP rather than vertical MP that better captures the behavior of most US MNEs. This is because almost 90% of affiliates ship less than 5% of goods to/from their parents. Secondly, the upstream–downstream supply chain relationship between US parent companies and affiliates does not explain the existence or volume of intra-firm trade flows empirically. One reason is that the primary motive for forming MNEs is the transfer of intangible inputs for production purposes, rather than the transfer of physical goods within a firm. These together points to the use of a model based on horizontal structure of MNEs with the proximity-concentration trade-off is suitable for studying the impact of international openness between the US and other OECD countries.³

This paper adds to the literature by asking the following questions. How do counterfactual changes in trade and MP costs affect firms' decisions to access foreign markets, conditional on gravity and the current trade and MP costs? And, how do firms' decisions affect international technology spillovers, as well as the static and dynamic effects of openness? The welfare effects arising from openness to trade versus MP can be very different since they are net substitutes in the context of US and other OECD countries, and also in the absence of the “statistical complementarity” between the two.

I develop a fully endogenous growth model similar to Romer (1990) and Barro and Sala-i-Martin (2004) by allowing international trade, MP, and firm heterogeneity as in Melitz (2003) and Helpman et al. (2004). Economic growth is generated by the expansion in the variety of intermediate inputs in which the incentives to develop intermediate inputs are affected by policies on openness to trade and MP.⁴

An important feature of the theoretical model is the use of a technology spillovers specification which highlights the importance of variety expansion as well as the quality of the technology diffused. In the model, the quality of a given technology is associated with its productivity. The technology diffused by more productive MNEs is of a higher quality than that diffused through trade. As suggested by Eaton and Kortum (1999) and Rodriguez-Clare (1996), and based on the empirical evidence from Alfaro and Charlton (2007), Pradhan (2006), and Smeets (2008), the quality of technology is important for technology diffusion. High quality technologies embody high productivity which can contribute more to the diffusion process. By allowing for this feature in the technology spillover process, the welfare effects of trade liberalization can be ambiguous, because there will be less MNEs diffusing high-quality technology when the option to export becomes more attractive.⁵

¹ Studies including Sachs and Warner (1995), Brunner (2003), Dollar and Kraay (2004), and Lai and Trefler (2004) suggest that trade liberalization leads to significant growth effects. However, Baldwin (1992) and Broda et al. (2006) suggest that gains from growth are much weaker than static gains from trade liberalization. These studies all focus on gains from trade rather than a broader measure of openness.

² The increase in both trade and MP over the past few decades also raises the concern as to whether the proximity-concentration trade-off between trade and MP is at odds with this phenomenon observed in the data. The increase in both trade and MP may have to do with falling trade and MP costs over time. While studies such as Novy (2013) provide estimates of iceberg trade costs, it is difficult to estimate the costs of inward MP. However, the decline in the MP costs can be reflected by the reduction of inward FDI barriers. In fact, empirical evidence suggests that the reduction in barriers to inward FDI has coincided with a decline in trade costs. Novy (2013) provides evidence on the fall of trade costs over the past few decades. On the other hand, OECD (2003) shows that all OECD countries experienced a decline in inward FDI restrictions between 1980 and 2000 using a FDI restrictiveness index. The reduction in corporate tax also provides incentives for inward FDI. As documented in Devereux et al. (2002), the medium corporate tax rate across 18 industrialized economies declined from around 50% to 35% over the period 1982–2001. Moreover, as documented in Navaretti and Venables (2004), the number of bilateral investment treaties worldwide increased from around 400 in 1950 to 2100 by the end of 2001. This reflects policy efforts worldwide to reduce barriers to inward FDI. On top of tax and subsidies incentives, many countries set up investment promotion agencies for marketing specific sectors in order to attract certain types of inward FDI and increase matching efficiency. For example, in the case of Ireland, the information technology sector attracted inward FDI from multinationals such as IBM and Microsoft under the help of Ireland's investment promotion agency. But the bottom-line is that, as long as the magnitude of the fall in MP costs is at least comparable to the fall in trade costs, the relatively faster increase in MP over trade in the past decades is not inconsistent with the existence of the proximity-concentration trade-off.

³ Econometric studies of general-equilibrium models of multinational firms have generally found that trade and MP are substitutes. Markusen and Maskus (2003) provide a comprehensive literature survey where they conclude that it is the similarities in relative size and factor endowments between countries, rather than the differences, that generate the most multinational activity. This means that MP mostly serves the purpose of accessing foreign markets by forgoing trade costs – the proximity-concentration trade-off. This evidence, including firm- and product-level studies as well as studies that examine the determinants of intra-industry affiliate sales and intra-industry trade, lends strong support to general equilibrium trade approaches that are based on horizontal MP. There is little support for vertical MP, due to the fact that the substitutability between trade and MP is larger than their complementarity. Studies such as Brainard (1997), Helpman et al. (2004), and Ramondo et al. (2013, 2014) also support this view based on the US multinational data.

⁴ The “scale-effect” problem in common endogenous growth models is corrected for in the model presented in this paper. See Section 2.5.1 for details.

⁵ In their theoretical work, Gustafsson and Segerstrom (2010) find that the effect of trade liberalization on productivity is ambiguous, depending on the strength of spillovers. Dinopoulos and Unel (2011) and Unel (2010) also find that the effect of trade liberalization on long-run growth is ambiguous.

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