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Serving Abroad: Export, M&A, and Greenfield Investment

Francesco Paolo Conteduca*
Ekaterina Kazakova**

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*Center for Doctoral Studies in Economics, University of Mannheim, Germany (email : francesco.conteduca@gess.uni-mannheim.de)
**Center for Doctoral Studies in Economics, University of Mannheim, Germany (email: Ekaterina.kazakova@gess.uni-mannheim.de)

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Abstract

This paper studies foreign-market entry patterns in the professional services industry. We build a structural model of horizontal foreign direct investment (FDI) with firms that are heterogeneous in terms of service quality. Firms can choose to serve foreign markets via exporting, cross-border mergers (M&A), or greenfield investment. Greenfield investment and exporting are subject to the standard proximity-concentration tradeoff and, in addition, associated with uncertainty about foreign quality perception, while M&A resolves this uncertainty by letting multinationals access the demand of the acquired firm. Reproduction of high quality abroad potentially requires larger fixed entry costs, inducing high-quality service firms to export. The model is sufficiently flexible to accommodate different orderings of entry types in terms of firm's service quality. We then structurally estimate the fundamental market-specific parameters of the model using firm-level FDI and trade data for a sample of German firms. We find that entry patterns are reversed compared to the standard sorting in manufacturing: only the firms providing the highest service quality export, while lower-quality firms conduct FDI. The relative sorting of M&A vs. greenfield FDI in terms of firm quality is market-specific and depends on the relative importance of uncertainty about quality perception, the structure of entry costs, and size of synergies associated with M&A. Finally, we calibrate the model equilibrium to the data on multinational and trade flows between the EU, the US, and the rest of the world. Simulation of the service-trade liberalization between the EU and the US, as planned for TTIP (Transatlantic Trade and Investment Partnership), shows that the reduction of non-tariff trade barriers and introduction of quality standards reallocate quality across entry alternatives, as well as make FDI a more prominent entry type.

Keywords: Multinational Firms, Foreign Direct Investment, Mergers, Greenfield Investment, Services.
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*Francesco Paolo Conteduca: Bank of Italy (email: francescopaolo.conteduca @esterni.bancaditalia.it); Ekaterina Kazakova: National Research University Higher School of Economics, Russia (email: ekaterina.kazakova@hse.ru). We are grateful to our supervisors Harald Fadinger and Volker Nocke for their guidance, support and valuable suggestions. We gratefully acknowledge the hospitality of the Research Data and Service Center of the Deutsche Bundesbank and thank them for providing us with access to the Microdatabase Direct investment (MiDi) and to the Statistics on International Trade Services (SITS). Authors thank the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) for funding through CRC TR 224. We also thank Mathieu Parenti, Mark Roberts, Nicolas Schutz, Hidenori Takahashi, Emanuele Tarantino, Alexander Tarasov, Ulrich Wagner, and all participants of Bonn-Mannheim PhD Workshop 2017, EGI conference in Bari, ETSG conference 2017, Mainz FDI Workshop 2017, EWMES 2017, CEP workshop 2018, CRC TR 224 conference 2018, IOSE conference in Saint-Petersburg 2018, EARIE 2018, DEGIT 2018, and seminars at the University of Mannheim, Concordia University, and HSE for their insightful comments and suggestions. All remaining errors are our own.

1 Introduction

Going abroad, firms select between opening a foreign branch, which allows them to be close to their consumers, and exporting, which is associated with variable trade costs but avoids duplication costs. This so-called proximity-concentration tradeoff is extensively discussed in the trade literature. In line with the empirical evidence for the manufacturing sector, a seminal paper by Helpman, Melitz, and Yeaple (2004) finds that only the most productive firms conduct foreign direct investment (FDI), while less productive firms serve foreign markets via exports.[1] However, the entry patterns for service exporters and multinationals do not correspond to the ones predicted by the classical proximity-concentration literature. Specifically, in the German professional services industry,[2] only the most productive firms export their services, while less productive firms opt for FDI.[3] In particular, the average exporter is 3.0 times larger and sells 2.1 times more domestically than an average multinational firm.[4] When breaking down service FDI by entry mode, 73% of FDI occurs via cross-border mergers and acquisitions (M&A), and only 27% via the opening of new establishments abroad (greenfield investment).[5] Moreover, M&A generates larger affiliate sales than greenfield investment.

In this chapter, we rationalize the differences in foreign-market entry patterns across industries and analyze their implications for trade-liberalization outcomes. The study of the last question is particularly relevant for understanding the effects of service-trade liberalization and potential differences in the outcomes compared to manufacturing due to the specific features of this sector.[6]

[1] For the manufacturing sector in Germany, Ottaviano and Mayer (2007) find that relative to exporters, multinationals are substantially larger, more productive, pay higher wages and generate higher value added. In particular, exporters are 3.0 times larger than domestic producers, while multinational firms are 13.2 times larger. Same difference holds true for other countries.

[2] Professional services can be described as a broad consulting industry, including legal and accounting activities, management consultancy activities, architectural and engineering activities, technical testing and analysis, scientific research and development, advertising and market research, veterinary activities and other professional, scientific and technical activities. In our analysis, we also consider IT consulting and administrative and support service activities.

[3] According to the General Agreement in Trade in Services, there are four possible modes to trade services abroad. A transaction can occur without a physical movement of a consumer or a service provider to a location of the other (mode 1); a consumer can receive the service in the country of a service supplier, which would be specified under the mode 2; finally, a service provider can temporarily move to the location of its foreign buyer (mode 4) or establish a branch there (mode 3). The statistical data on services trade for German firms further aggregate these modes and classify modes 1, 2 and 4 as export.

[4] Similar evidence was found by Bhattacharya, Patnaik, and Shah (2012) for the Indian software industry and by Oldenski (2012) for the US services industry.

[5] The statistics is reported for the average parameters over the period 2005 – 2014 in Germany. For comparison, in the manufacturing sector, 62.6% of FDI entries in during this period occur via M&A.

[6] Analyzing the Transatlantic Trade and Investment Partnership (TTIP), Francois, Manchin, Norberg, Pindyuk, and Tomberger (2013) find that reduction in non-tariff barriers has larger impact for the manufacturing sector than for the services.

This chapter contributes to the area of the literature concerned with the structural estimation of the proximity-concentration tradeoff by taking into account the distinction between M&A and greenfield investment, as well as by introducing industry- and country-specific returns to exporting and FDI. Due to the potential differences in the sorting patterns into FDI and exporting, the liberalization can have different effect in the services sector compared to manufacturing, so that the main change in the intensive and extensive margins would come from FDI rather than exporting.

We build a structural model of horizontal FDI with firms that are heterogeneous in terms of their service quality. Firms can choose to serve foreign markets via exporting, cross-border mergers (M&A), or greenfield investment. Since foreign consumers can have a different perception of the service quality, entry into a new foreign market is associated with uncertainty about demand. Therefore, firms face the tradeoff between trying to transmit their core quality to a prospective market without *ex ante* observing the tastes of foreign consumers (via greenfield investment and exporting), and "buying demand" of a preexisting foreign firm in order to get access to its network of consumers and its expertise (via M&A).[7] Moreover, as replicating a quality abroad is potentially subject to larger costs for firms with initially higher quality, these firms may decide to export in order to avoid larger entry costs associated with high-quality greenfield investment. In our model, the M&A process features "cherry-picking," meaning that better targets are more likely to be acquired. Finally, acquisitions provide a higher return to core quality when the magnitude of synergies between the acquirer and the targets is larger.

The model generates a completely flexible relationship between quality and entry types[8] for each market. Entry patterns depend on the industry- and country-specific parameters, which determine the return to firm's core quality for each entry type in a given market. For example, high-quality services are more likely to be provided via greenfield investment if expected perceived quality is high and FDI entry costs do not increase much in quality. Alternatively, one will observe high-quality services to be exported if variable trade costs are low and expected perceived quality is high. Finally, high-quality services will be provided via M&A if targets are on average of high quality and synergies between acquirers and targets are substantial. Thus, depending on the characteristics of the industry, the model is able to deliver different outcomes regarding entry patterns and foreign sales for each entry type.

[7] The Baker & McKenzie (2014) survey names "the acquisition of customers or distribution networks" as the main incentive for cross-border mergers and acquisitions. According to their survey, the chief financial officer of a South African MNE in the professional-services sector say about the M&A in Mauritius: "The customer base was very attractive and we were confident of extracting the value by targeting the customer base of the target company."

[8] Hereafter entry alternatives are called "entry types" in order to avoid any confusion with the GATS specification of entry modes in the services sector.

We then structurally estimate the fundamental parameters of the model for each market. We base our empirical analysis on firm-level data for German multinationals and exporters operating in the professional services sector. In particular, we consider the cross-section of the first entries of German multinationals into the EU, the US and the rest of the world markets during the period 2005 – 2014. In the structural estimation, we use information on the affiliate and domestic sales, as well as the entry types selected by firms in each market. The unique feature of the data is that it distinguishes between greenfield investment and M&A entries for each new FDI case. The structural estimation delivers the fundamental parameters which determine returns associated to each activity (change in the perception of quality across markets, synergies magnitude, trade costs, quality of M&A targets, and the cost of quality transmission with greenfield investment), as well as institutional entry costs specific to the foreign market and the entry type.

We find that the resulting equilibrium thresholds reverse the standard outcome for the manufacturing sector, where high-quality (or high-productivity) firms tend to engage in FDI. In contrast, firms with lower service quality prefer FDI to exporting. This result partly comes from the fact that the costs of replicating quality in a new market increase in core service quality, so that high-quality firms try to avoid these costs by serving foreign markets from their home location via exporting. Moreover, we find that the market differences in the distribution of foreign quality perception, as well as differences in the quality of M&A targets result in market-specific relations between the average service quality and FDI entry modes. While greenfield investors in the US exhibit a higher service quality than firms engaging in M&As, this relation is reversed for the EU and the rest of the world.

In the final part of our analysis, we aim to use the estimated model to examine the potential impact of a service-trade liberalization episode between the EU and the US, as planned for TTIP (Transatlantic Trade and Investment Partnership). We consider the impact on average service quality for each entry type and the average level of service quality provided in each market: the EU, the US, and the rest of the world. The model can be used to simulate two main features of TTIP for the services sector. First, we look at a reduction of institutional entry barriers, including facilitation of cross-border M&As and easier market access through reductions in costs associated to licensing and approvals of businesses. We consider a moderate scenario with a 10%-reduction in non-tariff barriers, as well as a more ambitious scenario of a 25%-reduction of barriers. Accordingly, this policy mainly impacts on the threshold quality that makes each entry alternative profitable, while the relative ranking between quality and entry modes remains unchanged. Second, we look at the introduction of quality standards, which reduces the costs of transferring core quality overseas. The

corresponding reallocation effects can result in changes of relative qualities exported and provided via greenfield investment. Moreover, given the predictions on the ordering of entry alternatives in our model, we can expect that facilitating quality transmission abroad leads to higher quality of M&A targets, so that mergers become less frequent but of a better quality.

1.1 Related Literature

This chapter contributes to the literature on the proximity-concentration tradeoff with heterogeneous firms. We depart from Helpman, Melitz, and Yeaple (2004), who describe the selection of firms into exporting and greenfield investment, by (i) allowing firms to acquire foreign targets in order to resolve uncertainty regarding the quality perception and to exploit the potential merger synergies; (ii) introducing the flexibility in the returns each entry activity provides to firm's revenue productivity. These novelties make our model empirically tractable and allow us to explain differences in the entry patterns across industries and countries.[9] This chapter relates to a small set of papers that structurally estimate a model of the Helpman, Melitz, and Yeaple (2004) type. The recent contributions by Irarrazabal, Moxnes, and Opromolla (2013), Ramondo and Rodríguez-Clare (2013), Ramondo (2014), Tintelnot (2017) propose frameworks suitable for the empirical analysis of multinational production and trade. In contrast to the model described in this chapter, these models predetermines the relation between productivities of firms selecting into exporting and FDI, since the return from exports is always smaller due to the presence of iceberg trade costs. Moreover, these papers do not consider M&A, which are conceptually different from the greenfield investment in terms of the technology transfer and, therefore, are driven by different incentives and provide different outcomes from greenfield investment.

This chapter also relates to the literature analyzing the determinants of cross-border mergers, among those the papers by Nocke and Yeaple (2007, 2008) are the closest to the present chapter. Analogously to Nocke and Yeaple (2007), we regard M&A as a vehicle for obtaining the network and service quality of an existing firm in the prospective market. Similar to their model, we regard quality as a non-transferable capacity. For example, a high-quality firm in the services sector may have an exceptional consultant, so that the costs of finding a new worker with the same set of skills are larger than those of sending the worker herself to the foreign country. Unlike Nocke and Yeaple (2007), we do not restrict the realization of perceived quality in the foreign market to be lower than at home. Moreover, in our framework, the ordering of cutoffs for greenfield investment

[9] Geishecker, Schröder, and Sørensen (2017) show that the exporter productivity and size premia vary across countries and industries.

and M&A is not determined by the source of firm heterogeneity but instead by the country-specific distribution of perceived quality shocks and the structure of entry costs. Additionally, we find that firms conducting greenfield FDI in the professional services sector have lower quality than exporters, so that we have a different ordering of cutoffs for these two entry types. Similarly to Nocke and Yeaple (2008), the incentives of engaging in cross-border acquisition and greenfield FDI differ across countries. As the distribution of target quality in the EU and the US is characterized by larger expectations of the targets' quality, the acceptance rate of M&A offers is higher, too.

This chapter extends the trade literature on the services sector. Bhattacharya, Patnaik, and Shah (2012) model the choice between FDI and export in IT-oriented services. They find that firms with high service quality prefer exporting over FDI. Differently from our work, the choice between entry types is driven by the differences in the overseas transferability of quality via export and greenfield investment. By contrast, we do not assume that the physical presence in the country reduces demand uncertainty. Given that services export involves personal contact between a supplier and a consumer, it seems hard to justify an assumption about the differences in perception of service quality between export and FDI. Moreover, perception of quality in our model reflects country-specific tastes, so that consumer preferences are independent of the supply mode. Oldenski (2012) also emphasizes the importance of personal presence in the country for providers of commercial services, which can affect the entry choice. In our model, the choice for M&A and greenfield investment is endogenous and not amplified by any restriction on the need for commercial presence for the personal contact with a consumer.

One of the key ingredients of our model is the uncertainty about foreign quality perception. Rob and Vettas (2003), Nguyen (2012), Albornoz, Calvo Pardo, Corcos, and Ornelas (2012), and Conconi, Sapir, and Zanardi (2016) highlight the importance of non-observability of demand in new destination markets, and learning about demand which occurs via entry in related foreign locations. For the services sector, we do not observe sequentiality of entry into foreign markets, and consider the first entry into a given market in order to avoid confusion between the mechanism of our interest and learning occurring via foreign activities. Aeberhardt, Buono, and Fadinger (2014) consider firms that can choose to serve a foreign market either directly, facing the costs of getting to know the foreign market, or indirectly, via a local partner who can potentially hold them up. Similar to their paper, we find that the characteristics of foreign markets can be crucial for determining the incentives to select one of the available alternatives.

Finally, this chapter also contributes to the literature highlighting the role of product quality in international trade. Analogously to Kugler and Verhoogen (2012), Johnson (2012), and Feenstra

and Romalis (2014), we argue that service quality is one of the key factors explaining firm heterogeneity. Similar to Cagé and Rouzet (2015), we assume that perceived quality is not observed prior to entry into the foreign market, therefore firm's choice is based on the expected perceived quality. Since we allow for M&A as a way to avoid informational frictions, we observe relatively less efficient firms active via acquired affiliates in the foreign markets. Moreover, since the professional services sector is a long quality ladder industry, we use the results of Khandelwal (2010) to argue that the sales of a firm are a good proxy for firm's service quality.

The rest of the chapter is organized as follows. Section 3 describes the data used in the empirical analysis and presents the entry patterns observed in the services sector for German firms. Section 4 estimates the fundamental market-specific parameters for German multinational firms. Section 5 calibrates the industry equilibrium and describes the way to conduct counterfactual analysis for the services sector liberalization according to the TTIP proposal. Section 6 concludes.

2 Theoretical Framework

We build a structural model to explain the entry choice of a firm when it decides to go abroad. There are three entry types distinguished: direct export, cross-border mergers and acquisitions, and greenfield investment. The main aim of the model is to rationalize the differences in the entry patterns across industries and countries. We describe the model for a firm operating in the services sector, and therefore highlight the importance of quality and brand recognition in generating heterogeneity across firms. However, the model can be applied to other sectors, when equivalently describing firm heterogeneity in terms of the revenue productivity.

2.1 Demand

The economy consists of a set $I = \{1, \ldots, N\}$ of countries. Each country $i \in I$ admits a representative consumer whose preferences are given by the quasi-linear utility function in the homogeneous good A_i

$$U_i = \beta_{s,i} \ln \left[\int_{\omega \in \Omega_i} \left(\tilde{\varphi}_i(\omega) q_i(\omega) \right)^{\frac{\sigma-1}{\sigma}} d\omega \right]^{\frac{\sigma}{\sigma-1}} + A_i, \tag{1}$$

where $\beta_{s,i}$ denotes the absorption of services sector in country i, $q_i(\omega)$ the amount of service ω, σ elasticity of substitution, Ω_i the endogenous set of varieties sold in country i, and $\tilde{\varphi}_i(\omega)$ the perceived

quality of service ω in country i.[10] In order to reflect potential differences in the perception of the service quality across different foreign markets, the quality $\tilde{\varphi}_i(\omega)$ of the variety ω can vary across countries. Quality perception of the service ω reflects the differences in tastes of consumers, value of quality to them, as well as the awareness of the brand of variety ω. A representative consumer in country i can evaluate the quality of a given variety with certainty.[11]

Let Y_i and $p_i(\omega)$ denote the total expenditure per consumer and the price of service ω in country i, respectively. Then, the representative consumer i's budget constraint given the upper-tier of utility maximization reads as

$$\int_{\omega \in \Omega_i} p_i(\omega) q_i(\omega) d\omega + A_i \leq Y_i. \tag{2}$$

By solving the consumer i's utility maximization problem subject to the budget constraint (2), we obtain the direct demand function for variety ω in country i which is given by

$$q_i(\omega) = \frac{\tilde{\varphi}_i(\omega)^{\sigma-1} p_i^{-\sigma}}{P_i^{1-\sigma}} \beta_{s,i} = \tilde{\varphi}_i(\omega)^{\sigma-1} p_i(\omega)^{-\sigma} \Phi_i, \tag{3}$$

where $P_i \equiv \left(\int_{\omega \in \Omega_i} \tilde{\varphi}_i(\omega)^{\sigma-1} p_i(\omega)^{1-\sigma} d\omega \right)^{1/(1-\sigma)}$ is a country i's quality-adjusted price index, $\Phi_i \equiv P_i^{\sigma-1} \beta_{s,i}$ is a demand shifter. The expression (3) implies that the demand for variety ω increases with its perceived quality $\tilde{\varphi}_i(\omega)$ in country i.

2.2 Supply

A firm from country $o \in I$ provides the same service variety ω in all markets it decides to operate. Therefore, we identify the firm by the supplied service variety ω.

Each firm is a monopolist for the service it provides, and makes its entry and provision choice taken aggregate price and market size as given. Firms are heterogeneous in the quality of their

[10] The homogeneous good is chosen as the numeraire; it is produced with a linear technology requiring a unit input of labor and is freely traded. In equilibrium, all countries produce a positive amount of a homogeneous good, which results in the equalization of the factor prices across markets. Thus, for the rest of the analysis, we consider the equilibrium wages in an open economy. In particular, this means that the level of wages, and therefore all entry costs expressed in labor terms, stay unaffected by any policy changes, and wages can be set equal to 1.

[11] Since the aim of this chapter is to analyze the determinants of the entry choice by firms, we disregard the potential uncertainty on the side of consumers. Therefore, in our setting, we model uncertainty regarding the quality perception at the side of a service provider, while consumers know with certainty the value each service provides to them. Alternatively, one can think about learning from the side of consumers about the quality of a given variety (Bagwell and Staiger (1989), Chisik (2003), Cagé and Rouzet (2015)). We can accommodate this concept in our model by assuming that the perceived quality reflects the current belief of a representative consumer regarding the quality of the product, so that she consumes a service basing her consumption choice on this belief.

services. In particular, each firm ω is endowed with a core level of quality φ.[12]

As consumers have different tastes toward quality and are differently aware of services' brands, same quality is differently perceived within and across countries. The country- and variety-specific perceived quality shock ϵ_i adjusts the core quality level of the firm to the perceived level in country i. In particular, the perceived quality of the service in country i is $\varphi_i = \varphi\epsilon_i$, which implies that services with initially higher core quality have on average better realizations of the perceived quality across markets. Since each firm operates a domestic unit, the perception of quality in the origin market is known by the firm.[13] At the same time, the firm cannot observe *ex ante* how its quality is perceived by foreign consumers if it was never present in the country.[14]

The problem of the firm can be separated into two stages. At the first stage, for each foreign market $i \in I_o^f \equiv I \setminus \{o\}$ the firm decides whether to enter, and if so, with which out of three alternatives: direct export or establishment of a cross-border greenfield investment or acquisition of a foreign target firm. Accordingly, the firm pays the entry costs associated with the selected foreign activities. Upon entry, the firm observes how its quality is perceived in each market it selected to operate in. At the second stage, the firm solves the profit maximization problem and sets the unit of service provision for each market.

A firm is defined by the variety of service it provides, ω, its country of origin, o, its core quality, φ, a vector of perceived quality shocks $\boldsymbol{\epsilon}$, a vector of quality of M&A offers, $\boldsymbol{\varphi^M}$, a vector of export entry costs, $\boldsymbol{f^E}$, and vector of institutional exntry costs with greenfield investment, $\bar{\boldsymbol{f}}^{\boldsymbol{G}}$.

2.3 Serving the Foreign Markets

Now we consider the choice of the firm to serve a foreign market i. In order to highlight the tradeoff among different entry types, we compute the payoffs associated with each alternative.[15]

[12] A core level of quality is an adjusted level of quality by the physical productivity, and is represented as a product of quality itself and the physical productivity of a firm. Hereafter, we refer to the quality adjusted by the physical productivity, φ, as the main source of heterogeneity across firms. Since the physical productivity of services firms is difficult to measure, we explain the variation in adjusted quality (or revenue productivity) by differences in the quality component. In other words, one can consider all firms in the services sector to exhibit the same level of physical productivity, but different service quality.

[13] In the absence of firm-specific origin quality shifter, the model would imply zero likelihood. This is due to the fact that home sales would solely define firm's core quality which in turn would result in deterministic supply choices for foreign markets. In other words, this means that two firms with identical core quality would opt for the same foreign activity choices while selecting between exporting and greenfield investment, which is not observed in the data. For more details, we refer to the estimation section.

[14] Nguyen (2012) introduces learning about demand in untested destination markets through the positive correlation of demand in them with markets firm is present in. In our model, we abstract from the learning aspect, defining markets to be large enough to capture specific tastes of consumers to the service. Moreover, the learning by operating abroad would imply sequentiality of entry, which is not observed in the data for the professional services industry.

[15] For what follows, we maintain that the profit associated with no activity in country i is normalized to 0.

Export and Greenfield Investment. Entering via exporting or greenfield investment, the firm transmits its quality abroad and does it under uncertainty about the perception of its quality by foreign consumers. This uncertainty can be mapped to the problem of incomplete transferability of quality (or technologies) overseas.[16] Therefore, a firm evaluates the benefits of entering via export or greenfield investment by considering the expected perceived quality in the prospective destination market. Accordingly, the more favorable is the expectation regarding the perceived quality shock in the foreign country, the higher the return to the core quality the firm expects from conducting greenfield FDI or exporting.

Although exporting and greenfield investment are similar to each other on the demand side, there are differences in the marginal and entry costs associated to these activities. In order to serve foreign market i via export, the firm pays an additional *ad valorem* trade cost $\tau_{i,o} > 1$. Therefore, the marginal costs of serving market i are larger for exporters. Entry costs of exporting, f_i^E, reflect non-tariff restrictions firms face by serving foreign market i via export, e.g. restriction to movement of people, licensing discrimination, or non-perfect regulatory transparency. In turn, as the replication of a higher level of quality and the establishment of a better brand can be more costly, we allow the entry costs of greenfield investment, $f_i^G(\varphi)$, to be dependent on the core quality φ of the firm. One can also rationalize this assumption by regarding these entry costs as related to advertisement expenses, which are proportional to the number of consumers a firm intends to reach in the new market.[17] In particular, we assume that the firm pays $f_i^G(\varphi) = \bar{f}_i^G + \alpha_i^G v_i(\varphi)$ when it establishes a foreign affiliate in country i, where v_i is the firm's value in market i under the assumption that it can fully transfer its core quality φ to the country i and there are no perceived quality frictions, i.e. $v_i \equiv (\sigma-1)^{\sigma-1}\sigma^{-\sigma}\varphi^{\sigma-1}\Phi_i$.[18] Thus, we associate the variable part of the entry costs to the firm's value in country i provided that country i's consumers attach the evaluation φ to the service itself. The parameters of the entry costs function can be interpreted as follows. The component $\bar{f}_i^G$ of the entry costs for greenfield investment represents the institutional entry barriers that the firm faces in country i. In particular, the level of institutional entry costs reflects the development of legal institutions, ease of getting the license, quality of capital markets, closeness of services regulations

[16] In particular, imperfect foreign mobility of technologies and loss to productivity associated to foreign locations are discussed by Nocke and Yeaple (2007), Guadalupe, Kuzmina, and Thomas (2012), and Tintelnot (2017).

[17] See Arkolakis (2010) who models explicitly the choice of marketing investment of firms that are heterogeneous in revenue productivity.

[18] Similarly to Arkolakis (2010), the aggregate market shifter, Φ_i, captures the fact that entry costs can be larger for larger markets. Moreover, since this shifter contains information about the average perceived quality in the market, one can think about larger replication costs for quality when entering a market with higher average quality of services.

of a host country and the origin, and other regulatory and non-regulatory restrictions to entry. The quality cost for greenfield investment, α_i^G, is determined by the country characteristics which affect the ease of quality transmission, e.g. size of the labor markets, advertisement costs.

The expected profits associated to the two above suitable choices are given by

$$\begin{aligned} \mathbb{E}\pi_i^G &= \underbrace{\left[\mathbb{E}\epsilon_i^{\sigma-1} - \alpha_i^G\right]\tilde{\Phi}_i}_{\Delta_i^G}\varphi^{\sigma-1} - \bar{f}_i^G, \\ \mathbb{E}\pi_i^E &= \underbrace{\mathbb{E}\left(\frac{\epsilon_i}{\tau_{i,o}}\right)^{\sigma-1}\tilde{\Phi}_i}_{\Delta_i^E}\varphi^{\sigma-1} - f_i^E, \end{aligned} \tag{4}$$

where $\tilde{\Phi}_i \equiv (\sigma-1)^{\sigma-1}\sigma^{-\sigma}\Phi_i$, Δ_i^G denotes the greenfield investor's return to the core quality in country i, and Δ_i^E denotes the exporter's return to the core quality in country i. From the expressions above, we can see that the return to greenfield investment will be larger the more favorable is the expectation of perceived quality and the lower are the costs of replicating the brand's quality abroad. Similarly, the exporter's return is larger the higher is expected perceived quality and as lower is the increase in the marginal costs associated to this activity.

Mergers and Acquisitions. The uncertainty of quality perception can be eliminated via M&A. By acquiring a foreign firm, a multinational gets access to the target firm's local market and, as a consequence, to its already established group of consumers. One can see the acquisition of a foreign firm as a device to "buy the demand" of a preexisting local firm.[19] Therefore, before accepting the merger, a firm knows with certainty how its service is perceived by consumers in the foreign location, and, specifically, which volume of sales it can generate.

We model the M&A market as follows. The firm receives a take-it-or-leave-it offer from a target firm with perceived quality φ_i^M.[20] Since the foreign firm observes the realization of the perceived quality shock to its service in its origin market i, the quality level φ_i^M is represented by a product of the core quality of the foreign target, φ', and the perceived quality shock, ϵ_i'. The acquisition price serves the role of the entry costs with M&A, $f_i^M\left(\varphi_i^M\right)$, and consists of the value of the foreign

[19] An analogous interpretation of M&A can be found in Nocke and Yeaple (2007).

[20] To make our model more tractable, we assume that each firm gets offers for M&A in each market. Alternatively, we can introduce the probability of getting an offer from each market, which will not change the results of the model, but this variation is not empirically tractable as identifying the corresponding parameters require additional data on M&As. At the same time, we allow the offer to be such that no firm finds it profitable to accept. Therefore, the resulting distribution of the target offer can be seen as the combination of the actual distribution and the probability of an offer.

firm, $v_i^M \equiv \tilde{\Phi}_i \varphi_i^M$, and the institutional entry costs, $\bar{f}_i^M$. The institutional costs include not only the legal costs of M&A in a given country but also capture the level of entry barriers imposed for mergers and acquisitions.

Though the acquirer cannot perfectly transfer its quality abroad, some common practices or brand name can be used by an acquired affiliate. Therefore, the acquisition process generates synergies $\mathcal{S}_i(\varphi)$, the size of which increases in the core quality of an acquirer.[21] The perceived quality of the acquired affiliate is $\varphi_i = \mathcal{S}_i(\varphi)\varphi_i^M$, so that perceived quality is $\mathcal{S}_i(\varphi)$ times larger than prior acquisition. It is important to note that should the synergies be positive, the net profit from M&A (weakly) increases with target firm's quality. Therefore, if the firm faces several merger proposals from one country, it optimally select the one from the highest quality target firm.

There are several things worth noting. First, the offers for M&A are independently and identically drawn across firms and countries. This assumption eliminates any self-selection of acquired firms to more (or less) productive acquiring firms. We rationalize it by the fact that foreign firms do not observe the quality of the service of potential acquirers, so that all foreign firms are *ex ante* identical for them. Moreover, the acquisition price is solely determined by the quality of the target firm, so that the benefit of a foreign firm from M&A is independent of the acquirer identity.

Second, we parameterize synergies by a linear function, i.e. $\mathcal{S}_i(\varphi) = s_i\varphi$.[22] The profits from acquiring the foreign firm are given by

$$\pi_i^M = \underbrace{s_i^{\sigma-1}\left(\varphi_i^M\right)^{\sigma-1}\tilde{\Phi}_i}_{\Delta_i^M}\varphi^{\sigma-1} - \tilde{\Phi}_i\left(\varphi_i^M\right)^{\sigma-1} - \bar{f}_i^M, \tag{5}$$

where Δ_i^M denotes the acquirer's return to the core quality in country i. This return is higher as better is the target firm, and is higher the magnitude of synergies s_i. In particular, one would expect higher synergies in the markets where common practices are more applicable and the brand name of an acquirer has a better reputation.

Third, we do not model any competition for the target firms from the side of potential acquirers. Since this does not drive our main results regarding the entry type choice, we avoid any complication for the merger market to keep our model as parsimonious as possible.

[21] Here we note that if the function of synergies is constant, so that the size of synergies is independent of the core quality of an acquirer, the M&A will be regard as an outside option, so that the lowest quality served abroad will be supplied via M&A. Moreover, we assume that the magnitude of synergies is observed by an acquirer prior making an entry decision. Therefore, we take M&A as a *safe* option or normalize all levels of uncertainty with respect to the level of uncertainty of m M&A.

[22] The linear function is needed to insure the single-crossing of the profits associated to each entry alternative.

To sum up, the quality of potential targets varies across and within countries and this, together with country-specific entry barriers, results in the differences of M&A price and merger profitability across foreign locations.

2.4 Entry Decision

Having described the profits associated to each of the three activities, we are ready to consider the first stage of the firm's problem: which markets to enter and via which entry alternatives. Prior to deciding about the entry into foreign markets, the firm observes (i) its core quality level φ, (ii) perceived quality in the origin φ_o, (iii) country-specific M&A offers $\boldsymbol{\varphi^M}$, (iv) entry costs associated to each entry type. The entry choice, $\boldsymbol{e} \equiv \{e_i\}_{i \in I_o^f}$, combines the entry type the firm selects for each foreign market $i \in I_o^f$ (if any), such that

$$e_i = \arg \max_{e_i \in \{0,E,G,M\}} \{\mathbb{E}\Pi_i^{e_i}\} \quad \forall i \in I_o^f, \tag{6}$$

where $\mathbb{E}\Pi_i^{e_i}$ corresponds to the (expected) profit from not entering (0), exporting (E), conducting greenfield investment (G), and M&A (M).

In the next paragraphs, we discuss the tradeoffs existing among the three described entry alternatives when entering market i. First, we describe the traditional proximity-concentration tradeoff between greenfield investment and exporting. Second, we analyze the choice between two types of foreign direct investment.

Proximity-Concentration Tradeoff. Consider the tradeoff between exporting and greenfield investment. We observe that exporting is preferred to greenfield investment in market i if and only if

$$\mathbb{E}\pi_i^E \geq \mathbb{E}\pi_i^G \quad \Leftrightarrow \quad \varphi^{\sigma-1}\left[\alpha_i^G - (1-\tau_{i,o}^{1-\sigma})\mathbb{E}\epsilon_i^{\sigma-1}\right] \geq \frac{f_i^E - \bar{f}_i^G}{\tilde{\Phi}_i}. \tag{7}$$

We can separate into two groups the set of parameters affecting the value for the quality cut-off between exporting and greenfield investment. The first group includes those parameters that determine the relative quality of services provided via each of the two entry types. Accordingly, these are the parameters that change the return to the core quality for exporters and greenfield investors, i.e. quality cost for replicating brand abroad, α_i^G, trade costs, $\tau_{i,o}$, and the expectation of the perceived quality, $\mathbb{E}\epsilon_i^{\sigma-1}$. The second group of parameters affects the propensity of each entry type to be selected and include entry costs of export, f_i^E, and institutional entry costs for greenfield

investment, $\bar{f}_i^G$.

If the replication of high quality abroad is harder, that is $\alpha_i^G \gg 0$ and replication costs outweigh the proximity benefits, then firms with higher quality will export in order to avoid large entry costs with greenfield FDI. Therefore, the average quality exported will be higher than the one provided via greenfield investment. Moreover, the lower the trade costs are and the less favorable the expectation of the perceived quality is, the more likely that high quality firms export their services to market i. The special case of this cutoff ordering arises if the institutional entry costs of greenfield are so large that all firms find it more profitable to export.

An inverse ordering of cutoffs in the core quality arises if greenfield entry costs are lower for firms with higher quality. This assumption would invert the condition for exporting and imply that high quality firms self-select into greenfield investment, while firms with relatively lower quality choose to export.[23] Moreover, the larger trade costs and the expectation of perceived quality are, the more likely it is that high-quality firms self-select into greenfield FDI, rather than exporting. In particular, if export entry costs are sufficiently large, all firms will conduct greenfield investment rather than export.

Two Types of Foreign Direct Investment. Now we turn to the choice between greenfield investment and M&A. The firm prefers greenfield investment over M&A in the market i if and only if

$$\mathbb{E}\pi_i^G \geq \pi_i^M \quad \Leftrightarrow \varphi^{\sigma-1}\left[\mathbb{E}\epsilon_i^{\sigma-1} - \alpha_i^G - s_i^{\sigma-1}\left(\varphi_i^M\right)^{\sigma-1}\right] \geq \frac{\bar{f}_i^G - \bar{f}_i^M}{\tilde{\Phi}_i} + \left(\varphi_i^M\right)^{\sigma-1}. \tag{8}$$

The selection of firms with higher or lower quality into greenfield investment rather than M&A depends on the firm-specific target draw and country-specific parameters. Therefore, we can talk about the ordering of cutoffs only subject to the clusters of firms defined by the quality of M&A offer firms receive in the foreign market i. Within a cluster, high quality is provided via greenfield investment rather M&A if (i) expected perceived quality is high, (ii) the increase in greenfield entry costs due to high core quality is low, (iii) synergies are low. Thus, the order of cutoffs is determined by the relation between the loss/gain in perceived quality and variable entry costs for greenfield FDI, as well as by the magnitude of synergies. In countries where the costs of finding abroad a consultant with an equal level of home skills are prohibitive, or the advertising expenditures are large, relatively more productive firms self-select into M&A rather than greenfield investment. If the

[23] In the empirical analysis, we do not restrict the sign of α_i^G, thus we are not assuming any ordering of exporting and greenfield investment cutoffs. In particular, with $\alpha_i^G = 0$ we will obtain a standard proximity-concentration tradeoff, when entry costs for greenfield investment are equal across firms with different quality.

institutional costs of mergers and acquisitions are too high, acquisition is not profitable for middle-quality firms, and only greenfield investment can be selected. We note that with the presence of uncertainty in quality perception, the set of accepted M&A is different from the case with perfect forecasting of foreign consumer tastes for a service; also there is no clear ordering of this activity with respect to others in terms of the core quality.[24]

2.5 Equilibrium

Now we aggregate the industry-level parameters, as market sizes and quality adjusted price indexes, and derive the general equilibrium for our model. Each country $i \in I$ is populated with mass n_i of firms heterogeneous in their service quality. We assume that all firm-specific parameters are independently drawn across countries and firms from corresponding distributions. The core quality φ is drawn from an arbitrary distribution $G(\varphi)$. The perceived quality shocks ϵ_i are drawn from an arbitrary country-i- and origin-o-specific distribution $H_{i,o}(\epsilon_i)$.[25] The M&A offers φ_i^M are drawn from an arbitrary country-i-specific distribution $M_i\left(\varphi_i^M\right)$. The entry costs of export to market i, f_i^E, and institutional costs for greenfield investment, $\bar{f}^G$ are drawn from the distribution $F_{i,o}^E\left(f_i^E\right)$ and $F_{i,o}^G\left(\bar{f}_i^G\right)$ with the positive supports, correspondingly.

Conditional on being active in market j, the share of firms from country $j \neq i$ with core quality level φ that enter market i with entry type e is

$$\zeta_{i,j}^e(\varphi) = \int_{f_i^E}\int_{\bar{f}_i^G}\int_{\varphi_i^M} \mathbb{1}\left[e_i\left(j,\varphi,f_i^E,\bar{f}_i^G,\varphi_i^M\right) = e \mid e_i\left(j,\varphi,f_i^E,\bar{f}_i^G,\varphi_i^M\right) \neq 0\right] dM_i\left(\varphi_i^M\right) dF_{i,j}^G\left(\bar{f}_i^G\right) dF_{i,j}^E\left(f_i^E\right). \tag{9}$$

We note that different realizations of firm-specific entry costs of export, greenfield and quality of M&A targets would result in different profits associated to those entry types.

[24] Empirically, if M&A quality is observed, this can be reflected in the higher variance of domestic sales generated by acquirers relative to exporters and firms conducting greenfield FDI compared to the case when quality of M&A is unobservable.

[25] Similar to Schott (2008), this assumption reflects the presence of the origin-specific shifters to the quality perception of quality.

The total sales generated by firms from country $j \neq i$ with core quality φ in country i via entry type e are given by

$$X_{i,j}^{e}(\varphi) = n_j \int_{f_i^E} \int_{\bar{f}_i^G} \int_{\varphi_i^M} \mathbb{1}\left[e_i\left(j, \varphi, f_i^E, \bar{f}_i^G, \varphi_i^M\right) = e\right] \cdot \int_{\epsilon_i} r_i^e\left(j, \varphi, \epsilon_i, \varphi_i^M\right) dH_{i,j}(\epsilon_i) dM_i\left(\varphi_i^M\right) dF_{i,j}^G\left(\bar{f}_i^G\right) dF_{i,j}^E\left(f_i^E\right). \tag{10}$$

Different realizations of perceived quality shocks and quality of targets would result in different foreign revenues. Integrating over the core quality levels of foreign firms and summing over all entry types and foreign countries, the aggregate trade inflow of services to country i is

$$X_i^{foreign} = \sum_{j \in I_i^f} \sum_{e=\{E,G,M\}} \int_{\varphi} X_{i,j}^{e}(\varphi) dG(\varphi). \tag{11}$$

The home production in country i is given by

$$X_i^{domestic} = n_i \int_{\varphi} \int_{\epsilon_i} r_i(i, \varphi, \epsilon_i) dH_{i,i}(\epsilon_i) dG(\varphi). \tag{12}$$

Total labor income in country i consists of two components. The first component is the labor cost of services provision in country i, which includes the sum of wages paid for domestic services suppliers, exporters from country i, as well as FDI-makers in country i. The second component combines entry costs paid by FDI- and export-entrants from foreign markets. The third component constitutes labor income in the homogeneous good sector.

Given that wages are equalized in the open economy when each country produces the homogeneous good, the labor market clearing condition reads as

$$
\begin{aligned}
L_i = \frac{\sigma-1}{\sigma}\Bigg[& X_i^{domestic} + \sum_{j\in I_i^f}\left(n_i \int_{\varphi} X_{j,i}^{E}(\varphi)dG(\varphi) + \sum_{e=\{G,M\}} n_j \int_{\varphi} X_{i,j}^{e}(\varphi)dG(\varphi)\right)\Bigg] \\
& + \sum_{j\in I_i^f} n_j \iiiint_{\varphi,f_j^E,\bar{f}_j^G,\varphi_j^M} \Big(\mathbb{1}\left[e_j\left(i,\varphi,f_j^E,\bar{f}_j^G,\varphi_j^M\right)=E\right] f_j^E \\
& + \mathbb{1}\left[e_j\left(i,\varphi,f_j^E,\bar{f}_j^G,\varphi_j^M\right)=G\right] f_j^G\left(\varphi,\bar{f}_j^G\right) \\
& + \mathbb{1}\left[e_j\left(i,\varphi,f_j^E,\bar{f}_j^G,\varphi_j^M\right)=M\right] f_j^M\left(\varphi_j^M\right)\Big) dF_{j,i}^E\left(f_j^E\right) dF_{j,i}^G\left(\bar{f}_j^G\right) dM_j(\varphi_j^M) dG(\varphi) \\
& + L_{A,i},
\end{aligned}
\tag{13}
$$

where $L_{A,i}$ denotes the labor in the homogeneous sector in country i.

The quality-adjusted price index in country i is formed by the contribution of foreign and domestic firms

$$
\begin{aligned}
P_i = \frac{\sigma-1}{\sigma}\Bigg[& \sum_{j\in I_i^f} n_j \int_{\varphi} \sum_{e} \zeta_{i,j}^{e}(\varphi)\left(\frac{\varphi}{\tau_{i,j}^{\mathbb{1}[e=E]}}\right)^{\sigma-1} dG(\varphi) \\
& + n_i \int_{\varphi} \varphi^{\sigma-1} dG(\varphi)\Bigg]^{\frac{1}{1-\sigma}}.
\end{aligned}
\tag{14}
$$

Finally, we assume that a representative consumer in country i owns the domestic firms, so that the aggregate income is given by the sum of the labor income and the profits generated by firms with origin in country i

$$
\begin{aligned}
Y_i = L_i + \frac{1}{\sigma} X_i^{domestic} & \\
& + n_i \int_{\varphi} \sum_{\substack{j\in I_i^f \\ e\in\{E,G,M\}}} \sum \int_{f_j^E} \int_{\bar{f}_j^G} \int_{\varphi_j^M} \mathbb{1}\left[e_j\left(i,\varphi,f_j^E,\bar{f}^G,\varphi_j^M\right)=e\right] \qquad (15) \\
& \cdot \int_{\epsilon_j} \left(\frac{r_j^e\left(j,\varphi,\epsilon_j,\varphi_j^M\right)}{\sigma} - f_j^e\left(\varphi,\bar{f}_j^G,\varphi_j^M\right)\right) dH_{j,i}(\epsilon_j) dF_{j,i}^E\left(f_j^E\right) \qquad (16) \\
& \cdot dF_{j,i}^G\left(\bar{f}_j^G\right) dM_j\left(\varphi_j^M\right) dG(\varphi).
\end{aligned}
$$

The next definition describes the general equilibrium of the model.

Definition 1. *(General Equilibrium). Given parameters* $\tau_{i,o}$, α_i^G, s_i, σ *and distribution functions* $G(\varphi)$, $H_{i,o}(\epsilon_i)$, $M_i\left(\varphi_i^M\right)$, $F_{i,o}^E(f_i^E)$, $F_{i,o}^G(\bar{f}_i^G)$ *for all countries* $o, i \in I$, *the equilibrium constitutes a set of levels of service consumption,* $q_i(\omega)$, *and homogeneous good,* A_i, *prices,* $p_i^e(o, \varphi, \epsilon_i, \varphi_i^M)$, *entry choices,* $\boldsymbol{e}(o, \varphi, \boldsymbol{f^E}, \bar{\boldsymbol{f}}^{\boldsymbol{G}}, \boldsymbol{\varphi^M})$, *price indexes,* P_i, *and income,* Y_i, *such that*

(*i*) *the optimal level of consumption of service variety* ω *and homogeneous good* A_i *is given by (2) and (3),*

(*ii*) $\boldsymbol{e}(o, \varphi, \boldsymbol{f^E}, \bar{\boldsymbol{f}}^{\boldsymbol{G}}, \boldsymbol{\varphi^M})$ *solves the firm's entry problem (6),*

(*iii*) $p_i^e(o, \varphi, \epsilon_i, \varphi_i^M)$ *solves the firm's profit maximization problem,*

(*iv*) P_i *satisfies equation (14),*

(*v*) *the labor market clears (13),*

(*vi*) Y_i *satisfies equation (15).*

2.6 Discussion

Our model is agnostic about the ordering of cutoffs between different entry types. Depending on the return parameters $\mathbb{E}\epsilon_i^{\sigma-1}$, $\tau_{i,o}$, α_i^G and s_i, as well as the distribution of target firms' quality, different groups of firms in terms of quality self-select into the corresponding activities.[26] Therefore, our model can explain the entry patterns specific to a given industry or country.

In particular, we expect that M&A is particularly relevant for sectors where quality is of high importance and its perception can vary a lot across countries. This can be no longer the case for industries with more homogeneous products or services, as well as industries where the physical productivity explains most of the firm heterogeneity. The perception of quality in such industries does not play an important role, which changes the tradeoff between M&A and other entry types. Moreover, synergies in the technologies are more relevant for sectors with firms heterogeneous with respect to the physical productivity. Therefore, by introducing synergies in the model, we are able to capture the patterns arising in the manufacturing sector and allow for a reverse ordering of the export-acquisition cutoff.

[26] The detailed description of all possible orderings of cutoffs is provided in the Appendix C.

Regarding the greenfield investment, in manufacturing, more productive firms can be more efficient in transferring their production technologies abroad and use of scale economies in building new foreign plants. Thus, greenfield investment entry costs can be lower for more efficient firms, which reverses the ordering of proximity-concentration cutoff with respect to the services sector.

3 Data

We rely on three main data sources for the empirical analysis: (i) the Microdatabase Direct investment (MiDi), (ii) the Statistics on International Trade in Services (SITS) database, and (iii) the AMADEUS database.

The data on the foreign affiliates of German multinational firms are obtained from MiDi.[27] According to the German Foreign Trade and Payments Regulation, all German firms are obliged to report outward FDI activities if (i) the share or voting rights of the German enterprise in the foreign affiliate constitutes at least 10% directly or 50% indirectly, and (ii) the balance sheet of the foreign affiliate exceeds 3 million Euros. The database is maintained since 1996 onwards and is available for researchers from 1999. Therefore, we observe the balance sheets of all German affiliates abroad that satisfy the above reporting requirements during the time period 1999 – 2014. In addition, MiDi provides information about the country of the foreign subsidiary and, since 2005, the type of entry in the foreign market, distinguishing between newly established enterprises (greenfield investment) and purchases, mergers or acquisitions (M&A).

We combine MiDi with SITS, which documents international service transactions carried out by German residents, where activities correspond to modes 1, 2 and 4 in the GATS classification.[28] Differently from MiDi, the reporting requirement for SITS is more stringent, so that all transactions exceeding 12,500 Euros monthly are included. In order to make the reports of multinationals and exporters comparable, we consider only those transactions in SITS that would also be included in MiDi if carried out via commercial presence. In other words, we restrict our focus on those firms whose annual service exports exceed one million Euros.[29]

[27] Deutsche Bundesbank (2016): Microdatabase Direct Investment 1999-2014. Version: 2.0. Deutsche Bundesbank. Dataset. http://doi.org/10.12757/Bbk.MiDi.9914.02.03

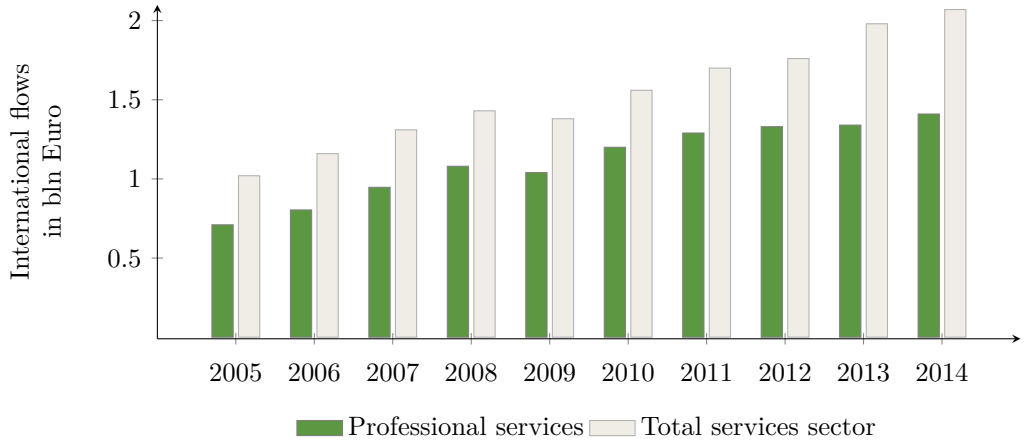
[28] Refer to the Section 1 for the description of the modes according to the GATS classification.

[29] Since the domestic sales of excluded exporters are comparable to those we consider in our analysis, the restriction of the sample does not drive main empirical results. Moreover, we note that requirements for MiDi are easier to satisfy for manufacturing firms rather than services. Therefore, we expect that larger proportion of services FDI is excluded from the database compared to manufacturing due to the features of FDI in these sectors. Specifically, un manufacturing, the settlement of a new plant requires larger capital investment which is more likely to overshoot the reporting threshold relative to the services FDI, where capital investment can be associated with renting the office for a consulting firm.

Finally, we use AMADEUS to obtain data on domestic activities of pure exporters, i.e. firms which are not present in MiDi, but only in SITS.[30]

Since we are concerned with the heterogeneity in the quality of the provided service, we focus on the professional services sector, among which are consulting, marketing, research and administrative activities.[31] This sector accounts for more than a half of all international transactions occurring in the services sector.[32] Together with financial services, the professional services sector is the one with the fastest growth of its share in the aggregate trade flow in developed countries. Figure 1 shows the evolution of international trade flows generated by German firms operating in this sector. We can see that the professional services represent a substantial share of international services flows from Germany.

Figure 1: International trade flows in services from Germany



Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2014, and Statistics on International Trade Services (SITS), 2001-2015, authors' calculations.

In the final sample, we consider German firms operating in the professional services sector in the period 2005 – 2014.[33] We exclude firm-market-specific observations starting before 2005, as this is the first year when the type of FDI entry is reported. This exclusion ensures that the perceived quality is unobserved in the foreign market before entering, as firms that operated in the market

[30] SITS contains information exclusively about foreign transactions, but does not provide any data on operations in Germany. These data are recovered via matching with MiDi, as well as with AMADEUS. The matching of the AMADEUS with Bundesbank's datasets has been performed by the Research Data and Service Center of the Deutsche Bundesbank. For more details, please, refer to Schild, Schultz, and Wieser (2017). Accordingly, we consider the subset of firms that is present both in SITS and AMADEUS datasets.

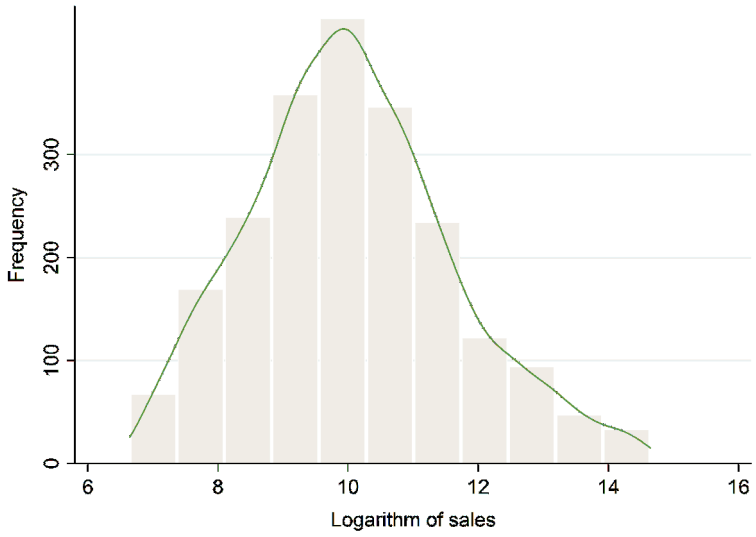
[31] According to Francois and Hoekman (2010), professional services is one of the sectors most exposed to uncertainty in quality.

[32] See the International Trade Statistics Report 2015 (WTO) and the World Investment Report 2015 (UNCTAD).

[33] See Appendix A for more detail on the combination of entries by multinationals and pure exporters by year.

in previous years could already have developed their consumer network, so that they did not face uncertainty on the demand side. Moreover, we consider only the first entries for each market. Furthermore, we disregard those firms which operate exclusively in the foreign markets.[34] During the period of the analysis, we observe a sample of 2,589 market-specific entries by 2,049 German firms. Since the choice to operate abroad is endogenous, we extend our sample with 1,727 domestic firms.[35] We consider three foreign markets: the European Union countries,[36] the United States, and the rest of the world. Figure 2 presents the distribution of total sales of firms operating in the services sector and serving foreign markets.[37] The sales distribution is skewed and there is a substantial number of relatively small players in the market.

Figure 2: Distribution of domestic sales



Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2014, and Statistics on International Trade Services (SITS), 2001-2015, authors' calculations.

Figure 3 displays that the patterns of entry into foreign markets are in line with the predictions of our theoretical model. Among multinational firms, most firms find it profitable to enter via M&A, followed by greenfield investment and exporting. As was noticed before, the requirements

[34] We exclude from the sample firms with zero domestic sales.

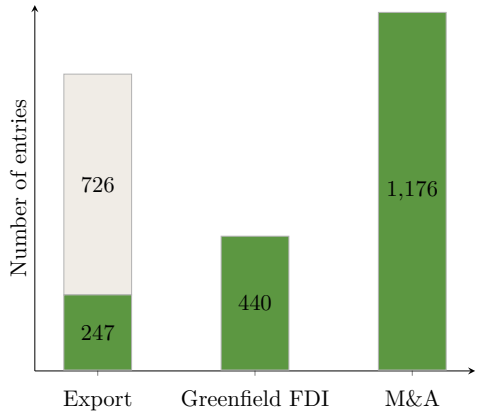
[35] We consider firms which are not present in MiDi and SITS databases and that satisfy the reporting requirement for capital.

[36] In the EU countries we include only EU-15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

[37] We note that due to the presence of the missing data for sales, we proxy those missing entries by regressing sales on capital stock.

for reporting on exporting and FDI differ, so that the comparison made is based on the restricted sample. Moreover, we compare the entry patterns in the service industry with those in a less differentiated sector (wholesale) and find that the frequency of entry types is different from that discussed for professional services (see Appendix B). In particular, in the wholesale sector, most firms select export to FDI, which is in line with the predictions of the standard framework for manufacturing (Helpman, Melitz, and Yeaple, 2004).

Figure 3: Frequency distribution of entry types



Note: The middle line represents the number of exporters that conduct multinational activity.
Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2014, and Statistics on International Trade Services (SITS), 2001-2015, authors' calculations.

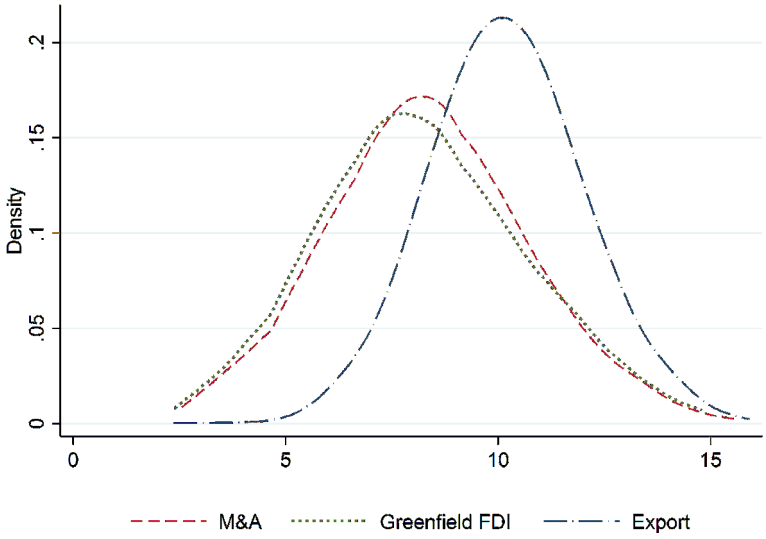
Services firms operate in different markets and can select different entry types for each. Table 1 presents the statistics for pairs of entry types selected by firms in the sample, as well as combinations of markets firms select to be present in. The presence of firms conducting several multinational activities is important for our empirical analysis, since it reflects the differences in the entry-type choices of a given firm across markets.

Table 1: Frequency tabulation of entry types and markets

	Other activity					Other market		
	Export	Greenfield FDI	M&A	No other activity		US	RoW	No other market
Export	346	10	13	436	EU	160	485	737
Greenfield FDI		37	74	349	US		113	197
M&A			278	800	RoW			651

Notes: For combinations of entry types, we consider only those firms which enter one or two markets due to the confidentiality requirements. There are 246 firms that operate in all markets.
Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2014, and Statistics on International Trade Services (SITS), 2001-2015, authors' calculations.

Figure 4: Density of log-domestic sales, by entry type



Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2014, and Statistics on International Trade Services (SITS), 2001-2015, authors' calculations.

We also conduct tests for the cutoff ordering. Table 2 presents the sales premium associated to each entry type. In all three foreign markets, exporters sell significantly more at home, which suggest that high-quality firms self-select into exporting.[38] At the same time, the ordering of M&A and greenfield FDI differs across foreign markets. While in the US the sales premium is larger for firms conducting greenfield investment, it is smaller in other markets.

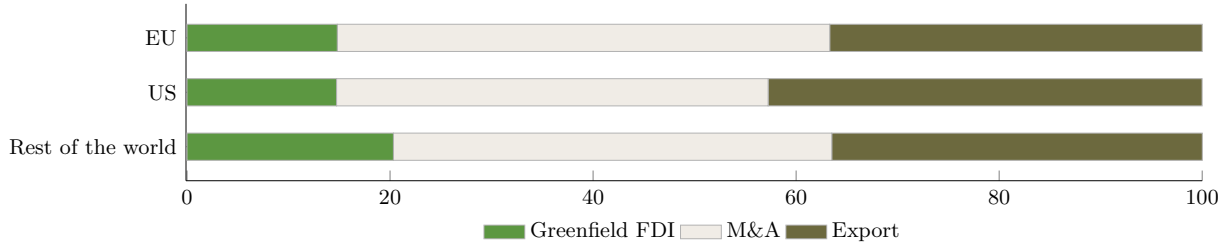
Table 3 presents a similar test for the cutoffs in terms of firm size. Again, exporters have more employees in Germany compared to firms conducting FDI. Here, the size premium is larger for greenfield investors in all foreign markets compared to acquires.

Next, we consider the importance of each entry alternative by foreign market. The frequency of entry types differs across foreign markets (see Figure 5). Greenfield FDI is a relatively more frequent entry type in the rest of the world. At the same time, M&A activity is more frequent in the EU compared to the US and the rest of the world. Our model would rationalize those differences with the level of fixed entry barriers associated to each foreign activity and the quality

[38]Given the worldwide evidence on the international flows in services, we believe that the ordering of cutoffs for export and FDI are not peculiar to German services firms. In particular, we notice that worldwide (i) most of transactions in the services sector occur via FDI, (ii) value added of exports is generated in the services sector is larger than in the manufacturing sector. This observation shows that only a minority of firms self-select into exporting and this minority is highly productive.

of foreign acquisition targets. With particular reference to the EU countries, this pattern could be explained by the relatively higher and less spread quality of potential targets. For the rest of the world, instead, the propensity of M&A might be linked to the high uncertainty of perceived quality related to greenfield FDI and exporting, as well as to the lower price for M&A. Therefore, we would expect that the role of M&A in resolving demand uncertainty is particularly relevant for these countries.

Figure 5: Entry type, foreign market level



Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2014, and Statistics on International Trade Services (SITS), 2001-2015, authors' calculations.

4 Structural Estimation

In this section, we describe the empirical strategy for the estimation of the fundamental market-specific parameters determining returns and entry costs corresponding to each entry alternative. We use firm-level data for German multinationals described in the previous section. In the following paragraphs, we describe the parameterization, discuss the identification and estimation strategies, and present the estimation results.

4.1 Parametrization

Since in this section we consider only German firms, the origin country o is Germany for all firms.[39]

We make the following parametric assumptions on the distributions. The core quality φ is drawn independently across firms from a Pareto distribution with scale parameter a and shape parameter γ. The perceived quality shocks ϵ_i are drawn independently across firms and countries from a country-specific log-normal distribution, $\log \mathcal{N}(\mu_{\epsilon,i}, \sigma_\epsilon)$. We normalize $\mu_{\epsilon,GER}$ to zero and regard the quality perception relative to Germany. The M&A offers φ_i^M are drawn independently across

[39] In this section, we abstract from the use of the subscript o.

firms and countries from a country-specific Pareto distribution with scale parameter a_i^M and shape parameter γ. Export-entry costs f_i^E are drawn from a log-normal distribution, $\log\mathcal{N}(f_i^E, \sigma_{f^E})$. Institutional entry greenfield costs $\bar{f}_i^G$ are drawn from a log-normal distribution, $\log\mathcal{N}(\bar{f}_i^G, \sigma_{f^G})$.[40] Finally, we parameterize the demand shifter Φ_i using country i' services sector absorption.[41] In particular, we take the market size of a country reported in MiDi or SITS as the recipient of a given transaction, rather than the average market value in the aggregated markets (the EU and the rest of the world). Then, we compute the average market size of a country in the aggregated market in each year, and take the maximum average market size when consider the outside option.

4.2 Identification Strategy

In this section, we briefly discuss the sources of variation we use to identify the parameters of interest. We separate the parameters into four groups: the domestic market parameters (a, γ), the export and greenfield investment parameters $\left(\{\mu_{\epsilon,i}\}_{i\in I^f}, \sigma_\epsilon, \{f_i^E\}_{i\in I^f}, \{\tau_i\}_{i\in I^f}, \sigma_{f^E}, \{\bar{f}_i^G\}_{i\in I^f}, \{\alpha_i^G\}_{i\in I^f}, \sigma_{f^G}\right)$, the M&A parameters $\left(\{s_i\}_{i\in I^f}, \{\bar{f}_i^M\}_{i\in I^f}, \{a_i^M\}_{i\in I^f}\right)$, and the general parameter σ. In the next paragraphs, we describe the main source of variation used to identify each group of parameters.

Domestic Market Parameters. Given the structure of our model, the intensive margin of domestic activity is explained by the variation in quality. Therefore, the distribution parameters (a, γ) for the core quality φ are mainly determined by the sales generated by firms in Germany, as well as by the sales generated by firms outside Germany.

Export and Greenfield Investment Parameters. Everything else equal, the difference in the foreign sales realized with greenfield investment and exporting with respect to the domestic sales determines the shocks to perceived quality and the corresponding parameters ($\{\mu_{\epsilon,i}\}_{i\in I^f}, \sigma_\epsilon$). Identification of greenfield investment quality costs $\{\alpha_i^G\}_{i\in I^f}$ is based on the tradeoff between greenfield FDI and exporting. In particular, the sign of these parameters determines if higher (or lower) quality firms self-select into exporting rather than opening new affiliates. The export entry costs and the institutional greenfield investment entry costs $\left(\{f_i^E\}_{i\in I^f}, \{\bar{f}_i^G\}_{i\in I^f}, \sigma_{f^E}, \sigma_{f^G}\right)$ are identified by

[40] This parametrization does not exclude the negative realizations of greenfield entry costs if α_i^G is negative. Therefore, in the estimation we restrict the realizations of total entry costs for greenfield investment, f_i^G, to be non-negative. Alternatively, one could make the mean of the underlying normal distribution to be dependent on ϕ, so that the total entry costs for greenfield investment would come from $\log\mathcal{N}(\bar{f}_i^G + \alpha_i^G v_i(\varphi), \sigma_{f^G})$.

[41] The data are taken from the World Bank database.

Table 2: Sales premium for exporters, acquirers and greenfield investors

Foreign market	Exporters				M&A				Greenfield investment			
	Sales premium		95% Conf. Interval		Sales premium		95% Conf. Interval		Sales premium		95% Conf. Interval	
EU	11.062	(0.205)	[10.661,	11.464]	8.776	(0.182)	[8.420,	9.133]	8.659	(0.266)	[8.138,	9.180]
US	10.994	(0.430)	[10.148,	11.840]	8.913	(0.428)	[8.072,	9.754]	9.173	(0.489)	[8.211,	10.134]
Rest of the world	10.461	(0.265)	[9.941,	10.980]	8.559	(0.262)	[8.046,	9.073]	8.142	(0.290)	[7.573,	8.710]
Total	10.806	(0.158)	[10.496,	11.116]	8.677	(0.151)	[8.381,	8.972]	8.472	(0.187)	[8.106,	8.839]

Notes: We estimate entry type premia as follows: $\log(Sales_{\omega,t}) = \beta_1 EXP_{\omega,t} + \beta_2 MA_{\omega,t} + \beta_3 GI_{\omega,t} + I_t + \xi_{\omega,t}$, where t is the year index, I are time dummies. All estimates are significant at the 1 percent level. $N = 2459, R^2 = 0.948$. Here for each entry type we consider only those firms, that do not conduct any other activity. Correspondingly, there are 1,094 observations ($R^2 = 0.951$) considered in the regression for the EU, 382 observations ($R^2 = 0.961$) for the US, and 983 observations ($R^2 = 0.941$) for the RoW.
Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2014, and Statistics on International Trade Services (SITS), 2001-2015, authors' calculations.

Table 3: Size premium for exporters, acquirers and greenfield investors

Foreign market	Exporters				M&A				Greenfield investment			
	Size premium		95% Conf. Interval		Size premium		95% Conf. Interval		Size premium		95% Conf. Interval	
EU	4.859	(0.267)	[4.334,	5.383]	2.542	(0.250)	[2.050,	3.034]	2.749	(0.396)	[1.971,	3.527]
US	5.034	(0.133)	[4.772,	5.296]	2.667	(0.226)	[2.222,	3.113]	2.936	(0.582)	[1.789,	4.084]
Rest of the world	4.813	(0.281)	[4.262,	5.363]	2.568	(0.270)	[2.038,	3.098]	2.586	(0.316)	[1.964,	3.207]
Total	4.919	(0.179)	[4.569,	5.269]	2.594	(0.172)	[2.257,	2.932]	2.730	(0.229)	[2.281,	3.179]

Notes: We estimate entry type premia as follows: $\log(Employment_{\omega,t}) = \beta_1 EXP_{\omega,t} + \beta_2 MA_{\omega,t} + \beta_3 GI_{\omega,t} + I_t + \xi_{\omega,t}$, where t is the year index, I are time dummies. All estimates are significant at the 1 percent level. $N = 1,508, R^2 = 0.832$. Here for each entry type we consider only those firms, that do not conduct any other activity. Correspondingly, there are 645 observations ($R^2 = 0.820$) considered in the regression for the EU, 242 observations ($R^2 = 0.864$) for the US, and 621 observations ($R^2 = 0.929$) for the RoW. We consider less observations due to the lack of information on the number of domestic employment.
Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2014, and Statistics on International Trade Services (SITS), 2001-2015, authors' calculations.

observing the entry choices of firms conditional on their core quality. Finally, *ad valorem* trade costs $\{\tau_i\}_{i \in I^f}$ are evaluated from the difference in revenues generated by firms via exports and greenfield investment. In particular, the lower the intensive margin of exporting is, the higher are trade costs associated with services exports.

M&A Parameters. The parameters related to the M&A activity deserve some discussion, since the quality of potential acquisition targets, a_i^M, affects directly both intensive and extensive margins of M&A. Therefore, one can find different combinations of a triple $(a_i^M, s_i, \bar{f}_i^M)$ that can rationalize the distribution of M&A sales and entries in the market i. For instance, fixing one triple of M&A parameters, it could be possible to find another one with a higher magnitude of synergies, lower quality of acquisition targets and lower level of institutional M&A entry costs, that would fit the observed data.

To identify those parameters, we consider two specifications.[42] In the first specification, we assume that the magnitude of synergies depends on the relative advance of a firm with respect to the least productive firm in the industry. Accordingly, we restrict the magnitude of synergies and parametrize it to $s_i = 1/a_i$. This restriction implies that a firm with the core quality φ can increase the level of quality of acquisition target by φ/a, which represents the ratio of firm's core quality to the lowest core quality in the market. Moreover, it follows that the least productive firm in the industry is just indifferent between being engaged in M&A or not should there be no institutional entry costs. In this specification, the magnitude of synergies a firm can generate is the same across all markets. Everything else equal, the quality of acquisition targets would be the main determinant of the differences in M&A sales realized across locations. In the second specification, we assume that the institutional restrictions for M&A and greenfield investment are similar. In particular, we restrict the level of M&A institutional entry costs to be equal to the median of the distribution of the institutional entry costs for greenfield investment. Hence, in this specification we can talk only about overall institutional barriers for entering via FDI.

Independent of the restriction specification, the parameters related to the intensive margin of M&A are recovered from the sales firms generate via acquired affiliates. The extensive margin

[42] Two natural restrictions are on the magnitude of synergies, which restricts the intensive margin, and the level of institutional entry costs, which puts restrictions on the extensive margin. The third restriction on the quality of M&A targets is less tractable, as it would imply restrictions not only on the parameters related to M&A entries, but also on the other entry modes. When conducting the Monte-Carlo simulations under an assumption that distribution parameters $\{a_i^M\}_{i \in I^f}$ are all the same and equal to a, we are able to show that it is not always possible to find the corresponding triple of M&A parameters in order to rationalize the observed data. The intuition behind this finding is that a_i^M enters revenues and entry costs simultaneously and it affects the Pareto distribution, which restrict the possible set of φ_i^M realizations.

determines the related entry cost parameters. In the Appendix D we simulate the model and show that all parameters are identified for both specifications.

General Parameters. Since the assumption of CES preferences implies that markups are constant, we can use data on sales and variable costs to recover the corresponding σ parameter.[43]

4.3 Estimation Strategy

There are two sources of heterogeneity in service quality which are observed by firms, but not observed by the econometrician: the core quality φ and the draws for target firm quality $\left\{\varphi_i^M\right\}_{i\in I^f}$. When we construct the maximum likelihood function, we need to integrate over all possible realizations of the quality levels, so that the combination of the two sources determines the optimal choice of the entry type. Moreover, we need to account for all possible orderings of cutoffs with respect to the core quality depending on the distribution parameters of perceived quality shocks $(\{\mu_{\epsilon,i}\}_{i\in I^f}, \sigma_\epsilon)$, *ad valorem* trade costs $\{\tau_i\}_{i\in I^f}$ and quality transmission costs $\{\alpha_i^G\}_{i\in I^f}$.[44] In order to avoid this complication, we exploit the assumptions on the independence of draws for target firms' qualities and core quality, which allows us to separate entry choices across markets conditional on the firm's core quality.

The construction of the likelihood implies several steps. In particular, we divide the choice of entry type into two stages. If the firm ω selects the entry type $e_{\omega,i}$ in the foreign market i, it should prefer it to (i) entering via *M&A*, (ii) entering via any other entry type than *M&A*, i.e.

$$\begin{aligned} e_{\omega,i} &= \arg\max_{e_i'} \left\{\mathbb{E}\Pi_i^{e_i'}\right\}_{e_i'\in\{0,E,G,M\}} \Leftrightarrow \\ e_{\omega,i} &= \arg\max_{e_i'} \left\{\max_{e_i''} \left\{\mathbb{E}\Pi_i^{e_i''}\right\}_{e_i''\in\{0,E,G\}}, \Pi^{e_i'=M}\right\}. \end{aligned} \tag{17}$$

Therefore, in the first stage we determine for each firm the probability of preferring observed entry types to entering into all markets with *M&A*. We note that conditional on the core quality and entry costs, choice of an alternative over *M&A* in one market is solely determined by the draw of target firm's quality. Given that *M&A* draws are i.i.d. across markets, we can consider probability of entry type choice over *M&A* in each foreign market separately. Then, for the firm ω with core

[43] At the moment, we set $\sigma = 3.18$ to make our results comparable to Francois, Manchin, Norberg, Pindyuk, and Tomberger (2013).

[44] Three possible orderings of cutoffs in ascending in core quality order are: *i*) *M&A – Greenfield Investment – Export*, *ii*) *Greenfield Investment – M&A – Export*, *iii*) *M&A – Export – Greenfield Investment*.

quality level φ the probability of selecting alternative $e_{\omega,i}$ in the foreign market i over *M&A* is

$$\begin{aligned}&\Pr_i^1\left(e_{\omega,i} \succeq M\&A \mid \varphi, f_i^{e_{\omega,i}}; \theta_i^1\right) = \\ &\int \mathbb{1}\left\{\mathbb{E}\Pi_i^{e_{\omega,i}}\left(\varphi, \varphi_i^M, \epsilon_i, f_i^{e_{\omega,i}}, \tau_i, s_i; \mu_{\epsilon,i}, \sigma_\epsilon\right)\right. \\ &\left.\geq \Pi_i^M\left(\varphi, \varphi_i^M, s_i, \bar{f}_i^M\right)\right\} dM(\varphi_i^M; a_i^M, \gamma),\end{aligned} \tag{18}$$

where $\theta_i^1 = \left\{\mu_{\epsilon,i}, \sigma_\epsilon, a_i^M, \gamma, \tau_i, s_i\right\}$.

In particular, the draw of target firm's quality should be below the corresponding country-specific cutoff, which in turn is represented by a function in the core quality φ and (institutional) entry costs of a selected activity $f_i^{e_{\omega,i}}$. Let $\tilde{\Delta}_i^G$ denote firm's return to core quality associated to greenfield investment in a foreign market, respectively; that is,[45]

$$\tilde{\Delta}_i^G \equiv \mathbb{E}\epsilon_i^{\sigma-1}\tilde{\Phi}_i. \tag{19}$$

Then, the corresponding upper bounds for the realization of φ_i^M for the choice of not entering into the market i, φ_i^{M0}, entering via exporting, φ_i^{ME}, and greenfield investment, φ_i^{MG}, for the firm with core quality $\varphi > 1/s_i$ are as follows

$$\begin{aligned}\varphi_i^{M0} &= \left[\frac{\bar{f}_i^M}{\tilde{\Phi}_i(\varphi s_i)^{\sigma-1} - \tilde{\Phi}_i}\right]^{\frac{1}{\sigma-1}}, \\ \varphi_i^{ME} &= \left[\frac{\bar{f}_i^M + \Delta_i^E - f_i^E}{\tilde{\Phi}_i(\varphi s_i)^{\sigma-1} - \tilde{\Phi}_i}\right]^{\frac{1}{\sigma-1}}, \\ \varphi_i^{MG} &= \left[\frac{\bar{f}_i^M + \tilde{\Delta}_i^G - f_i^G}{\tilde{\Phi}_i(\varphi s_i)^{\sigma-1} - \tilde{\Phi}_i}\right]^{\frac{1}{\sigma-1}},\end{aligned} \tag{20}$$

while if the firm has the core quality level $\varphi < 1/s_i$, it never finds it profitable to acquire a target firm in the market i, so that such firm selects any alternative over *M&A* with deterministic probability in the market i.[46]

[45] Here we adopt a different notation for returns, as entry costs for greenfield investment should be considered in total when comparing this entry type to *M&A*.

[46] For simplicity, if $\varphi > 1/s_i$ we assume that *Greenfield Investment* is preferred to *M&A* with probability 1 in the market i. In this case, option of not entering dominates both *M&A* and *Greenfield investment*. Therefore, in the second stage the *Greenfield investment* will be dominated by *No entry*, so that the likelihood of selecting *Greenfield investment* will be zero independent of the value which we assign to the probability to select *Greenfield investment* over *M&A* in the first stage. The probability of selecting *M&A* over *M&A* is one.

In the second stage, we determine the probability of choosing a given entry type in each market over all other alternatives, but *M&A*. The cutoffs (if relevant[47]) in the core quality with respect to *Export*, *Greenfield investment*, and *No entry* are

$$\varphi_i^{0E} = \frac{f_i^E}{\Delta_i^E},\ \varphi_i^{0G} = \frac{\bar{f}_i^G}{\Delta_i^G},\ \varphi_i^{GE} = \frac{f_i^E - \bar{f}_i^G}{\Delta_i^E - \Delta_i^G}, \tag{21}$$

where φ_i^{jk} defines firm's threshold such that with core quality φ satisfying $\varphi_i^{\sigma-1} = \varphi_i^{jk}$ firm is indifferent between entering with the entry type j or k into the foreign market and enters with k if the core quality is above the relevant cutoff, where $j, k \in \{0, E, G\}$ with $j \neq k$.

The cutoffs for choosing *M&A* depend both on the core quality and realization of target firms' qualities. Thus, the density of the revenues in each location and the choice of *M&A* are interdependent. However, using the monotonicity of M&A revenues in the target firm's quality, we can constrain the possible realizations of target firms' draws of quality to rationalize the sales associated to M&A and observed in the data. In particular, we can express the target firm's quality as $\varphi_{\omega,i}^M = r_{\omega,i}^M / \tilde{\Phi}_i (s_i \varphi)^{\sigma-1}$ and redefine all cutoffs for firm ω for selecting *M&A* over other alternatives in terms of the sole core quality.[48]

Finally, the likelihood for each firm consists of (i) the probability of observing chosen entry types $\{e_{\omega,i}\}_{i \in I^f}$, (ii) the density of the country-specific revenues $\{r_{\omega,i}\}_{i \in I^f}$,[49] (iii) the density of the domestic revenues $r_{\omega,GER}$ conditional on the entry choices and firm's core quality. We transform the density of revenues into the density of perceived quality shocks for *Export*, *Greenfield investment*, and domestic sales. The density of M&A sales is transformed into the density of M&A quality draws. Since the perceived quality shocks are i.i.d. across firms and countries, the final representation of

[47] The relevance of cutoffs is discussed in the Appendix C.

[48] Formal expressions for cutoffs in the core quality for selecting *M&A* over other alternatives can be found in the Appendix F.

[49] Here we drop the entry-type superscript for sales to reduce notation complication.

the contribution of the firm ω to the likelihood is

$$
\begin{aligned}
& l_\omega\left(\theta; \{e_{\omega,i}, r_{\omega,i}\}_{i\in I^f}, r_{\omega,GER}\right) = \\
& \int \Pr\left(\boldsymbol{e}_\omega = \boldsymbol{e} |\ \varphi; \{\theta_i^1\}_{i\in I^f}\right) \\
& \cdot \left|J_\omega^\epsilon\left(\varphi; \{\tau_i\}_{i\in I^f}\right)\right| \prod_{e_i\in\{E,G\}} y\left(r_i^{-1}(r_{\omega,i}) \ \middle|\ \varphi; \{\mu_{\epsilon,i}\}_{i\in I^f}, \sigma_\epsilon\right) \\
& \cdot \left|J_\omega^{\varphi^M}\left(\varphi; \{s_i\}_{i\in I^f}\right)\right| \prod_{e_i=M} m\left(r_i^{-1}(r_{\omega,i}) \ \middle|\ \varphi; \left\{a_i^M\right\}_{i\in I^f}, \gamma\right) \\
& \cdot \left|\frac{dr_{GER}(\epsilon_{GER})}{d\epsilon}\left(r_{GER}^{-1}(r_{\omega,GER})\right)\right|^{-1} y\left(r_{GER}^{-1}(r_{\omega,GER}) \ |\ \varphi; \sigma_\epsilon\right) dG(\varphi; a, \gamma),
\end{aligned}
\tag{22}
$$

where θ is the vector of parameters to estimate, $\left|J_\omega^\epsilon\left(\varphi; \{\tau_i\}_{i\in I^f}\right)\right|$ is the absolute value of the determinant of the Jacobian associated to the transformation of the density of foreign revenues generated via export and greenfield investment into the density of the perceived quality shocks, $\left|J_\omega^{\varphi^M}\left(\varphi; \{s_i\}_{i\in I^f}\right)\right|$ is the absolute value of the Jacobian associated to the transformation of the density of M&A foreign revenues into the density of the M&A quality draws, $y\left(\cdot \ \middle|\ \{\mu_{\epsilon,i}\}_{i\in I^f}, \sigma_\epsilon\right)$ is the univariate density of the perceived quality shocks, $m\left(\cdot \ \middle|\ \left\{a_i^M\right\}_{i\in I^f}, \gamma\right)$ is the univariate density of the M&A quality draws, and $G(\varphi; a, \gamma)$ is the distribution of the core quality.

To estimate the model we solve the constrained optimization problem, which is specified as follows

$$
\begin{aligned}
& \max_{\theta, \{\varphi_i\}_{i\in I^f}, \varphi_{GER}} \log \prod_{\omega\in\Omega_{GER}} l_\omega\left(\theta; \{e_{\omega,i}, r_{\omega,i}\}_{i\in I^f}, r_{\omega,GER}\right) \\
& \text{subject to: } r_{\omega,i} = r_i(\varphi_i) \wedge r_{\omega,GER} = r_{GER}(\varphi_{GER}) \ \ \forall\ \omega\in\Omega_{GER},\ i\in I^f.
\end{aligned}
\tag{23}
$$

4.4 Estimation Results

Table 4 presents the estimates of the structural parameters.[50]

Institutional entry costs of both types of FDI are below the institutional export-entry costs. Therefore, only the firms with the highest core quality find it profitable to export.[51] Entry costs of greenfield investment increase with the core quality of the firm, which confirms the hypothesis that transferring higher quality is more costly. The cost of quality for greenfield investment is higher in the US relative to the rest of the world and the EU. This result can be explained by higher average

[50] We note that results are obtained without putting any restriction on M&A parameters. Though this may result in a bias of absolute parameter values, we can make a relative comparison of parameters across different markets and entry types.

[51] The orderings of the returns and fixed part of the entry costs across entry types are the same.

quality of services provided in the US market, as well as higher advertisement costs.

Table 4: Maximum likelihood estimates

Common parameters		Estimates	
Scale parameter of core quality distribution, a		0.139	
Shape parameter of core quality distribution, γ		4.649	
S.d. log perceived quality shock, σ_ϵ		0.887	
S.d. log export-entry costs, σ_{fE}		2.996	
S.d. log greenfield investment entry costs, σ_{fG}		9.436	
Country-specific parameters	EU	US	RoW
Median entry cost with export, $\exp(f^E)$	4.455	1.069	3.803
Iceberg trade costs, τ	1.468	2.259	2.897
Median log perceived quality shocks, $\exp(\mu_\epsilon)$	0.858	0.375	0.655
Median institutional entry costs with greenfield FDI, $\exp(\bar{f}^G)$	0.279	0.611	0.764
Quality price for greenfield FDI, α^G	0.224	0.575	0.200
Median institutional entry costs of M&A, $\exp(\bar{f}^M)$	0.216	0.048	1.565
M&A synergies, s	6.457	1.729	3.934
Scale parameter of M&A quality distribution, a^M	0.115	0.148	0.368
Number of firms			3776
Log-Likelihood			−3.245E+4

Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2014, and Statistics on International Trade Services (SITS), 2001-2015, authors' calculations.

Next, we discuss the parameters which determine the revenues associated with each activity. The perception of quality in the foreign markets is lower with respect to the median perceived quality in Germany. When the loss in the perception is only 14% for the EU, the mode perceived quality in the US and the rest of the world markets for German services is substantially lower. In particular, this results in the change of the cutoff ordering between M&A and greenfield for the US market: more productive firms prefer to acquire firms in the US. Iceberg trade costs in the services sector are mainly explained by the gravity parameters. Not surprisingly, an increase in the marginal costs is the lowest for the EU market. Finally, the magnitude of synergies generated via M&A is larger in the EU compared to the US and the rest of the world, which reflects larger applicability of German common practices in this market and better brand-name recognition.

5 Counterfactual Analysis

In this section, we address the question of how the liberalization affects the services sector. Specifically, we examine the potential effect of the Transatlantic Trade and Investment Partnership (TTIP) related to the services sector on the average quality of services provided via each entry type and

overall quality of services provided in the EU, the US, and the rest of the world.

We describe the main steps of conducting a counterfactual analysis with the proposed model. First, we discuss how to calibrate the iceberg trade costs and parameters of the origin-specific distributions of the perceived quality shocks to data on bilateral multinational and trade flows between markets. Second, we explain how to simulate a trade liberalization with our model and what can be the differences in liberalization outcomes in the services sector with respect to manufacturing. As previous steps done, we can analyze the effect of the introduction of quality and safety standards which result in the reduction of the costs of quality transfer with greenfield investment.

5.1 Calibration

Some additional data are needed to calibrate the general equilibrium of the model. For the multinational and trade outflows and inflows in the EU and the US, we use the data provided by the OECD. The multinational outflows type-specific FDI in Germany are taken from MiDi. We set the mass of firms in each market proportional to the number of listed companies in the region. Accordingly, we use data from the World Bank to determine the size of the labor force in each market and the share of labor employed in the services sector.

Taking Germany as a representative EU country, we set all origin-specific structural parameters for the EU firms equal to the ones estimated for Germany. Specifically, we assume that EU firms face the same uncertainty in quality perception in the foreign markets, draw entry costs from the same distributions and pay same iceberg trade costs. Moreover, as the magnitude of the iceberg trade costs in the professional services sector can be explained by gravity parameters, we restrict the trade costs to be symmetric.

Following the theoretical specification of our model, we account for the possibility that quality perception and the level of entry costs can depend not just on the destination country, but also on the origin of trade flows. The perception of quality can differ due to the presence of "country-brands", for instance German services could be perceived differently from those provided by US firms in the RoW market. The flexibility in parameters corresponding to the perceived quality shocks would allow us to match closer intensive margin of services trade. At the same time, the closeness of regulations on services sector between origin and host countries would make the institutional entry barriers different across various country pairs. When allowing for origin- and destination-specific entry costs, we are able to match better extensive margin, and therefore selection patterns into different activities. Moreover, those two assumptions allow us to regard all countries the same in

terms of the core quality distribution.[52]

More specifically, we assume that $k_{i,o} = k_i + k_o$, where $k_{i,o} = \left\{\mu_{\epsilon,i,o}, f^E_{i,o}, \bar{f}^G_{i,o}, \bar{f}^M_{i,o}\right\}$ can be represented as a sum of the destination country component k_i, and the origin country component k_o. We normalize all parameters related to the EU market to zero, so that the estimates for entry costs and quality perception shocks obtained for Germany can be regarded as the corresponding destination country components.

Thus, there are eight parameters, θ^c, to be calibrated: (i – ii) US – RoW and RoW – RoW iceberg trade costs, and (iii – viii) origin country components of the perceived quality shocks' distribution and entry costs for the US and the rest of the world.

Using the predictions of the model on the export and FDI flows across foreign markets, we construct the set of moments for our calibration. The first subset of moments includes the shares of each foreign market in the US and the EU trade and multinational flows. The theoretical decomposition of export and import across foreign markets is given by

$$\kappa^{1,import}_{i,j} = \frac{\int_\varphi X^E_{i,j}(\varphi) dG(\varphi)}{\sum_{i\neq j}\int_\varphi X^E_{i,j}(\varphi) dG(\varphi)}, \quad \kappa^{1,export}_{i,j} = \frac{\int_\varphi X^E_{i,j}(\varphi) dG(\varphi)}{\sum_{i\neq j}\int_\varphi X^E_{i,j}(\varphi) dG(\varphi)}, \tag{24}$$

where $i \in \{EU, US\},\ j \in \{EU, US, RoW\}$.[53] For each country, we drop a moment with respect to one foreign country. This results in six moment conditions.[54]

Next, we take the shares of each foreign market in the FDI inflows and outflows in the US and the EU markets. The model prediction for these moments is

$$\begin{aligned}
\kappa^{1,inflow}_{i,j} &= \frac{\int_\varphi \left[X^G_{i,j}(\varphi) + X^M_{i,j}(\varphi)\right] dG(\varphi)}{\sum\limits_{i\neq j}\int_\varphi \left[X^G_{i,j}(\varphi) + X^M_{i,j}(\varphi)\right] dG(\varphi)}, \\
\kappa^{1,outflow}_{i,j} &= \frac{\int_\varphi \left[X^G_{j,i}(\varphi) + X^M_{j,i}(\varphi)\right] dG(\varphi)}{\sum\limits_{i\neq j}\int_\varphi \left[X^G_{j,i}(\varphi) + X^M_{j,i}(\varphi)\right] dG(\varphi)},
\end{aligned} \tag{25}$$

where $i \in \{EU, US\}, j \in \{EU, US, RoW\}$. Accordingly, we consider six additional moment condi-

[52] With non-origin specific institutional entry barriers the model will predict the same cutoffs for a given country for all entrants independent of their origin. This would largely restrict the set of possible market shares of foreign suppliers and make the calibration of the model not feasible.

[53] We allow for trade between countries within the same aggregated region (the EU and the rest of the world). Therefore, only non-feasible pair of i and j combination is $US - US$.

[54] Correspondingly, there are two moment conditions for flows associated to the US and four moment conditions for the EU.

tions.

Then, we include the shares of each foreign market in the greenfield investment and M&A services flows from Germany. Here we assume that the German FDI composition is similar to the aggregate EU composition of FDI. The proportion of country j in the greenfield investment and M&A outflows from Germany is

$$\kappa^{1,G}_{EU,j} = \frac{\int_\varphi X^G_{j,EU}(\varphi)dG(\varphi)}{\sum_j \int_\varphi X^G_{j,EU}(\varphi)dG(\varphi)}, \quad \kappa^{1,M}_{EU,j} = \frac{\int_\varphi X^M_{j,EU}(\varphi)dG(\varphi)}{\sum_j \int_\varphi X^M_{j,EU}(\varphi)dG(\varphi)}, \tag{26}$$

where $j \in \{EU, US, RoW\}$. This condition gives us four additional moments.

The second set of moments defines the composition of a trade flow to each foreign destination by export and FDI. First, the theoretical share of import from country j to country i in total expenditure of country i to services from country j is given by

$$\kappa^{2,import}_{i,j} = \frac{\int_\varphi X^E_{i,j}(\varphi)dG(\varphi)}{\sum_{e\in\{E,G,M\}} \int_\varphi X^e_{i,j}(\varphi)dG(\varphi)}, \tag{27}$$

where $i \in \{EU, US\}, j \in \{EU, US, RoW\}$. Analogously, the theoretical share of export in total sales flows from country i to country j is given by

$$\kappa^{2,export}_{i,j} = \frac{\int_\varphi X^E_{j,i}(\varphi)dG(\varphi)}{\sum_{e\in\{E,G,M\}} \int_\varphi X^e_{j,i}(\varphi)dG(\varphi)}, \tag{28}$$

where $i \in \{EU, US\}, j \in \{EU, US, RoW\}$.

Finally, we include the proportion of destination-specific greenfield investment flows and M&A flows in outward German activities. The proportion of M&A in the total FDI flow to the foreign market from the EU is

$$\kappa^{2,M}_{EU,j} = \frac{\int_\varphi X^M_{j,EU}(\varphi)dG(\varphi)}{\int_\varphi \left[X^M_{j,EU}(\varphi) + X^M_{j,EU}(\varphi)\right] dG(\varphi)}, \tag{29}$$

where $j \in \{EU, US, RoW\}$. This condition gives us three additional moments.

Therefore, we construct 31 moments, $\boldsymbol{\kappa}$. We then minimize the squared difference between theoretical moments and the data targets conditional on the vector of the aggregate market parameters

satisfying the model equilibrium

$$\begin{aligned} &\max_{\theta^c} \left(\boldsymbol{\kappa}(\theta^c) - \boldsymbol{\kappa}\right)' \left(\boldsymbol{\kappa}(\theta^c) - \boldsymbol{\kappa}\right) \\ &\text{subject to: } L_i(\theta^c) = L_i \wedge P_i(\theta^c) = P_i \wedge Y_i(\theta^c) = Y_i \ \forall i \in I, \end{aligned} \tag{30}$$

where $L_i(\theta^c)$ is given by (13), $P_i(\theta^c)$ is given by (14), and $Y_i(\theta^c)$ is given by (15). We take all moments with the equal weights.

5.2 Counterfactual Analysis

In the counterfactual analysis, we simulate the liberalization in the services sector as it is described for TTIP agreement. According to the proposals of the European Commission,[55] the services sector liberalization has two important policies which are the reduction of the non-tariff trade barriers and introduction of services quality standardization. In terms of the model, an increase in mobility of professional consultants, fastening of licenses approvals and elimination of legal restrictions of professional services trade will be reflected in the reduction of the institutional trade barriers, that is $\boldsymbol{f^E}, \bar{\boldsymbol{f}}^{\boldsymbol{G}}$ and $\bar{\boldsymbol{f}}^{\boldsymbol{M}}$. Standardization of the quality requirements can decrease costs of entering foreign markets with the greenfield investment by facilitating the transferring of quality overseas; therefore, we would expect that the costs of quality transfer, $\boldsymbol{\alpha^G}$, will decrease.

The reduction in the institutional entry costs does not change the relative quality provided by each entry mode, but in turn it affects the absolute value of the average quality supplied by exporters, FDI-makers and domestic firms as institutional barriers determine the proportions of firms selecting in one or another entry mode. Contrarily, the introduction of quality standards results in an increase of a return to greenfield investment and therefore could have implications on the sorting entry patterns. A sufficiently stringent quality requirements could revert the sorting between export and greenfield investment and result in the highest quality services to be provided with FDI. Moreover, an increase in the return to greenfield investment would have an effect on the acceptance of M&A offers, leading to less M&A but of a higher quality.

Following Francois and Hoekman (2010), we consider two possible scenarios for trade liberalization. In the moderate scenario, we simulate a 10%-reduction of the non-tariff barriers, where we reduce bilateral institutional entry costs for the US and the EU markets. In the more ambitious scenario, we simulate a 25%-reduction of institutional entry barriers. For each case we consider a change in the aggregate income, as defined by (15); a change in the average quality $\tilde{\varphi}_i$ of services

[55] Detailed information about proposals could be found on the website of the European Commission.

in the market i, as defined by (31); and a change in the average quality provided by exporters and FDI-makers, that is by groups g_i^e separated according to different entry types e, as defined by (32)

$$\tilde{\varphi}_i = \left[\sum_{j \in I_i^f} n_j \int_{\varphi} \zeta_{i,j}^e(\varphi) \varphi^{\sigma-1} dG(\varphi) + n_i \varphi^{\sigma-1} dG(\varphi) \right]^{\frac{1}{\sigma-1}}, \tag{31}$$

$$\tilde{\varphi}_{i,g_i^e} = \left[\sum_{j \in g_i^e} n_j \int_{\varphi} \zeta_{i,j}^e(\varphi) \varphi^{\sigma-1} dG(\varphi) \right]^{\frac{1}{\sigma-1}}. \tag{32}$$

Given the structural parameter estimates obtained in Section 4, we can expect the main effect of liberalization to come from the changes in the multinational activity in the services sector. As non-tariff trade barrier fall, previously domestic firms can become profitable for starting the FDI activity in the foreign market. While export can increase, this would be mainly due to selection into exporting over FDIrather than deriving from entries of previously internationally inactive firms. This is a crucial difference with the effect of liberalization in manufacturing, which highlights the importance of a proper consideration of the selection patterns into foreign activities across industries and countries.

6 Conclusion

This chapter analyzes the entry patterns into foreign markets specific to the professional services sector. We explain theoretically why the largest service firms in the industry export, while the smaller companies open new foreign affiliates or acquire preexisting foreign targets. Since international activities are associated with high uncertainty in the perception of service quality in the non-tested destination markets, most firms find it profitable to enter a new market by buying foreign firms with an already established consumer network in order to avoid demand risks. At the same time, the most productive firm can generate higher sales by engaging in greenfield FDI or by exporting the quality of their origin country abroad subject to entry costs.

Our parsimonious model fits the empirical evidence on German firms. We find that entry patterns are reversed compared to the standard sorting in manufacturing: only the firms providing the highest service quality export, while lower-quality firms conduct FDI. The relative sorting of M&A vs. greenfield FDI in terms of firm quality is market-specific and depends on the relative importance of uncertainty about quality perception, the structure of entry costs, and size of synergies associated

with M&A. Finally, we calibrate the model equilibrium to the data on multinational and trade flows between the EU, the US, and the rest of the world. The theoretical model suggest that the service-trade liberalization, based on the reduction of non-tariff trade barriers and introduction of quality standards, can reallocate quality across entry alternatives, increase quality of acquired targets, and make FDI a more prominent entry type.

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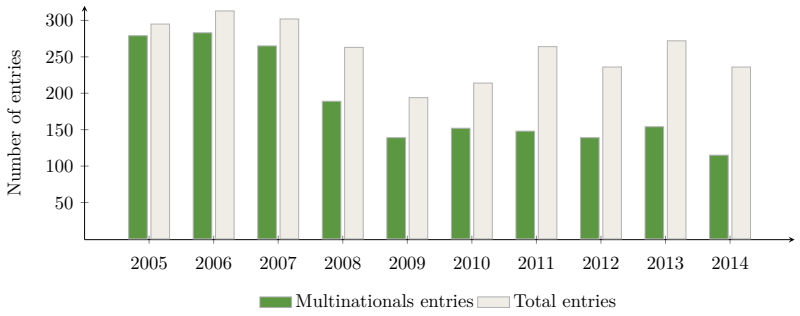
A Entry by Year

Figure 6 reports the number of entries by year into foreign countries observed in the sample of firms supplying professional services. The green bars refer only to entries related to multinational enterprises whereas the gray bars include also pure exporters. We note that entry activity is larger at the beginning of the sample (2005 – 2007). However, starting from 2008, we note that the economic crisis reduced the entries activity of both groups of firms (especially for multinationals).

Entries has been slowly reverting to the levels observed before the crisis with respect to pure exporters, whereas they are still below the pre-crisis level with respect to multinational enterprises.

Figure 6: Foreign market entries

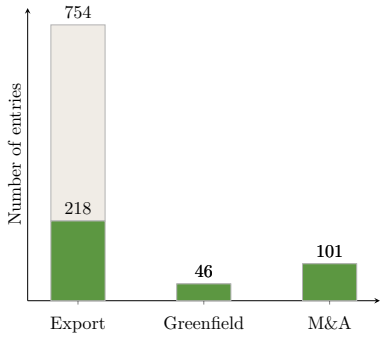


Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2014, and Statistics on International Trade Services (SITS), 2001-2015, authors' calculations.

B Wholesale

Figure 7 displays the patterns of entries into foreign markets. Generally, in the wholesale sector the quality is not the most important business driver. The patterns we observe for this sector are in line with the literature describing entry behavior for manufacturing (Helpman, Melitz, and Yeaple, 2004). In particular, we observe that most firms enter via export whereas entry by greenfield investment activity is the less frequent, differently from professional services.

Figure 7: Entry type in wholesale



Note: The middle line represents the number of exporters that conduct multinational activity.
Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2014, and Statistics on International Trade Services (SITS), 2001-2015, authors' calculations.

The results in Table 5 are also in line with patterns described for manufacturing. In particular, we find that the sales premium for the exporters is the lowest across the various entry types, reflecting that exporters are relatively less productive than foreign direct investors.

Table 5: Sales and size premia in wholesale sector

	Premia		95% Conf. Interval	
		Exporters		
Sales premia	11.667	(0.254)	[11.168,	12.165]
Size premia	4.483	(0.221)	[4.049,	4.917]
		M&A		
Sales premia	11.765	(0.271)	[11.226,	12.305]
Size premia	4.949	(0.237)	[4.478,	5.420]
		Greenfield investment		
Sales premia	11.759	(0.331)	[11.109,	12.408]
Size premia	4.418	(0.288)	[3.853,	4.983]

Notes: We estimate entry type premia as follows: $Y_{\omega,t} = \beta_1 EXP_{\omega,t} + \beta_2 MA_{\omega,t} + \beta_3 GI_{\omega,t} + I_t + \epsilon_{\omega,t}$, where t is the year index, I are year dummies, and Y is the log of firm characteristic for which the premia are estimated. All estimates are significant at the 1 percent level. Estimation of sales premia: $N = 901$, $R^2 = 0.9760$. Estimation of size premia: $N = 894$, $R^2 = 0.8773$.
Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2014, and Statistics on International Trade Services (SITS), 2001-2015, authors' calculations.

C On the Intuition of Cutoff Ordering

Let Δ^E, Δ^M, and Δ^G denote firm's return to core quality associated to export, M&A, and greenfield investment in a foreign market, respectively;[56] that is,

$$\Delta^E \equiv \mathbb{E}\epsilon^{\sigma-1}\tau^{1-\sigma}\tilde{\Phi},$$
$$\Delta^M \equiv \left(\varphi^M\right)^{\sigma-1} s^{\sigma-1}\tilde{\Phi},$$
$$\Delta^G \equiv \left(\mathbb{E}\epsilon^{\sigma-1} - \alpha^G\right)\tilde{\Phi}.$$

Let φ^{jk} define firm's threshold such that with core quality φ satisfying $\varphi^{\sigma-1} = \varphi^{jk}$ firm is indifferent between accessing the foreign market with entry type j or k, where

$$j, k \in \{0, \textit{Export}, \textit{Greenfield investment}, \textit{M\&A}\} \text{ with } j \neq k.$$

We distinguish six cases depending on the relation between returns to core quality and then specify sub-cases according to the relation between fixed part of entry costs. This case distinction allows us to determine the relevant intervals of core quality corresponding to the selection into one of three activities (if any). Depending on the structure of the entry costs, some option can dominate another one in terms of profits. Firm's choice between alternatives is determined by the level of core quality. Therefore, we can describe firm's optimal choices given the level of its core quality.

Case 1. $\Delta^E > \Delta^G \geq \Delta^M$.[57]

This case corresponds to the situation in which firm's largest returns to core quality are associated to *Export*, whereas lowest returns are associated to *M&A*.

Case 1.1. $f^E > \bar{f}^G > f^M$.[58]

In this case, the activity with the highest return to core quality is also the most expensive in terms of entry costs. According to the ordering of zero cutoffs (that is, φ^{E0}, φ^{G0}, and φ^{M0}), we specify four possible sub-cases.

[56] Hereafter, we skip country index.

[57] For illustrative purpose, we provide for all sub-cases of case 1 the corresponding figure with profit lines. For the next cases, we skip figures as they are analogous to the case 1.

[58] For the simplicity of notation, in this section we denote $f^M \equiv f^M\left(\varphi^M\right)$.

Case 1.1.1. $\varphi^{M0} < \varphi^{G0} < \varphi^{E0}$.

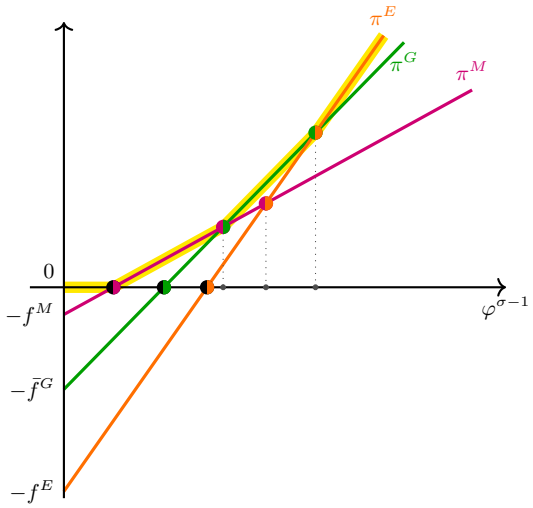
We further separate two sub-cases depending on the relation between the quality level required to switch from *M&A* to *Greenfield investment* or to *Export*.

Case 1.1.1.1. $\varphi^{EM} \geq \varphi^{GM}$.

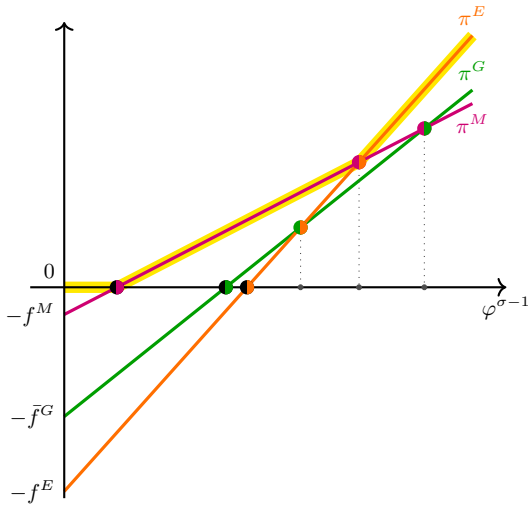
In this case, all alternatives can be optimal for some intervals of core quality. In particular, the firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{M0}$; firm chooses *M&A* if $\varphi^{M0} \leq \varphi^{\sigma-1} < \varphi^{GM}$; firm chooses *Greenfield investment* if $\varphi^{GM} \leq \varphi^{\sigma-1} < \varphi^{EG}$; firm chooses *Export* if $\varphi^{\sigma-1} \geq \varphi^{EG}$.

Case 1.1.1.2. $\varphi^{EM} < \varphi^{GM}$.

In this case, *Greenfield investment* is not optimal. Indeed, *Greenfield investment* becomes more profitable than *M&A* at a larger level of quality than that required for *Export* to become more profitable than *M&A*. Hence, firm decides to stay out if $\varphi^{\sigma-1} < \varphi^{M0}$; firm chooses *M&A* if $\varphi^{M0} \leq \varphi^{\sigma-1} < \varphi^{EM}$; firm chooses *Export* if $\varphi^{\sigma-1} \geq \varphi^{EM}$.



Case 1.1.1.1. $\varphi^{M0} < \varphi^{G0} < \varphi^{E0} \wedge \varphi^{EM} \geq \varphi^{GM}$.

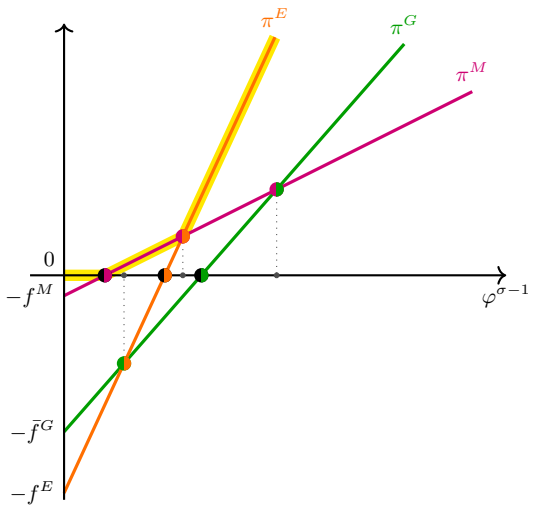


Case 1.1.1.2. $\varphi^{M0} < \varphi^{G0} < \varphi^{E0} \wedge \varphi^{EM} < \varphi^{GM}$.

Zero cutoff for *M&A* with x-coordinate φ^{M0}
Zero cutoff for *Greenfield investment* with x-coordinate φ^{G0}
Zero cutoff for *Export* with x-coordinate φ^{E0}
Maximum profits for a given level of core quality
Cutoff between *M&A* and *Greenfield investment* with x-coordinate φ^{GM}
Cutoff between *Greenfield investment* and *Export* with x-coordinate φ^{EG}
Cutoff between *M&A* and *Export* with x-coordinate φ^{EM}

Case 1.1.2. $\varphi^{M0} < \varphi^{E0} \leq \varphi^{G0}$.

In this case, *Export* provides a higher return than *Greenfield investment*, while it becomes profitable at the lower level of quality. Thus, *Greenfield investment* is not optimal. If $\varphi^{\sigma-1} < \varphi^{M0}$, then firm chooses to stay out. If $\varphi^{M0} \leq \varphi^{\sigma-1} < \varphi^{EM}$, firm chooses *M&A*. If $\varphi^{\sigma-1} \geq \varphi^{EM}$, firm chooses *Export*.

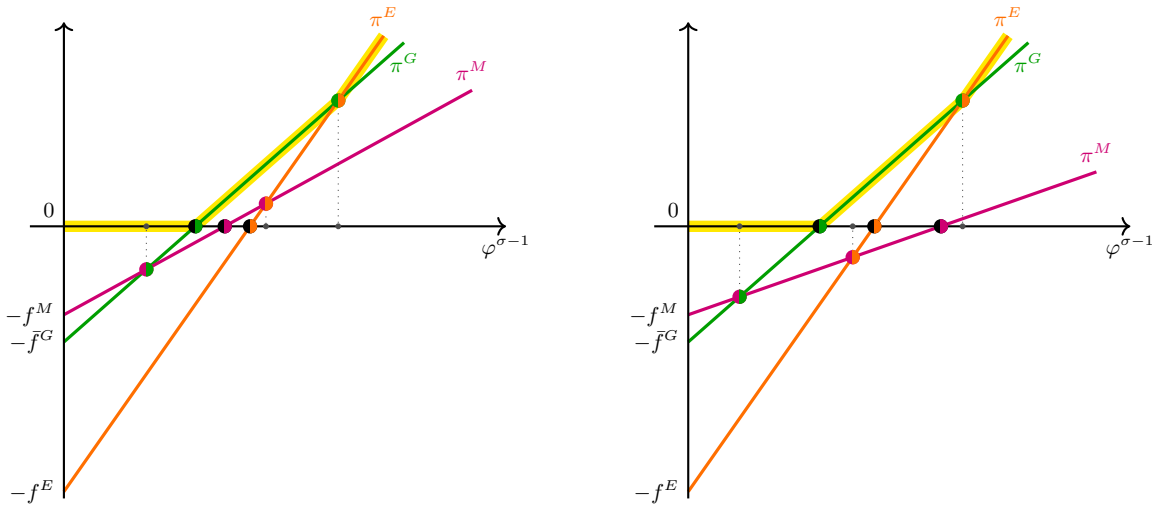


Case 1.1.2. $\varphi^{M0} < \varphi^{E0} \leq \varphi^{G0}$.

Zero cutoff for *M&A* with x-coordinate φ^{M0}
Zero cutoff for *Greenfield investment* with x-coordinate φ^{G0}
Zero cutoff for *Export* with x-coordinate φ^{E0}
Maximum profits for a given level of core quality
Cutoff between *M&A* and *Greenfield investment* with x-coordinate φ^{GM}
Cutoff between *Greenfield investment* and *Export* with x-coordinate φ^{EG}
Cutoff between *M&A* and *Export* with x-coordinate φ^{EM}

Case 1.1.3. $\varphi^{G0} \leq \varphi^{M0} \wedge \varphi^{G0} < \varphi^{E0}$.

In this case, *Greenfield investment* provides a higher return than *M&A*, while is becomes profitable at the lower level of core quality than *M&A*. Thus, no firm finds it optimal to serve foreign markets via M&A. In this case, firm stays out if it is not productive enough to conduct greenfield investment, i.e. $\varphi^{\sigma-1} < \varphi^{G0}$; firm chooses *Greenfield investment* if $\varphi^{G0} \leq \varphi^{\sigma-1} < \varphi^{EG}$; finally, firm chooses *Export* if $\varphi^{\sigma-1} \geq \varphi^{EG}$.



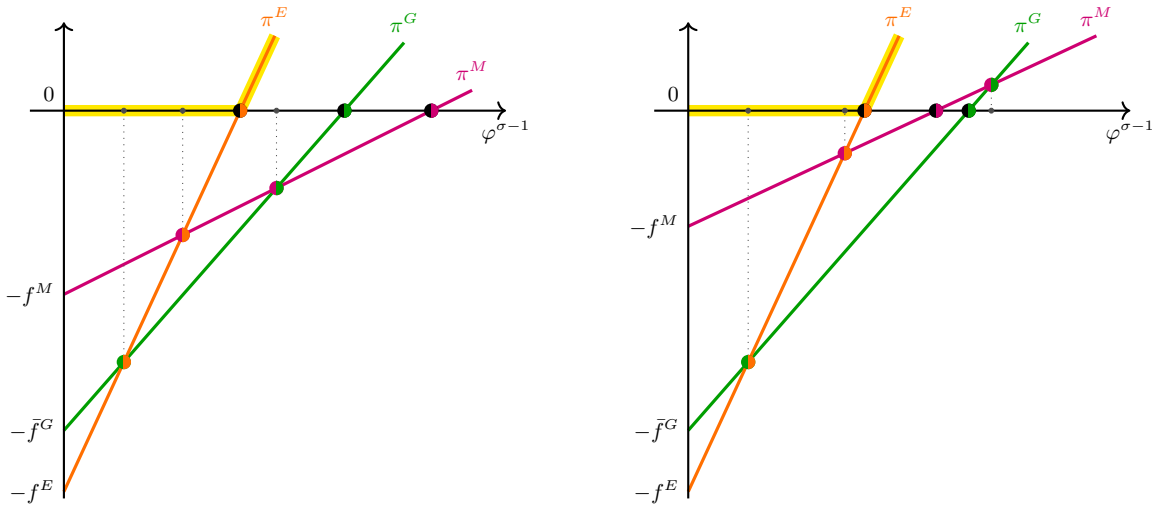
(a) $\varphi^{M0} < \varphi^{E0}$.

(b) $\varphi^{M0} \geq \varphi^{E0}$.

Case 1.1.3. $\varphi^{G0} \leq \varphi^{M0} \wedge \varphi^{G0} < \varphi^{E0}$.

Case 1.1.4. $\varphi^{E0} \leq \min\{\varphi^{M0}, \varphi^{G0}\}$.

In this case, only *Export* can be optimal since this alternative provides the highest return to core quality and is the first alternative to become profitable among the available ones. In particular, firm chooses *Export* if it is efficient enough to export, i.e. $\varphi^{\sigma-1} \geq \varphi^{E0}$, and stays out otherwise.



(a) $\varphi^{G0} < \varphi^{M0}$.

(b) $\varphi^{G0} \geq \varphi^{M0}$.

Case 1.1.4. $\varphi^{E0} \leq \min\{\varphi^{M0}, \varphi^{G0}\}$.

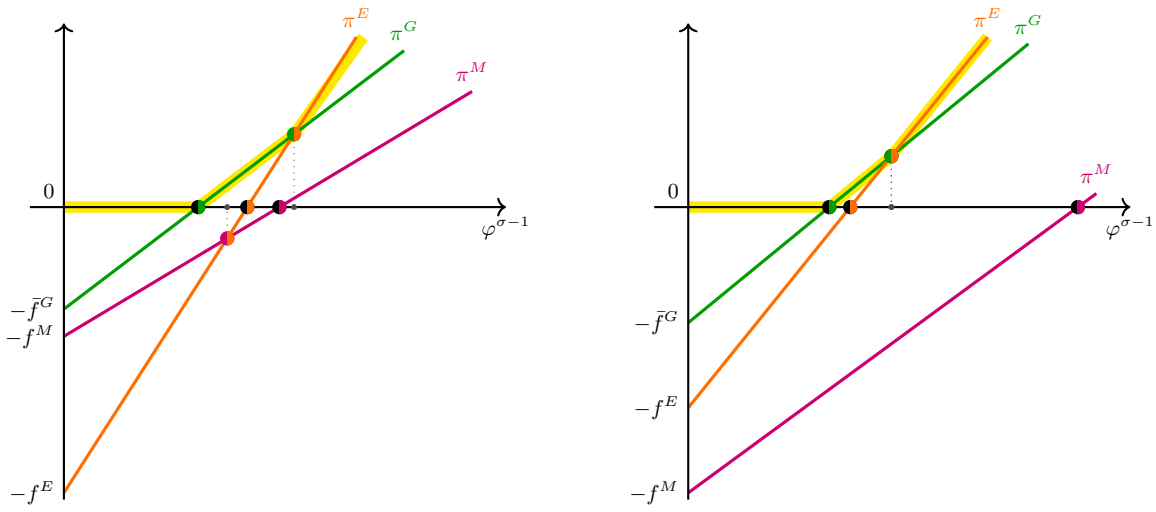
- Zero cutoff for *M&A* with x-coordinate φ^{M0}
- Zero cutoff for *Greenfield investment* with x-coordinate φ^{G0}
- Zero cutoff for *Export* with x-coordinate φ^{E0}
- Maximum profits for a given level of core quality
- Cutoff between *M&A* and *Greenfield investment* with x-coordinate φ^{GM}
- Cutoff between *Greenfield investment* and *Export* with x-coordinate φ^{EG}
- Cutoff between *M&A* and *Export* with x-coordinate φ^{EM}

Case 1.2. $f^M \geq \bar{f}^G \wedge f^E > \bar{f}^G$.

In this case, *M&A* cannot be optimal since it provides lower return than *Greenfield investment* but requires larger entry costs. We distinguish two additional sub-cases depending on the relation between zero cutoffs associated to *Greenfield investment* and *Export*.

Case 1.2.1. $\varphi^{E0} > \varphi^{G0}$.

In this case, both *Export* and *Greenfield investment* can be profitable at some levels of core quality. Firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{G0}$; it chooses *Greenfield investment* if $\varphi^{G0} \leq \varphi^{\sigma-1} < \varphi^{EG}$; finally, it selects *Export* if $\varphi^{\sigma-1} \geq \varphi^{EG}$.



(a) $f^M < f^E$.

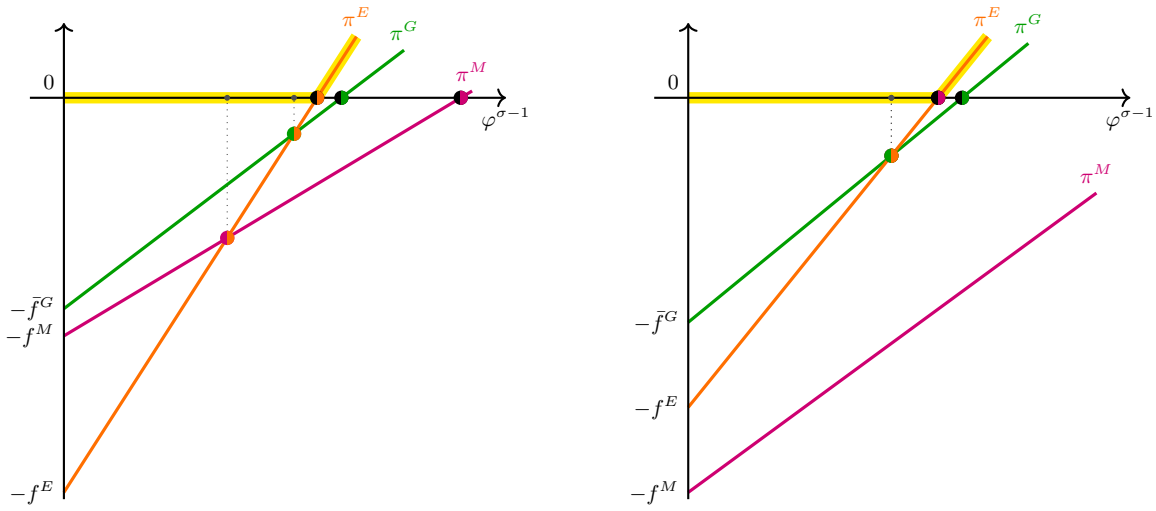
(b) $f^M \geq f^E$.

Case 1.2.1. $\varphi^{E0} > \varphi^{G0}$.

Zero cutoff for *M&A* with x-coordinate φ^{M0}
Zero cutoff for *Greenfield investment* with x-coordinate φ^{G0}
Zero cutoff for *Export* with x-coordinate φ^{E0}
Cutoff between *Greenfield investment* and *Export* with x-coordinate φ^{EG}
Cutoff between *M&A* and *Export* with x-coordinate φ^{EM}
Maximum profits for a given level of core quality

Case 1.2.2. $\varphi^{E0} \leq \varphi^{G0}$.

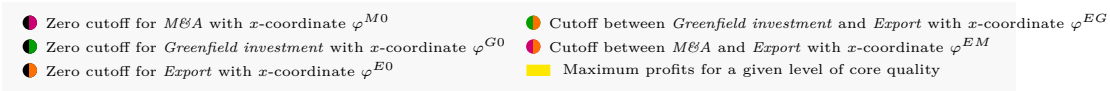
In this case, the activity yielding the largest returns, *Export*, becomes profitable at a lower level of core quality compared with *Greenfield investment*. Thus, only *Export* can be optimal. In particular, if $\varphi^{\sigma-1} \geq \varphi^{E0}$, firm chooses *Export* and stays out otherwise.



(a) $f^M < f^E$.

(b) $f^M \geq f^E$.

Case 1.2.2. $\varphi^{E0} \leq \varphi^{G0}$.



Case 1.3. $\bar{f}^G \geq f^E > f^M$.

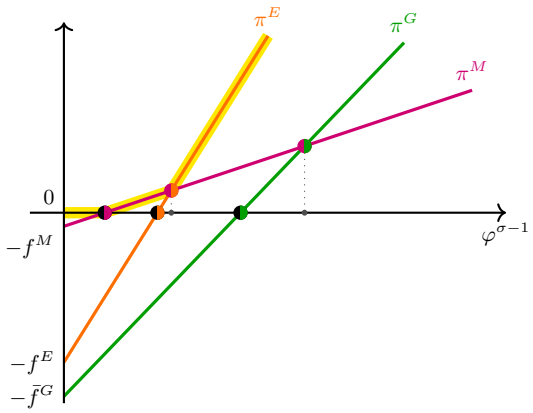
In this case, *Greenfield investment* is more costly than *Export* but has lower return. Thus, no firm finds it optimal to conduct *Greenfield investment*. We further separate two sub-cases depending on the relative positioning of the zero cutoffs for *M&A* and *Export*.

Case 1.3.1. $\varphi^{M0} < \varphi^{E0}$.

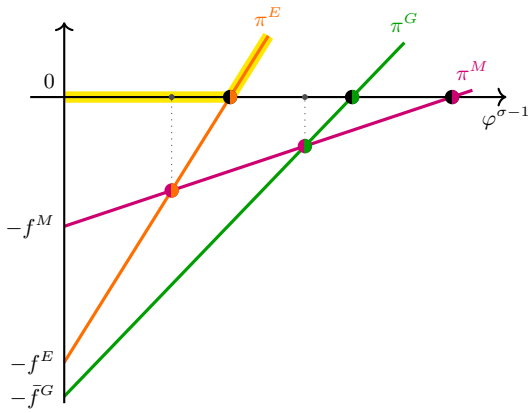
In this case, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{M0}$; it chooses *M&A* if $\varphi^{M0} \leq \varphi^{\sigma-1} < \varphi^{EM}$; it chooses *Export* if $\varphi^{\sigma-1} \geq \varphi^{EM}$.

Case 1.3.2. $\varphi^{M0} \geq \varphi^{E0}$.

In this case, only *Export* can be optimal. This occurs since *M&A* requires higher core quality than *Export* to be profitable although it gives a lower return. Thus, firm chooses *Export* if $\varphi^{\sigma-1} \geq \varphi^{E0}$ and stays out otherwise.



Case 1.3.1. $\varphi^{M0} < \varphi^{E0}$.

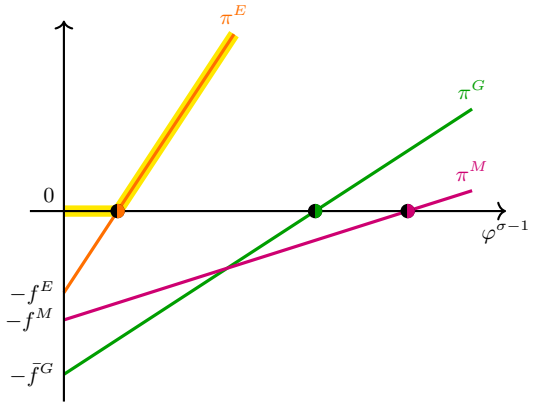


Case 1.3.2. $\varphi^{M0} \geq \varphi^{E0}$.

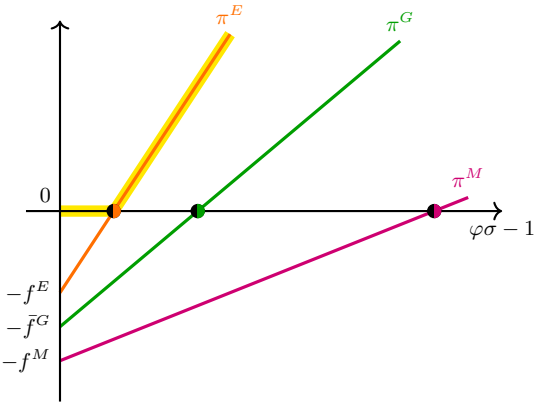
Zero cutoff for *M&A* with x-coordinate φ^{M0}
Zero cutoff for *Greenfield investment* with x-coordinate φ^{G0}
Zero cutoff for *Export* with x-coordinate φ^{E0}
Cutoff between *M&A* and *Greenfield investment* with x-coordinate φ^{GM}
Cutoff between *M&A* and *Export* with x-coordinate φ^{EM}
Maximum profits for a given level of core quality

Case 1.4. $f^E \leq \min\{f^M, \bar{f}^G\}$.

In this case, only *Export* can be optimal since this option yields the highest return to core quality and, at the same time, is the cheapest, in terms of entry costs. Thus, firm chooses *Export* if $\varphi^{\sigma-1} \geq \varphi^{E0}$ and stays out otherwise.



(a) $f^M < \bar{f}^G$.



(b) $f^M \geq \bar{f}^G$.

Case 1.4. $f_i^E \leq \min\{f_i^M, \bar{f}_i^G\}$.

Zero cutoff for *M&A* with x-coordinate φ^{M0}
Zero cutoff for *Greenfield investment* with x-coordinate φ^{G0}
Zero cutoff for *Export* with x-coordinate φ^{E0}
Maximum profits for a given level of core quality

Case 2. $\Delta^E \geq \Delta^M > \Delta^G$.

In this case, *Export* is still providing the largest return to core quality, followed by *M&A* and *Greenfield investment*. Similarly to the first case, we distinguish all relevant cases depending on the structure of the entry costs for three activities.

Case 2.1. $f^E > f^M > \bar{f}^G$.

In this case, more expensive in terms of entry costs alternative is also providing higher return to core quality, so that all activities can be potentially optimal for some levels of core quality.

Case 2.1.1. $\varphi^{G0} < \varphi^{M0} < \varphi^{E0}$.

Next two sub-cases are specified according to the position of cutoffs between *Greenfield investment* and two other choice options.

Case 2.1.1.1. $\varphi^{EG} \geq \varphi^{GM}$.

In this case, *Greenfield investment* becomes more profitable than *M&A* at the lower level of quality than *Export*. This means that medium-productive firms will find it profitable to acquire foreign firms. In particular, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{G0}$; it chooses *Greenfield investment* if $\varphi^{G0} \leq \varphi^{\sigma-1} < \varphi^{GM}$; it chooses *M&A* if $\varphi^{GM} \leq \varphi^{\sigma-1} < \varphi^{EM}$; it chooses *Export* if $\varphi^{\sigma-1} \geq \varphi^{EM}$.

Case 2.1.1.2. $\varphi^{EG} < \varphi^{GM}$.

In this case, *M&A* is never optimal. Thus, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{G0}$; firm chooses *Greenfield investment* if $\varphi^{G0} \leq \varphi^{\sigma-1} < \varphi^{EG}$; finally, firm chooses *Export* if $\varphi^{\sigma-1} > \varphi^{EG}$.

Case 2.1.2. $\varphi^{G0} < \varphi^{E0} \leq \varphi^{M0}$.

Since the quality required for *M&A* to be profitable is higher than the one for *Export*, firm will not go for *M&A*. Hence, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{G0}$; it chooses *Greenfield investment* if $\varphi^{G0} \leq \varphi^{\sigma-1} < \varphi^{EG}$; it chooses *Export* if $\varphi^{\sigma-1} \geq \varphi^{EG}$.

Case 2.1.3. $\varphi^{M0} \leq \varphi^{G0} \wedge \varphi^{M0} < \varphi^{E0}$.

In this case, *Greenfield investment* cannot be optimal, as it becomes profitable at the higher level of core quality than *M&A*, which provides higher return. Therefore, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{M0}$; firm chooses *M&A* if $\varphi^{M0} \leq \varphi^{\sigma-1} < \varphi^{EM}$; firm chooses *Export* if $\varphi^{\sigma-1} \geq \varphi^{EM}$.

Case 2.1.4. $\varphi^{E0} \leq \min\{\varphi^{G0}, \varphi^{M0}\}$.

In this case, only *Export* can be optimal. This happens since this alternative is of the highest return and becomes profitable at the lowest level of core quality. In this case, firm chooses *Export* if it is efficient enough, i.e. $\varphi^{\sigma-1} \geq \varphi^{E0}$, and stays out otherwise.

Case 2.2. $\bar{f}^G \geq f^M \wedge f^E > f^M$.

In this case, *Greenfield investment* cannot be optimal, as it is dominated by *M&A* which provides

higher return for lower price. Depending on the ordering of zero cutoffs for *Export* and *M&A* we can distinguish two sub-cases.

Case 2.2.1. $\varphi^{E0} > \varphi^{M0}$.

In this case medium-productive firms find it profitable to acquire foreign targets. In particular, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{M0}$; it chooses *M&A* if $\varphi^{M0} \leq \varphi^{\sigma-1} < \varphi^{EM}$; finally, it chooses *Export* if $\varphi^{\sigma-1} \geq \varphi^{EM}$.

Case 2.2.2. $\varphi^{E0} \leq \varphi^{M0}$.

In this case, *Export* is the only alternative that can be optimal. This is due to the fact that *Export* provides a higher return to core quality and requires lower quality to become profitable. In particular, if $\varphi^{\sigma-1} \geq \varphi^{E0}$, firm chooses *Export* and stays out otherwise.

Case 2.3. $f^M \geq f^E > \bar{f}^G$.

In this case, *M&A* is dominated by *Export* which provides higher profit at all quality levels.

Case 2.3.1. $\varphi^{E0} > \varphi^{G0}$.

In this case, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{G0}$; it chooses *Greenfield investment* if $\varphi^{G0} \leq \varphi^{\sigma-1} < \varphi^{EG}$; it chooses *Export* if $\varphi^{\sigma-1} \geq \varphi^{EG}$.

Case 2.3.2. $\varphi^{E0} \leq \varphi^{G0}$.

If *Greenfield investment* becomes profitable at the higher level of core quality than *Export*, then only *Export* can be optimal. In particular, firm chooses *Export* if $\varphi^{\sigma-1} \geq \varphi^{E0}$ and stays out otherwise.

Case 2.4. $f^E \leq \min\{\bar{f}^G, f^M\}$.

In this case, only *Export* can be optimal as the alternative with the highest return to core quality and the lowest entry costs. In particular, firm chooses *Export* if $\varphi^{\sigma-1} \geq \varphi^{E0}$ and stays out otherwise.

Case 3. $\Delta^G \geq \Delta^E > \Delta^M$.

We switch to the case when *Greenfield investment* provides the largest return to core quality; the middle-level return is provided by *Export* and the lowest return corresponds to *M&A*.

Case 3.1. $\bar{f}^G > f^E > f^M$.

First we consider the subcase, when the entry costs increase with the return to core quality that entry type provides.

Case 3.1.1. $\varphi^{M0} < \varphi^{E0} < \varphi^{G0}$.

In this case case, an activity with higher return becomes profitable at the higher level of core quality.

Case 3.1.1.1. $\varphi^{GM} \geq \varphi^{EM}$.

In this case, all activities can be optimal for some levels of core quality. In particular, firm

chooses to stay out if $\varphi^{\sigma-1} < \varphi^{M0}$; it chooses *M&A* if $\varphi^{M0} \leq \varphi^{\sigma-1} < \varphi^{EM}$; it chooses *Export* if $\varphi^{EM} \leq \varphi^{\sigma-1} < \varphi^{EG}$; it chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{EG}$.

Case 3.1.1.2. $\varphi^{GM} < \varphi^{EM}$.

In this case, *Greenfield investment* becomes more profitable than *M&A* at the lower level of quality than *Export*. Thus, *Export* cannot be optimal. Firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{M0}$; it chooses *M&A* if $\varphi^{M0} \leq \varphi^{\sigma-1} < \varphi^{GM}$; it chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{GM}$.

Case 3.1.2. $\varphi^{M0} < \varphi^{G0} \leq \varphi^{E0}$.

In this case, *Export* cannot be optimal, since it becomes profitable at the higher level of quality than *Greenfield investment*. Firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{M0}$; it chooses *M&A* if $\varphi^{M0} \leq \varphi^{\sigma-1} < \varphi^{GM}$; it chooses *Greenfield investment* otherwise.

Case 3.1.3. $\varphi^{E0} \leq \varphi^{M0} \wedge \varphi^{E0} < \varphi^{G0}$.

M&A cannot be optimal, as it requires higher level of core quality to be profitable than *Export*. Thus, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{E0}$; firm chooses *Export* if $\varphi^{E0} \leq \varphi^{\sigma-1} < \varphi^{EG}$; firm chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{EG}$.

Case 3.1.4. $\varphi^{G0} \leq \min\{\varphi^{M0}, \varphi^{E0}\}$.

Greenfield investment becomes profitable at the lowest level of core quality among three options being of the highest return. Thus, only *Greenfield investment* can be optimal in this case. In particular, firm chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{G0}$ and stays out otherwise.

Case 3.2. $f^M \geq f^E \wedge \bar{f}^G > f^E$.

In this case, *M&A* is dominated by *Export* which has higher profit at all levels of core quality.

Case 3.2.1. $\varphi^{G0} > \varphi^{E0}$.

Firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{E0}$; it chooses *Export* if $\varphi^{E0} \leq \varphi^{\sigma-1} < \varphi^{EG}$; it chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{EG}$.

Case 3.2.2. $\varphi^{G0} \leq \varphi^{E0}$.

In this case, *Export* is not optimal for firms in the middle range of quality. Therefore, only *Greenfield investment* can be optimal. In particular, firm chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{G0}$ and stays out otherwise.

Case 3.3. $\bar{f}^E \geq f^G > f^M$.

In this case, *Export* provides lower profit than *Greenfield investment* at all levels of core quality. Thus, this option cannot be optimal.

Case 3.3.1. $\varphi^{G0} > \varphi^{M0}$.

In this case, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{M0}$; firm goes for *M&A* if $\varphi^{M0} \leq \varphi^{\sigma-1} < \varphi^{GM}$; finally, it chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{GM}$.

Case 3.3.2. $\varphi^{G0} \leq \varphi^{M0}$.

In this case, only *Greenfield investment* can be optimal, as it becomes profitable at the lower level of core quality than *M&A*, but provides higher return. Therefore, firm chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{G0}$ and stays out otherwise.

Case 3.4. $\bar{f}^G \leq \min\{f^M, f^E\}$.

In this case, *Greenfield investment* dominate both *Export* and *M&A*. Thus, firm chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{G0}$ and stays out otherwise.

Case 4. $\Delta^G > \Delta^M \geq \Delta^E$.

In this case, we keep *Greenfield investment* as the activity which provides the firm with the highest return to core quality. On the contrary, the lowest returns are associated with *Export*, followed by *M&A*.

Case 4.1. $\bar{f}^G > f^M > f^E$.

Under the above assumption, none of the alternatives is *a priori* dominated by another one, as higher entry costs correspond to higher returns from a given action. Depending on the position of the zero cutoffs, we distinguish four sub-cases.

Case 4.1.1. $\varphi^{E0} < \varphi^{M0} < \varphi^{G0}$.

In this case, relevant cutoffs of quality are determined by the position of *Export* cutoff with respect to the other two entry types.

Case 4.1.1.1. $\varphi^{EG} \geq \varphi^{EM}$.

If *M&A* becomes more profitable than *Export* at a lower level of core quality than *Greenfield investment*, firms in the middle range of quality find it optimal to acquire foreign targets. In particular, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{E0}$; it chooses *Export* if $\varphi^{E0} \leq \varphi^{\sigma-1} < \varphi^{EM}$; it chooses *M&A* if $\varphi^{EM} \leq \varphi^{\sigma-1} < \varphi^{GM}$; it chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{GM}$.

Case 4.1.1.2. $\varphi^{EG} < \varphi^{EM}$.

If *M&A* becomes more profitable than *Export* at a higher level of core quality than *Greenfield investment*, *M&A* cannot be optimal. Thus, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{E0}$; it chooses *Export* if $\varphi^{E0} \leq \varphi^{\sigma-1} < \varphi^{EG}$; it chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{EG}$.

Case 4.1.2. $\varphi^{E0} < \varphi^{G0} \leq \varphi^{M0}$.

M&A cannot be optimal as this activity provides lower returns than *Greenfield investment* but becomes profitable at a higher level of core quality. In this case, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{E0}$; it chooses *Export* if $\varphi^{E0} \leq \varphi^{\sigma-1} < \varphi^{EG}$; finally, firm chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{G0}$.

Case 4.1.3. $\varphi^{M0} \leq \varphi^{E0} \wedge \varphi^{M0} < \varphi^{G0}$.

In this case, *Export* cannot be optimal. This is due to the fact that *Export* provides lower returns than *M&A* but requires a larger level of core quality to become profitable. Therefore,

firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{M0}$; firm chooses *M&A* if $\varphi^{M0} \leq \varphi^{\sigma-1} < \varphi^{GM}$; finally, firm goes for *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{GM}$.

Case 4.1.4. $\varphi^{G0} \leq \min\{\varphi^{E0}, \varphi^{M0}\}$.

Only *Greenfield investment* can be optimal since it provides higher returns to core quality than other alternatives and, at the same time, becomes profitable at a lower level of quality. In particular, firm chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{G0}$ and stays out otherwise.

Case 4.2. $f^E \geq f^M \wedge \bar{f}^G > f^M$.

In this case, *Export* cannot be optimal as it provides lower profits than *M&A* for any level of core quality.

Case 4.2.1. $\varphi^{G0} > \varphi^{M0}$.

In this case, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{M0}$; it chooses *M&A* if $\varphi^{M0} \leq \varphi^{\sigma-1} < \varphi^{GM}$; it chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{GM}$.

Case 4.2.2. $\varphi^{G0} \leq \varphi^{M0}$.

In this scenario, only *Greenfield investment* can be optimal. Therefore, firm chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{G0}$ and stays out otherwise.

Case 4.3. $f^M \geq \bar{f}^G > f^E$.

In this case, *M&A* cannot be optimal as it is dominated by *Greenfield investment*. Indeed, *Greenfield investment* yields higher returns to core quality than *M&A* does at a lower fixed cost.

Case 4.3.1. $\varphi^{G0} > \varphi^{E0}$.

In this case, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{E0}$; it chooses *Export* if $\varphi^{E0} \leq \varphi^{\sigma-1} < \varphi^{EG}$; it chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{EG}$.

Case 4.3.2. $\varphi^{G0} \leq \varphi^{E0}$.

In this case, only *Greenfield investment* can be optimal. This happens because this action provides higher returns than *Export* and becomes profitable at the lower level of core quality. In particular, firm chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{G0}$ and stays out otherwise.

Case 4.4. $\bar{f}^G \leq \min\{f^E, f^M\}$.

In this case, *Greenfield investment* dominates *Export* and *M&A*. In particular, firm chooses *Greenfield investment* if $\varphi^{\sigma-1} \geq \varphi^{G0}$ and stays out otherwise.

Case 5. $\Delta^M > \Delta^E > \Delta^G$.

In this case, we assume that *M&A* provides the largest return to core quality; middle-range return is provided by *Export*; finally, the lowest return to core quality corresponds to *Greenfield investment*.

Case 5.1. $f^M > f^E > \bar{f}^G$.

For the given structure of entry costs, all three alternatives can be optimal for some level of core quality.

Case 5.1.1. $\varphi^{G0} < \varphi^{E0} < \varphi^{M0}$.

Firm's choice as a function of core quality is driven by the ordering of the cutoffs for switching between from *Greenfield investment* to either *M&A* or *Export*.

Case 5.1.1.1. $\varphi^{GM} \geq \varphi^{EG}$.

In this case, all entry types can be optimal for some level of core quality. In particular, the firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{G0}$; it chooses *Greenfield investment* if $\varphi^{G0} \leq \varphi^{\sigma-1} < \varphi^{EG}$; firm selects *Export* if $\varphi^{EG} \leq \varphi^{\sigma-1} < \varphi^{EM}$; finally, firm chooses *M&A* if $\varphi^{\sigma-1} \geq \varphi^{EM}$.

Case 5.1.1.2. $\varphi^{GM} < \varphi^{EG}$.

In this case, *M&A* becomes more profitable than *Greenfield investment* at a lower level of core quality than *Export*. Since *M&A* provides the firm with a higher return to core quality than *Export*, the later cannot be optimal. Hence, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{G0}$; it chooses *Greenfield investment* if $\varphi^{G0} \leq \varphi^{\sigma-1} < \varphi^{GM}$; finally, firm goes for *M&A* if $\varphi^{\sigma-1} \geq \varphi^{GM}$.

Case 5.1.2. $\varphi^{G0} < \varphi^{M0} \leq \varphi^{E0}$.

In this case, *Export* cannot be optimal since it becomes profitable at a higher level of quality than *M&A* which yields higher returns to core quality. Therefore, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{G0}$; it chooses *Greenfield investment* if $\varphi^{G0} \leq \varphi^{\sigma-1} < \varphi^{GM}$; finally, it chooses *M&A* if $\varphi^{\sigma-1} \geq \varphi^{GM}$.

Case 5.1.3. $\varphi^{E0} \leq \varphi^{G0} \wedge \varphi^{E0} < \varphi^{M0}$.

In this case, *Greenfield investment* cannot be optimal. This is due to the fact that *Greenfield investment* provides the firm with a lower return than *Export*, but becomes profitable at a higher level of core quality. Therefore, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{E0}$; firm selects *Export* if $\varphi^{E0} \leq \varphi^{\sigma-1} < \varphi^{EM}$; firm chooses *M&A* if $\varphi^{\sigma-1} \geq \varphi^{EM}$.

Case 5.1.4. $\varphi^{M0} \leq \min\{\varphi^{G0}, \varphi^{E0}\}$.

In this case, *M&A* provides the firm with the highest return and becomes profitable at a lower level of core quality than the other two alternatives do. Therefore, only *M&A* can be optimal. In particular, firm chooses *M&A* if $\varphi^{\sigma-1} \geq \varphi^{M0}$ and stays out otherwise.

Case 5.2. $\bar{f}^G \geq f^E \wedge f^M > f^E$.

In this case, *Greenfield investment* cannot be optimal as this option is dominated by *Export*.

Case 5.2.1. $\varphi^{M0} > \varphi^{E0}$.

In this case, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{M0}$; it chooses *Export* if $\varphi^{M0} \leq \varphi^{\sigma-1} < \varphi^{EM}$; it chooses *M&A* if $\varphi^{\sigma-1} \geq \varphi^{EM}$.

Case 5.2.2. $\varphi^{M0} \leq \varphi^{E0}$.

Since *M&A* gives a higher return to core quality than *Export* and, at the same time, becomes

profitable at a lower level of quality, *Export* cannot be optimal. In particular, firm chooses *M&A* if $\varphi^{\sigma-1} \geq \varphi^{M0}$ and stays out otherwise.

Case 5.3. $f^E \geq f^M > \bar{f}^G$.

In this case, *Export* cannot be optimal as it provides the firm with a lower profit than *M&A* for any level of core quality.

Case 5.3.1. $\varphi^{M0} > \varphi^{G0}$.

In this case, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{G0}$; firm picks *Greenfield investment* if $\varphi^{G0} \leq \varphi^{\sigma-1} < \varphi^{GM}$; it chooses *M&A* if $\varphi^{\sigma-1} \geq \varphi^{GM}$.

Case 5.3.2. $\varphi^{M0} \leq \varphi^{G0}$.

In this case, only *M&A* can be optimal since this option yields the largest return and becomes profitable at a lowest level of core quality than *Greenfield investment* and *Export* do. In particular, firm chooses *M&A* if $\varphi^{\sigma-1} \geq \varphi^{M0}$ and stays out otherwise.

Case 5.4. $f^M \leq \min\{\bar{f}^G, f^E\}$.

In this case, *M&A* provides the firm with higher profit than other alternatives for any level of quality. Therefore, firm chooses *M&A* if $\varphi^{\sigma-1} \geq \varphi^{M0}$ and stays out otherwise.

Case 6. $\Delta^M \geq \Delta^G \geq \Delta^E$.

In the last case, we assume that *M&A* gives the largest return to core quality, followed by *Greenfield investment* and *Export*.

Case 6.1. $f^M > \bar{f}^G > f^E$.

In this scenario, all three alternatives can be optimal as higher returns to core quality is associated to higher entry costs.

Case 6.1.1. $\varphi^{E0} < \varphi^{G0} < \varphi^{M0}$.

In this scenario, *Export* becomes profitable before *Greenfield investment* and *M&A*. Hence, the possibility of engaging in each of the alternatives crucially depends on the relative position of the cutoffs for switching from *Export* to either *Greenfield investment* or *M&A*.

Case 6.1.1.1. $\varphi^{EM} \geq \varphi^{EG}$.

In this case, middle-range quality firms find it profitable to conduct greenfield investment. Thus, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{E0}$; it chooses *Export* if $\varphi^{E0} \leq \varphi^{\sigma-1} < \varphi^{EG}$; it selects *Greenfield investment* if $\varphi^{EG} \leq \varphi^{\sigma-1} < \varphi^{GM}$, finally, firm chooses *M&A* if $\varphi^{\sigma-1} \geq \varphi^{GM}$.

Case 6.1.1.2. $\varphi^{EM} < \varphi^{EG}$.

Since the level of quality that makes *M&A* more productive than *Export* is lower than the level of quality required for *Greenfield investment* to be more productive than *Export*,

Greenfield investment is not optimal. Therefore, firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{E0}$; it chooses *Export* if $\varphi^{E0} \leq \varphi^{\sigma-1} < \varphi^{EM}$; finally, it goes for *M&A* if $\varphi^{\sigma-1} \geq \varphi^{EM}$.

Case 6.1.2. $\varphi^{E0} < \varphi^{M0} \leq \varphi^{G0}$.

In this case, *Greenfield investment* cannot be optimal as this activity becomes profitable at a larger level of quality than the one at which *M&A* does. In particular, firm decides to stay out if $\varphi^{\sigma-1} < \varphi^{E0}$; firm chooses *Export* if $\varphi^{G0} \leq \varphi^{\sigma-1} < \varphi^{EM}$; firm goes for *M&A* if $\varphi^{\sigma-1} \geq \varphi^{EM}$.

Case 6.1.3. $\varphi^{G0} \leq \varphi^{E0} \wedge \varphi^{G0} < \varphi^{M0}$.

In this scenario, *Export* cannot be optimal due to the fact that it provides lower returns than *Greenfield investment* but requires a higher level of quality to be profitable. Therefore, firm decides to stay out if $\varphi^{\sigma-1} < \varphi^{G0}$; it chooses *Greenfield investment* if $\varphi^{G0} \leq \varphi^{\sigma-1} < \varphi^{GM}$; finally, firm chooses *M&A* if $\varphi^{\sigma-1} \geq \varphi^{GM}$.

Case 6.1.4. $\varphi^{M0} \leq \min\{\varphi^{E0}, \varphi^{G0}\}$.

In this case, only *M&A* can be optimal since this is the alternative yielding the highest return and becomes profitable at a lower level of quality than the other two options. Thus, firm chooses *M&A* if $\varphi^{\sigma-1} \geq \varphi^{M0}$ and stays out otherwise.

Case 6.2. $f^E \geq \bar{f}^G \wedge f^M > \bar{f}^G$.

In this case, *Export* gives lower profits than *Greenfield investment* for any level of core quality and, thus, it cannot be optimal.

Case 6.2.1. $\varphi^{M0} > \varphi^{G0}$.

Firm chooses to stay out if $\varphi^{\sigma-1} < \varphi^{M0}$; it chooses *Greenfield investment* if $\varphi^{M0} \leq \varphi^{\sigma-1} < \varphi^{GM}$; it chooses *M&A* if $\varphi^{\sigma-1} \geq \varphi^{GM}$.

Case 6.2.2. $\varphi^{M0} \leq \varphi^{G0}$.

In this case, only *M&A* can be optimal as it becomes profitable at a lower level of core quality than *Greenfield investment* but also gives higher returns. Hence, firm chooses *M&A* if $\varphi^{\sigma-1} \geq \varphi^{M0}$ and stays out otherwise.

Case 6.3. $\bar{f}^G \geq f^M > f^E$.

In this case, *M&A* dominates *Greenfield investment*.

Case 6.3.1. $\varphi^{M0} > \varphi^{E0}$.

In this case, firm decides to stay out if $\varphi^{\sigma-1} < \varphi^{E0}$; it chooses *Export* if $\varphi^{E0} \leq \varphi^{\sigma-1} < \varphi^{EM}$; finally, it goes for *M&A* if $\varphi^{\sigma-1} \geq \varphi^{EM}$.

Case 6.3.2. $\varphi^{M0} \leq \varphi^{E0}$.

In this case, only *M&A* can be optimal. This happens as *M&A* provides the firm with a higher return to core quality than *Export* does, and it requires lower quality to become profitable. Hence, firm chooses *M&A* if $\varphi^{\sigma-1} \geq \varphi^{M0}$ and stays out otherwise.

Case 6.4. $f^M \leq \min\{f^E, \bar{f}^G\}$.

In this case, only *M&A* can be optimal as it dominates profits associated to the other two alternatives. Therefore, firm chooses *M&A* if $\varphi^{\sigma-1} \geq \varphi^{M0}$ and stays out otherwise.

D Sensitivity Analysis for Two Specifications for M&A Parameters

In order to identify the parameters of the model, we need to put restrictions on those parameters affecting M&A profitability. We specify two possible restrictions: (i) the magnitude of synergies is determined by the relative productivity of a firm with respect to the least productive firm in the market, (ii) the medians of the institutional entry costs for the two types of FDI are the same. For each specification, we simulate 10 datasets with 10,000 firms. Each dataset keeps the same parameters, except those related to M&A, across the two specifications. We take the elasticity of substitution $\sigma = 6$ and set demand shifters to $\Phi_{GER} = 100$, $\Phi_{EU} = 90$, $\Phi_{US} = 100$, $\Phi_{RoW} = 80$. Then, we estimate the model using each simulated dataset. The averages of estimated parameters are reported in Table 6 for the first specification and in Table 7 for the second one.

Table 6: Specification of M&A with $s = 1/a$

Common parameters	True parameters			$s = 1/a$		
Scale parameter of core quality distribution, a	0.4			0.400		
Shape parameter of core quality distribution, γ	8.0			7.899		
S.d. log perceived quality shock, σ_ϵ	0.05			0.051		
S.d. log export-entry costs, σ_{fE}	0.1			0.082		
S.d. log greenfield investment entry costs, σ_{fG}	0.1			0.049		
Country-specific parameters	EU	US	RoW	EU	US	RoW
Median entry cost with export, $\exp(f^E)$	0.091	0.067	0.050	0.087	0.066	0.051
Iceberg trade costs, τ	1.020	1.050	1.070	1.027	1.052	1.072
Median log perceived quality shocks, $\exp(\mu_\epsilon)$	0.970	0.905	0.932	0.974	0.907	0.934
Median institutional entry costs with greenfield FDI, $\exp(\bar{f}^G)$	0.082	0.050	0.030	0.080	0.050	0.030
Quality price for greenfield FDI, α^G	0.100	0.200	0.300	0.126	0.201	0.311
Median institutional entry costs of M&A, $\exp(\bar{f}^M)$	0.100	0.050	0.010	0.098	0.050	0.011
Scale parameter of M&A quality distribution, a^M	0.350	0.300	0.310	0.349	0.299	0.311

Table 7: Specification of M&A with $\bar{f}^M = \exp\left(\bar{f}^G\right)$

Common parameters	True parameters			$\bar{f}^M = \exp\left(\bar{f}^G\right)$		
Scale parameter of core quality distribution, a	0.4			0.401		
Shape parameter of core quality distribution, γ	8.0			8.183		
S.d. log perceived quality shock, σ_ϵ	0.05			0.051		
S.d. log export-entry costs, σ_{fE}	0.1			0.072		
S.d. log greenfield investment entry costs, σ_{fG}	0.1			0.054		
Country-specific parameters	EU	US	RoW	EU	US	RoW
Median entry cost with export, $\exp(f^E)$	0.091	0.067	0.050	0.086	0.066	0.050
Iceberg trade costs, τ	1.020	1.050	1.070	1.046	1.057	1.071
Median log perceived quality shocks, $\exp(\mu_\epsilon)$	0.970	0.905	0.932	0.979	0.908	0.935
Median institutional entry costs with greenfield FDI, $\exp\left(\bar{f}^G\right)$	0.082	0.050	0.030	0.079	0.051	0.031
Quality price for greenfield FDI, α^G	0.100	0.200	0.300	0.164	0.201	0.306
M&A synergies, s	2.300	2.500	3.700	2.292	2.509	3.747
Scale parameter of M&A quality distribution, a^M	0.400	0.300	0.200	0.403	0.300	0.203

E Technical Notes on the Constrained Maximum Likelihood Estimation

In the estimation, we simulate and numerically integrate the likelihood function. We discuss in detail the integration procedure for each dimension of heterogeneity.

Core Quality φ. The core quality φ is drawn independently across firms from a Pareto distribution. We simulate a grid of 50 points in order to integrate the likelihood function with respect to φ. First, we generate 50 random points that come from the different quartiles of the Pareto distribution.

If firm does not acquire a foreign firm in any market, we follow the procedure applied in Tintelnot (2017). In particular, we construct 10 intervals using the following set of points $[0, 0.2, 0.4, 0.6, 0.8, 0.9, 0.95, 0.98, 0.99, 0.999, 1]$ and draw 5 points assuming they constitute the support of a uniformly distributed random variable. This allows us to obtain the corresponding nodes of a Pareto cumulative distribution function. Each node has a weight proportional to the length of the interval. For example, a node from the interval $[0, 0.2]$ enters the estimation with a weight 0.04. Since the underlying distribution of the core quality is Pareto, we attribute more weight to the nodes in the first percentiles of the distribution.

If firm acquires a foreign firm abroad, this implies restrictions on the possible realizations of φ. Recall that in order to estimate the constrained maximum likelihood, we use (i) a transformation of the density of M&A foreign sales into the density of the M&A quality draws, (ii) the restrictions implied by realized M&A sales in order to rewrite the whole problem in terms of φ. In particular, the density of M&A draws reads as $m(\varphi_i/(s\varphi_M)|\varphi; a_i^M, \gamma)$. Since M&A quality draws come from a Pareto distribution, this implies a technical restriction, which makes the likelihood equal to zero when integrating in the regions $\varphi > \varphi_i/(s_i a_i^M)$. In this case, we account for the presence of the technical restrictions of φ realizations that can result in non-zero likelihood and construct the grid for nodes of φ distribution accordingly. In order to do so, we first take the

technical upper bound implied by M&A choices for each firm. If M&A is selected as an entry type for several foreign markets, we take the minimum of upper bounds, that is $\bar{\varphi}_{\omega}^{tech} = \min\{\varphi_i/(s_i a_i^M) \mid e_{\omega,i} = M\&A\}$. Then, we compute the value of the Pareto cumulative distribution function for the obtained upper bound and check in which of the previously discussed 10 intervals the value falls. We set the upper bound of this interval to the cdf $\bar{\varphi}_{\omega}^{tech}$ and take all lower quartile intervals as given. To select the number of points to sample from each interval, we weights the *importance* of the interval as a length of the interval relative to its initial length. For example, if $\bar{\varphi}_{\omega}^{tech}$ felt into the second interval, $[0.2, 0.4]$, we will assign weight $(\bar{\varphi}_{\omega}^{tech} - 0.2)/(0.4 - 0.2)$ and weight 1 to the first interval, $[0, 0.2]$. Here we draw nodes using the quasi-random Hatlon number generator to grant more representation of the integration region and to avoid any random component in the realization of the likelihood function. Similarly to the benchmark case without M&A choice, the weights are taken proportionately to the length of the interval. Therefore, for each firm conducting M&A in any of the regions we obtain a firm-specific grid for the numerical integration needed to compute the likelihood function. It is important to note that without this correction we would underestimate likelihood for firms engaged in M&A, as we would sample integration points for φ from the interval where the likelihood is equal to zero.

Export Entry Costs f^E and Institutional Entry Costs for Greenfield Investment $\bar{f}^G$. Entry costs are drawn from a destination-specific log-normal distribution. We simulate 1,000 draws for each entry costs using the quasi-random Hatlon number generator. Recall that we divide the entry choice into two stages. In the first stage, we compute the probability of selecting the observed entry types over entering in all foreign markets with M&A. In the second stage, we condition on the observed choice by using an indicator function of choosing the observed entry type in each region over *No entry*, *Greenfield investment*, and *Export*. Following Train (2009), we approximate the indicator choice function with a smooth, strictly positive function. This is done in order to avoid jumps in the likelihood value across different simulations and make the likelihood function differentiable.

We normalize all profits with respect to the most profitable alternative and use the logit transformation function with a scale factor λ, that is

$$\mathbb{E}\tilde{\Pi}_i^{e_i} = \mathbb{E}\Pi_i^{e_i} - \max\left\{\mathbb{E}\Pi_i^{e_i'}\right\}_{e_i' \in \{0,E,G\}} \text{ and } S^{e_i} = \frac{\exp\left(\mathbb{E}\tilde{\Pi}_i^{e_i}/\lambda\right)}{\sum \exp\left(\mathbb{E}\tilde{\Pi}_i^{e_i}/\lambda\right)}, \tag{33}$$

where S^{e_i} approximates the identity function for choice e_i. We note that the limit of the approximated identity function as λ goes to zero is the identity function. Normalization allows us to make λ smaller and therefore increase the precision of the approximation.

To make the estimation procedure consistent for M&A, we use an approach similar to that implemented for the other entry types by adding a noise to $\bar{f}^M$, such that $\tilde{\bar{f}}_i^M = \bar{f}_i^M + \epsilon_i^M$, where ϵ_i^M is drawn from $\mathcal{N}(0, 1\text{E–}6)$.

Perceived quality shocks $\boldsymbol{\epsilon}$. The perceived quality shocks follow a destination-specific log-normal distribution. We use the closed form of the log-normal expected value.

Quality of M&A Targets $\boldsymbol{\varphi^M}$. The quality of M&A targets is drawn independently across markets and firms from a destination-specific Pareto distribution. The integration with respect to M&A quality draws is done at the first stage of the entry choice, when a firm decides whether to enter a market via M&A or via any other entry type. We derive a closed form for the probability of this choice. Here we eliminate the simplification assumed in the footnote 46 that *Greenfield investment* is preferred to *M&A* in the first stage if *M&A* is dominated by *No entry* (when firm has low core quality and it not able to generate positive synergies). This simplification was valid under the fact that *Greenfield investment* is never selected in the second stage being dominated by *No Entry*. However, this is not necessarily true with an introduction of the approximation of the identity function for the second stage entry choice, which can be larger than zero even if *Greenfield investment* yields lower returns than *No Entry*. Accordingly, we take the probability of the first stage as given and revert the cutoff condition, meaning that we compute the probability that the M&A quality draw is large enough to make costs of acquiring a foreign firm large enough for *M&A* to be less profitable that non-profitable *Greenfield investment*.

The constrained maximum likelihood function estimation follows the procedure described by Su and Judd (2012). First, for a given guess of parameters, we invert the sales function in order to obtain the level of the perceived quality which rationalizes the observed in the data foreign sales. Second, we compute the likelihood function and iterate till it is maximized. According to Su and Judd (2012), the proposed approach is asymptotically equivalent to a nested fixed-point approach in terms of results. Similarly to Tintelnot (2017), who implements the proposed algorithm in his estimation, we face the problem that the estimates are bias as the model is estimated on the finite sample of firms. In Appendix D we show that the estimates obtained with a proposed algorithm are close to the true parameters of the data generation process.

We maximize the likelihood with the simulated annealing together with the hybrid global maximizing algorithm `patternsearch`. Same algorithms are used in the calibration of the general equilibrium.

F Cutoffs for Selecting M&A

To select *M&A* over *No entry* the core quality φ of the firm ω should satisfy the following inequality

$$\left(\varphi_i^{0M}\right)^{\sigma-1} \geq \frac{r_{\omega,i}}{s_i^{\sigma-1}\left[r_{\omega,i} - \bar{f}_i^M\right]}. \tag{34}$$

However, if the sales realized via M&A, $r_{\omega,i}$, do not exceed the level of the institutional entry costs for M&A $\bar{f}_i^M$ in country i, firm will not be involved in M&A independently on its level of core quality.

To select *M&A* over *Export* the core quality φ of the firm ω should be in the interval

$$\left(\varphi_i^{EM}\right)^{\sigma-1} \in \left[\frac{f_i^E - \bar{f}_i^M + r_{\omega,i} - \sqrt{D_i^E}}{2\Delta_i^E}, \frac{f_i^E - \bar{f}_i^M + r_{\omega,i} + \sqrt{D_i^E}}{2\Delta_i^E}\right], \tag{35}$$

where $D_i^E = \left[f_i^E - \bar{f}_i^M + r_{\omega,i}\right]^2 - 4r_{\omega,i}\Delta_i^E s_i^{1-\sigma}$. If $D_i^E < 0$, then firm will not be involved in M&A independently on its level of core quality.

To select *M&A* over *Greenfield investment* the core quality φ of the firm ω should be in the interval

$$\left(\varphi_i^{GM}\right)^{\sigma-1} \in \left[\frac{f_i^G - \bar{f}_i^M + r_{\omega,i} - \sqrt{D_i^G}}{2\tilde{\Delta}_i^G}, \frac{f_i^G - \bar{f}_i^M + r_{\omega,i} + \sqrt{D_i^G}}{2\tilde{\Delta}_i^G}\right], \tag{36}$$

where $D_i^G = \left[f_i^G - \bar{f}_i^M + r_{\omega,i}\right]^2 - 4r_{\omega,i}\tilde{\Delta}_i^G s_i^{1-\sigma}$. If $D_i^G < 0$, then firm will not be involved in M&A independently on its level of core quality.