OESTERREICHISCHE NATIONALBANK

EUROSYSTEM

WORKSHOPS

Proceedings of OeNB Workshops

International Trade & Domestic Growth: Determinants, Linkages and Challenges

September 27, 2007

Stability and Security.

No. 14

Endogenous Export Modes

Trade Intermediation versus Wholesale FDI in General Equilibrium

Gabriel J. Felbermayr

Benjamin Jung[1]

Eberhard Karls University Tübingen

Empirical evidence and the business literature suggest that exporting requires either a foreign partner or an own foreign sales representation. Standard trade models abstract from this fact. We propose a business-to-business matching model in which heterogeneous producers may seek a foreign general importer. Alternatively, producers may establish a foreign affiliate. Exporters select into either of those modes depending on their productivity, brand reputation, and the tradability of their goods. Market access costs and the size of the non-tradables sector are endogenously determined. The additional trading friction sheds light on the "missing trade puzzle" discussed in the empirical literature.

Keywords: Heterogeneous firms, international trade, export modes, search externalities, business-to-business matching, double marginalization, missing-trade-puzzle

JEL-Codes: F12, F15

[1] We are grateful to Julien Prat, Wilhelm Kohler, Horst Raff, Jörn Kleinert, and seminar participants at the ETSG Meeting 2006 in Vienna, at a workshop at Tübingen university, and at the OeNB Conference "International Trade & Domestic Growth: Determinants, Linkages and Challenges" for comments and discussion. All remaining errors are ours. E-mail: gabriel.felbermayr@uni-tuebingen.de; benjamin.jung@uni-tuebingen.de. Address: Economics Department, Eberhard Karls University Tübingen, Nauklerstrasse 47, 72074 Tübingen, Germany.

1. Introduction

Firms that are about to enter a foreign export market may do so in various ways. They can either search for a local foreign partner who acts as a trade intermediary or a "general importer" (GI). Or they can establish an own sales representation. The academic business literature pays a lot of attention to this strategic choice; however, formal economic analysis within general equilibrium models is scarce.

A series of articles in the *Journal of International Business Studies* has highlighted the overall importance of trade intermediation, and its relative prevalence across sectors (see, e.g., Peng and Ilinitch, 1998, Peng and York, 2001, and Trabold, 2002). There is also evidence on the huge importance of trade intermediation in history (Greif, 1993) and for small specialized economies such as Hong-Kong or Singapore (Feenstra and Hanson, 2004; Feenstra, Hanson, and Lin, 2004). On the other hand, Kleinert and Toubal (2005, 2006) document the empirical importance of wholesale affiliates as a specific form of foreign direct investment. Fryges (2007) reports that sizeable shares of firms select into different export modes. Recently, starting with Rauch (1999), there is a growing literature on the role of formal and informal networks for the determination of bilateral trade volumes. Empirical evidence presented by Rauch and Trindade (2002) and Combes et al. (2005) lends support to the idea that the international matching of buyers and sellers involves important frictions.[2]

Despite the strong empirical evidence, trade intermediation and wholesale affiliates do not play any role in canonical trade models. The older literature ignores trade costs altogether; the new trade models pioneered by Krugman (1979) have taken variable trade costs serious. Only very recently, Melitz (2003) models fixed costs of foreign market access ("beachhead costs"; see Baldwin, 1988), which can be interpreted as foreign direct investment in wholesale affiliates. However, his model does not allow for trade intermediation as an alternative mode of exporting.[3]

In this paper we model the choice between the indirect (intermediated) and the direct (through own sales affiliate) export modes. In the first mode, producers save

[2] Egan and Mody (1993), Hakansson (1982), and Turnbull and Cunningham (1981) provide descriptive studies on bilateral buyer-seller links in international trade. They report suggestive evidence on highly collaborative, long-lasting trade relationships between producers and intermediators in the manufacturing sector. Schröder et al. (2005) offer a partial equilibrium model of trade intermediation.

[3] There are a number of papers in the industrial organization tradition that study the choice of export modes in partial equilibrium (e.g., Raff and Kim, 2005). However, these models do not allow drawing conclusions on aggregate variables. Nor do they easily lend to empirical verification. Krautheim (2007) discusses wholesale FDI in a version of the Chaney (2007) model. He does not, however, address trade intermediation.

on fixed market access costs but loose discretion over pricing in the foreign market to their partner. Moreover, searching for a partner is costly and takes time. In the second mode, producers have to set up a foreign affiliate. The advantage of that mode is that they retain control over the consumer price of their product. We model the search-and-matching process between business firms (*business-to-business (B2B) matching*) using a matching function approach familiar from the labor market literature (Pissaride, 2000). This approach has been introduced into international economics by Grossman and Helpman (2002), who focus on vertical supply chains. In that setup, search costs are a function of the tightness of the market, which, in turn, depends on the endogenous decisions of both, producers and general importers, to search for a partner.

We embed the export mode choice in a general equilibrium trade model with heterogeneous firms à la Melitz (2003). We offer a slight generalization of Melitz, by allowing firms to differ in terms of the tradability of their goods, their strength of brand name, and their productivity. This framework allows to reproduce important stylized facts on the importance of trade intermediation relative to own affiliates for heterogeneous firms.

Our approach is formally related to Helpman et al. (2004), who study horizontal FDI in a model of the proximity concentration tradeoff. That paper differs from ours as we do not analyze foreign production of multinational enterprises. Rather, the focus is on the matching process between producers and those foreign firms that sepcialize on importing goods; in the following, we refer to those firms as to general importers.[4]

Matching between producers and specialized importers is not immediate. This fact has a crucial implication: when parties finally match, they are locked into a *bilateral monopoly* situation which makes them vulnerable to *hold-up* from the other partner. We assume that the only commitment that producers can make is to engage in *exclusive dealership arrangements*. Otherwise, as in Grossman and Helpman (2002), no enforceable contracts exist. Hence, the price at which the producer sells to the general importers is determined through bilateral Nash bargaining. While the general importer has full discretion to set the price in the foreign market, the producer decides about the supplied quantity. The outcome of that game is that trade intermediation drives up the consumer price in the foreign market. The additional markup is given by the inverse of the producer's bargaining power and measures how strongly the producer's quantity decision reaches through

[4] Our framework is also related to recent work by Rauch and Watson (2003) and Casella and Rauch (2002), who stress the importance of Business-to-Business (B2B) relationships. Compared to those papers, our model is dynamic, features heterogeneous firms, allows for firms to differ with respect to their preferred foreign export mode, and determines the number of general importers and exporters endogenously. Most importantly, our model endogenizes foreign market access costs, since the cost of searching for a foreign general importer is endogenous.

to the foreign consumer price. Hence, variable profits are lower when exporting involves a general importer.

The rate at which producers and firms match depends on market tightness, i.e., the number of searching general importers relative to the number of searching producers. Tightness is driven by producers' and general importers' endogenous decisions to engage into costly search. As in all matching approaches, the matching friction involves a departure from first best, since there is an uninternalized search externality: entry of general importers (producers) drives up the expected cost of general importers (producers) to find a partner.

The mechanism studied in this paper is a promising candidate to square empirical facts with theoretical models, see the work of Alessandria (2004) and Drozd and Nosal (2007) in international real business cycle models, as well as Reed and Trask (2006) in a homogeneous firms trade model. It also provides a point of departure for a series of companion papers (see Felbermayr and Jung, 2008a, b).

The main result of the present paper is that, in equilibrium, producers are endogenously selected into the two export modes according to attributes of their products or of their technology. Firms with high levels of *productivity*, easily *tradable variants*, or strong *brand reputation*, establish own subsidiaries. Firms with intermediate values of the above characteristics choose to search for general importers. Along the steady state, only a fraction of those firms actually is matched and produces for the export market. Intermediation helps producers with good product characteristics to save on fixed foreign market access costs; however, this translates into lower overall export sales, thereby – at least partly – rationalizing the missing trade puzzle.

Moreover, related to the last observation, we find that institutional change may lead to a lower aggregate productivity, since exporters that switch from the direct to the indirect mode achieve smaller export sales, thereby contributing less to per capita GDP, and since relatively unproductive firms start exporting, drawing weight in the calculation of average GDP.

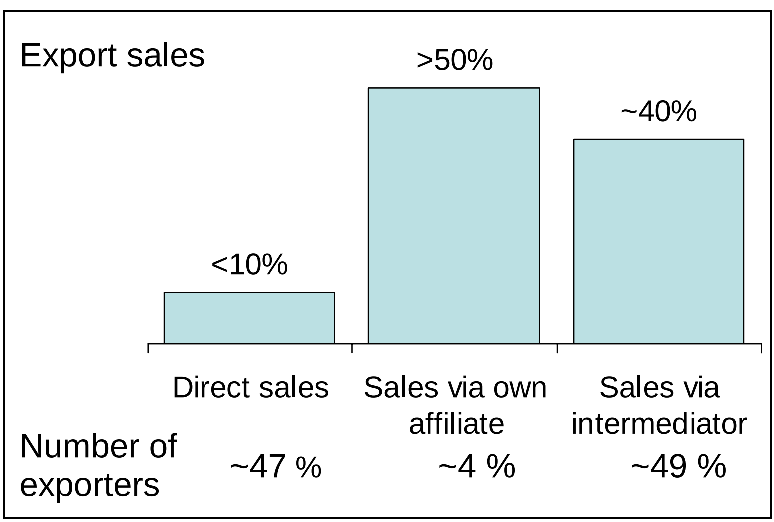
The remainder of the paper falls into four chapters. Chapter 2 gives a short overview over stylized facts, while Chapter 3 introduces the analytical framework and derives a first result on the pricing behavior under trade intermediation. Chapter 4 shows the conditions under which a strictly positive share of the total mass of producers export through trade intermediation. Holding aggregate variables constant, it uses a graphical device to discuss the equilibrium sorting of firms obtained in our model. Chapter 5 sketches the free entry conditions of producers and general importers, and discusses theoretical extensions. Finally, chapter 6 concludes.

2. Stylized Facts

In this section we discuss a few striking stylized facts. Statistical information on the importance of different export modes is difficult to obtain. However, combining information from the MIDI Database entertained at the German Bundesbank, export sales data from the German Statistical Office, and data from a survey undertaken by the ZEW, a German research institute, we are able to sketch the broad picture. The key fact is that direct contact of a producer in one country with the end user in another country is quantitatively not important. Similar patterns exist in the U.S. (Bernard et al., 2006), or in France (Trabold, 2002).

Chart 1 shows the distribution of German manufactured goods export sales over different export modes. Sales via own affiliates in foreign countries amount to over 50% of total exports, with sales via foreign intermediators accounting for another 40%. The residual is direct exports that does not involve foreign direct investment nor a foreign general importer. There are a number of empirical problems, since total export sales by goods provided by the statistical office cannot exactly be mapped into the classification of sectors provided by the Bundesbank. In chart 1, we choose to present the conservative case, where producer-to-consumer exports are most likely overestimated.

Chart 1: Relative Prevalence of Export Modes, Germany, 2003



Source: MIDI Datenbank der Deutschen Bundesbank; Statistisches Bundesamt; Fryges (2007).

Chart 1 also reports the share of actively exporting firms in each mode. This information draws on survey results presented in Fryges (2007). Most producers export either through an intermediator (49%) or directly to the final client in the foreign country (47%). Only 3% engage in FDI. At first glance, these results seem to contradict our findings on shares in total export volumes. However, taking the data at face value, they imply that the largest share of exports is undertaken by a small number of firms. There is large empirical evidence that this is actually the case (Bernard et al., 2006).

Fryges (2007) documents another important fact, namely that the number of firms that maintains own sales affiliates in foreign countries has increased between 1997 and 2003. This finding comes from a survey of German firms, but it has been replicated in an independent study for the United Kingdom. While in general the number of firms per se is not indicative of the total export volume channeled through some export mode, the fact that own affiliates are the prevailing choice for large firms suggests that also the share of exports channeled through affiliates has increased over time.

The implications of chart 1 can be summarized as follows: (i) Direct sales from the producer to a foreign end client amount to less than 10% of German exports, and are therefore quantitatively negligable. Exporters require either an own foreign sales affiliation or a foreign partner. Moreover, the share of exports through own affiliates has increased over time. (ii) It follows that fixed costs of foreign market access must have important aggregate implications, since the largest share of exports involves some type of fixed costs. (iii) A few firms make up a large share of total export sales. This points to a strong degree of heterogeneity amongst exporters.[5]

In 2005, the stock of outward FDI of the entire German manufacturing sector amounted to a total of 223 billion Euro. About half that sum (104 billion) was invested in some foreign affiliate active in the manufacturing sector. Some 32% (71 billion) was parked in holding companies, or financial affiliate. The remaining 17% (38 billion Euro) were held in affiliate trading companies. Taking out holding companies and the finance sector, German manufacturing firms held about a quarter (27%) of their total FDI in companies classified in the trading sector. While that number includes also investment into foreign purchasing units, it is largely dominated by sales representations, as vertical FDI makes up only a small share of total German outward FDI.

Looking at the sectoral distribution of the quantitative importance of FDI into sales affiliates, one finds that the share of FDI invested in sales affiliates relative to total non-finance investment is highest in the mechanical engineering sector (about 36% on average over the period 2002 to 2005) and the automotive sector (34% on average), while it is rather low in the chemical (18%) or the electric power

[5] The evidence shown in chart 1 is tentative; further research is needed, but requires richer firm-level data than what is available now. However, the pattern is consistent with a number of related facts, e.g., the correlation between firm size and FDI.

equipment industries (11%). Over 2001–2005 the cross-sectoral pattern was fairly stable.

Regarding the geographical dimension of German outward FDI, the Bundesbank publication allows to distinguish between the stock of FDI invested in the U.S.A., EU-25, and the rest of the world. Taking averages over the reported 2002–2005 time period, the share of investment in trade affiliates in total FDI of the manufacturing sector (again, excluding finance), amounts to about 27% for the EU-25, 26% for the U.S.A., and again 27% for the rest of the world.

We may summarize: a substantial share of total outward foreign direct investment (FDI) goes into the establishment or acquisition of foreign sales affiliates. There is little variation across the U.S.A., Europe, and the rest of the world, but significant sectoral variation.

Facts 1 and 2 establish the importance and relative prevalence of own sales affiliates. Empirical information on the role of general importers is more difficult to find. Trabold (2002) is amongst the rare studies that offer quantitative information. His empirical analysis draws on French customs data. His findings can be summarized as follows: import intermediation by general importers is most prevalent (i) the farther away in terms of geography and culture an export market market is, and (ii) the lower the marketing-intensity of a product is. Moreover, (iii) the share of total exports that involve import intermediation has been falling during the 1980s.

Our model can reproduce the stylized facts highlighted above. It is, however, also consistent with the broader evidence on the importance of networks, and search externalities discussed in the introduction.

3.Model Setup

We study a model with two symmetric countries. Following Helpman et al. (2004), in each country there are two active sectors: a perfectly competitive numéraire sector, with unit labor input coefficients and costless tradability; and a differentiated goods sector, with heterogeneous firms operating under conditions of monopolistic competition.

3.1 Demand Structure

Each country i is populated by a representative household, which inelastically supplies L units of labor to a perfectly competitive labor market. The household derives utility from consuming z units of the numéraire good, and a basket of differentiated goods. We assume that preferences are separable over those two items, with an upper Cobb-Douglas nest, and the basket of differentiated goods a Dixit-Stiglitz aggregate:

$$U = (1-\mu)\ln z + \frac{\mu}{\rho}\ln\int_{\omega\in\Omega_i}\left[\zeta(\omega)x(\omega)\right]^{\rho}\mathrm{d}\omega. \quad (1)$$

The household spends the share $0<\mu<1$ on differentiated goods and the remainder on the numéraire. The set of available varieties in country i is given by Ω_i, with ω denoting a generic variety.[6] The parameter $0<\rho<1$ describes the degree of substitutability of any each pair of varieties. However, unlike in the standard Dixit-Stiglitz representation, consumers may attach different weights $\zeta(\omega)\geq 0$ to different varieties, reflecting the fact that varieties may contribute asymmetrically to overall utility. We refer to $\zeta(\omega)$ as to the strength of variety $\omega' s$ brand name or the reputation of the producer. It may also be held to denote quality. In any case, a higher value of $\zeta(\omega)$ means that the respective variety yields a higher contribution to utility.[7]

The only source of income for the household is from wages, which we can normalize to unity in all countries thanks to our assumptions on the numéraire sector. Hence, the budget constraint reads

$$L \geq z + \int_{\omega\in\Omega_i} p(\omega)x(\omega)\mathrm{d}\omega. \quad (2)$$

Maximizing (1) subject to (2), we find the following demand function for a variety ω from country j

$$x(\omega) = H\frac{\zeta(\omega)^{\sigma-1}}{p(\omega)^{\sigma}}, \quad (3)$$

where $H \equiv \mu L/\left(\int_0^n\left[\zeta(\omega)\,p(\omega)\right]^{1-\sigma}d\omega\right)$ is proportional to country $i' s$ market size L, n is the measure of the sets Ω_i and Ω_j, and $\sigma\equiv 1/(1-\rho)>1$ is the elasticity of substitution between varieties.[8]

[6] Note that the set of available varieties differs across countries, since fixed costs of exporting prevent some varieties from being traded.

[7] Combes et al. (2005) offer a similar formulation of preferences. However, their ζ is constant across varieties imported from a given country.

[8] Note that by symmetry both sets Ω_i and Ω_j have the same measure n.

3.2 Heterogeneous Production Firms and Export Modes

Firms in the differentiated goods sector differ with respect to a vector of characteristics $\{\zeta(\omega),\tau(\omega),a(\omega)\}$, where $a(\omega)>0$ denotes the marginal cost of producing variety ω, and $\tau(\omega)\geq 1$ refers to variety-specific variable distribution costs of the iceberg type, which occur regardless of whether a good is traded internationally or not. Whenever one unit of a variety is to be delivered to a foreign partner, $\tau(\omega)$ units of that good have to leave the gates of the producer's factory. We see $\tau(\omega)$ as a short-hand way to introduce marketing and distribution costs that arise when a good is sold. There is no reason to assume that those costs are zero for transactions when the producer and the consumer happen to reside in the same country. However, in international transactions, total variable trade costs are $\tilde{\tau}(\omega)=\bar{\tau}\tau(\omega)$, where $\bar{\tau}\geq 1$ accounts for transportation costs and may be thought of as a function of distance. We refer to $\bar{\tau}$ to the systematic component of trade costs, and of $\tau(\omega)$ as the idiosyncratic component. Note that the systematic component magnifies the idiosyncratic part; hence, more marketing-intensive goods are also more expensive to deliver to foreign markets. The importance of that source of heterogeneity has been recently emphasized by Bergin and Glick (2007).[9]

Producers are also heterogeneous with respect to their marginal costs of production, $a(\omega)$. With the wage rate normalized to unity, $a(\omega)$ is equal to the labor requirement for one unit of output. Heterogeneity along this line has been shown to be empirically relevant, and is core in much recent work following Melitz (2003). For producing $y(\omega)$ units, the firm ω faces incurs total production costs $c(\omega)=a(\omega)y(\omega)+f^{D}$, where f^{D} denotes the fixed costs of production..

In much of our analysis, we can summarize the vector of characteristics $\{\zeta(\omega),\tau(\omega),a(\omega)\}$ in a single scalar $A(\omega)\equiv a(\omega)\tau(\omega)/\zeta(\omega)$, since $A(\omega)$ is a sufficient statistic to describe firm behavior (see details below). Higher values of $A(\omega)$ are equivalent to higher marginal costs of production, lower tradability, and a lower degree of brand reputation. Following Melitz (2003), the entry of producers requires payment of a cost f^{E}. Only after paying the entry fee

[9] However, in contrast to our formulation, his model has zero trade costs for deliveries within a same country.

do firms learn about their characteristics $A(\omega)$. We assume that $A(\omega)$ follows some c.d.f. $G(A)$.[10] We can then rank firms with respect to their realization of A. The advantage of our broader definition of firm heterogeneity relative to the focus in the literature on productivity is that empirical evidence suggests that productivity (or, closely related to it, firm size) are poor predictors of exporting behavior once one controls for unobserved firm characteristics (such as $\zeta(\omega)$ or $\tau(\omega)$), see Fryges (2006).

A key object of the present paper is to understand the sorting of firms into different export modes along their A-dimension. The first mode – direct exports – requires the setup of a sales representation in the foreign country, which implies some additional fixed investment f^F. This is the situation studied by Melitz (2003). The investment f^F has been referred to by Baldwin (1988) as *beachhead costs*, and usually turns up in FDI statistics under the guise of wholly owned sales affiliates.[11]

The second export mode – indirect exports – requires a match with a specialized trade intermediator, which we call general importer (GI). GIs know the foreign market better than the foreign producer. Hence, fixed costs of market entry are lower for the GI. However, the producer has to invest into costly search for a GI and – once matched – looses control on the consumer price of its output. Along the A dimension, we focus on the empirically relevant case where producer with the lowest realizations of A (low marginal costs, high reputation, high tradability) choose the direct export mode, producers with lower-intermediate realizations go for the indirect export mode, producers with upper-intermediate realizations do not find it optimal to export in either mode, and producers with the highest values of A quit the market upon drawing their vector of characteristics. Before turning to a detailed description of the of the indirect export mode, we briefly discuss the monopolists' pricing problem for domestic and indirect export sales.

Operating profits from *domestic sales* are $\tau(\omega)\cdot H\left[\tau(\omega)p(\omega)\right]^{-\sigma}\zeta(\omega)^{\sigma-1}\cdot\left[p(\omega)-a(\omega)\right]-f^D$. The first part in that

[10] Note that we do not need to impose any restrictions on the correlation between the different components of $A(\omega)$.

[11] The empirical literature on foreign direct investment (FDI) stresses the importance of wholesale affiliates (Kleinert and Toubal, 2006). Somewhat surprisingly, this fact has not provoked theoretical research; in theoretical models, FDI relates to foreign production activities carried out by some multinational firm (see Helpman, 2006). Our paper offers a theory of FDI into wholesale affiliates.

expression, $\tau(\omega)$, reflects the fact that domestic sales of x require $\tau(\omega)x$ units of the respective variety to be produced. The second part, $H\left[\tau(\omega)p(\omega)\right]^{-\sigma}\zeta(\omega)^{\sigma-1}$, gives the level of demand that the household has for a variety ω with c.i.f. price $\tau(\omega)p(\omega)$. The third part, $\left[p(\omega)-a(\omega)\right]$, refers to the per unit margin of the price over marginal cost. To maximize profits, the firm sets the f.o.b. price $p(\omega)=a(\omega)/\rho$, where $1/\rho>1$ is the markup over marginal costs. With our choice of preferences, the f.o.b. price does not depend on $\zeta(\omega)$. Inserting the optimal price in the monopolist's objective function, domestic profits can be written as

$$\pi^D(A)=BA^{1-\sigma}-f^D, \tag{4}$$

where it becomes apparent that profits depend only on $A(\omega)$ and not independently on the different components of $A(\omega)$. In the following we drop the dependence of A on ω since it is sufficient to know A in order to identify a specific producer. We follow Helpman et al. (2004) and write profits in terms of $B\equiv(1-\rho)H\rho^{\sigma-1}$, which is an aggregate magnitude, that involves the endogenous price index and exogenous parameters. Clearly, profits from domestic sales decline in A since $1-\sigma$ is a negative number. They rise in B, which captures the size of the market, and fall in fixed costs of production, f^D.

The monopolist generates non-negative profits from *direct exporting*, if export revenues suffice to cover additional variable production costs and foreign investment f^F. The objective function now is $\tilde{\tau}(\omega)\cdot H\left[\tilde{\tau}(\omega)p(\omega)\right]^{-\sigma}\zeta(\omega)^{\sigma-1}\cdot\left[p(\omega)-a(\omega)\right]-f^F$. Maximum profits from direct exporting are

$$\pi^F(A)=B(\bar{\tau}A)^{1-\sigma}-f^F, \tag{5}$$

where the systematic part of trade costs (independent from A), $\bar{\tau}$, appears as an additional determinant of variable profits, along with the foreign measure of market size B and the costs of investing abroad, f^F. Clearly, foreign profits are lower the higher the systematic component of trade costs.

3.3 Trade Intermediation and General Importers

Our slight generalization of the notion of firm heterogeneity apart, the setup discussed in section 3.2 above is the same as in Melitz (2003). In this section, we model the endogenous emergence of a new type of firms that misses in most standard trade models: trade intermediators or, using our preferred term, general importers. Following Spulber (1998, p. 3), an intermediator is "*...an economic agent who purchases from suppliers for resale or who helps sellers and buyers to meet and transact.*" We focus on the first function of a GI and on the matching problem between the GI and the producer of a certain variety. The second function refers to the activity of trade brokerage, where the intermediator confines to matching producers and consumers and does not incur any entrepreneurial risk. Trade brokers are empirically elusive institutions that are difficult to model.[12]

We can think of the GI as a firm that is located in a foreign market and has superior knowledge of local market conditions, legal institutions, idiosyncratic consumer preferences, etc. Hence, we assume that the GI has lower fixed costs of market access, f^M, than the direct exporter would have $\left(f^F\right)$. Without loss of generality, we may set $f^M = 0,$ but refrain from doing so for the time being.[13]

A key complication when using a GI is that relationship-specific investment is needed. This comes in terms of search costs. Conceptually, search costs are essential to allow for a meaningful sorting of firms along the A dimension; if a producer would have free access to GI's comparative advantage (low market access costs), every active producer would use that opportunity. We model the emergence of GIs in equilibrium as an explicit trade-off between costs and benefits. In particular, we assume that both GIs and producers have to search for foreign varieties to import, and that this search is costly. Search costs arise due to the participation at international trade fairs, correspondence and direct contact to potential partners, etc. Search costs are endogenous, as they depend on the number of searching firms and GIs. When a search is successful, GIs and producers find themselves in a bilateral monopoly situation which endows the GI with market power that allows to recoup the search costs.

We assume that all firms are *single product firms*. While this is in line with most recent trade models, this assumption is not very realistic. In reality, many GI's have diversified product portfolios, possibly originating from different countries. In principle, the GI should take this fact into account when deciding about which price to charge to consumers, at least if the different goods are substitutes. If the GI in some country j controls a sufficiently large share of the

[12] The *raison d'être* of trade brokers is the existence of asymmetric information. This is an interesting issue in itself, which we take up in Felbermayr and Jung (2007).

[13] One could also think that the GI's specific knowledge of the foreign market translates into lower variable (distribution) costs. While this is a theoretical possibility, it is clear the largest portion of variable distribution costs consists in tariffs and transportation costs, which in principle are the same across export modes. However, one could allow for the idiosyncratic component of trade costs $\tau(\omega)$ to differ across export modes.

market, it would internalize the cannibalization effect induced by additional varieties and charge a higher markup (Feenstra and Hong, 2007). In turn, this constitutes an incentive for GIs to expand. Apart from the pricing issue, multiproduct GIs may also benefit from economies of scope. The endogenous emergence of multi-product GIs is certainly worth to look at. However, it also lends to a number of additional complications, so that in the present paper we rule this possibility out.

To endogenize search costs, we follow the standard practice in search and matching models of unemployment (Pissarides, 2000) and assume the existence of a matching function. This approach has been fruitfully applied by Grossman and Helpman (2002) in a model of vertical supply chains. Our model differs in that we study exporting rather than sourcing behavior and allow for heterogeneous firms. Let n^S be the number of producers searching for an opportunity to export, and n^G the corresponding number of GIs searching for an opportunity to import goods. As long as they are unmatched, producers and GIs incur per-unit-of-time search costs c^P and c^G, respectively. At each instant, $N(n^S, n^G) \leq \min\left\{n^P, n^G\right\}$ trade relationships are formed, where $N\left(.,.\right)$ is linear-homogeneous, as well as increasing and strictly concave in both arguments.

We model GIs as *ex ante* identical; moreover, since producers differ with respect to their characteristics A, GIs are *ex post* heterogeneous. Firms' heterogeneity does not have any bearing on search costs, so that the rate at which a searching producer is matched with a GI does not depend on A. With our assumptions on the matching technology, matching rates depend only on the degree of *market tightness* $\theta \equiv n^G/n^P$, i.e., the number of searching GIs relative to searching producers. Exploiting the properties of $N\left(.,.\right)$, we can write the rate at which a producers are matched to a GI as $\eta(\theta) \equiv n^M(1,\theta)$ and the rate at which GIs are matched to producers as $\eta(\theta)/\theta$. Clearly, the concavity of $N\left(.,.\right)$ implies that $\eta(\theta)$ strictly increases in θ while $\eta(\theta)/\theta$ falls. This illustrates the standard search externality associated to entry of producers and GIs on their respective peers.

The empirical work of Besedeš and Prusa (2006) suggests that in trade relations there is a substantial amount of turnover. We introduce this fact into our analysis by allowing for some exogenous separation rate $\delta^G > 0$. Moreover, to ensure convergence to an ergodic equilibrium distribution of productivities, we require an exogenous death shocks for producers, δ^P. If δ^G and δ^P are independent, the total rate of match destruction is $\delta \equiv \delta^P + \delta^G$.[14]

3.4 The Game between Producers and General Importers

We consider a framework where no enforceable contracts can be written ex ante. Producers and GIs can credibly commit to a single promise: to stick to exclusive dealership arrangements. Without this commitment, intermediated trade can only be an equilibrium outcome under very special circumstances. Producers can be held up by GIs, since the production costs are sunk at the bargaining stage and the producer cannot make any alternative use of the quantity manufactured with the view of selling on the foreign market (i.e., the producer's outside option is zero). Expected search costs are $c^P/\eta(\theta)$ from the producer perspective and $c^G\theta/\eta(\theta)$ from the perspective of a generic GI. When a match happens to be formed, these costs are sunk. This implies that, when a match occurs, both parties find themselves in a situation of bilateral monopoly. Otherwise, we follow Grossman and Helpman (2002) or Antras and Helpman (2004), assuming that bargaining over the joint surplus of a match to be an asymmetric Nash problem, where $\beta \in [0,1]$ is the bargaining power of a producer.

The game implies the following staging: first, the producer decides about the quantity of output to provide to the GI. Second, both parties bargain about the joint surplus from selling the good at the foreign market at price $p^G(\omega)$. As usual, the game is solved by backward induction.

Denoting the ex post joint surplus by $J(\omega)$, we have $J(\omega) = p^G(\omega)x\left[p^G(\omega)\right] - f^M$. At the time of the bargain, variable production costs (which also account for transportation costs) have already been incurred, so that they do not turn up in the *ex post* surplus. The Nash bargaining results in a sharing of the joint surplus according to the two parties' relative bargaining powers, where the producer appropriates $\beta J(\omega)$, and the general importer $(1-\beta)J(\omega)$.

Predicting its share of the surplus at the bargaining stage, the producer choses her optimal quantity to supply to the GI. She solves

[14] Time is continuous. Hence, destruction rates and rates of match creation take values on the entire real line. The matching rates refer to the rate by which a match occurs in the next infinitesimally short time period. The death rates δ^P and δ^G relate to the survival rate into the next infinitesimally short time period.

$$\max_{x(\omega)} \beta J(\omega) - a(\omega)\tilde{\tau}(\omega) x\left[p^{G}(\omega)\right]$$

subject to the demand function (3), taking into account that in order to supply a quantity x to the GI, she has to produce $\tilde{\tau}(\omega)x$ units of her variety, where $\tilde{\tau}$ denotes the total iceberg transportation costs from shipping abroad. Plugging in the expression for $J(\omega)$, and using the inverse demand function derived from (3), the first order condition of the producer implies a pricing rule $p^{G}(\omega) = a(\omega)\tilde{\tau}(\omega)/(\beta\rho)$. Importantly, the standard markup over effective marginal costs $1/\rho$ is magnified by an additional factor $1/\beta$ which is endogenously pinned down by the parameter governing bargaining between the producer and the GI.

We may summarize: the price charged for imports by a general importer (GI) is given by

$$p^{G}(\omega) = \frac{1}{\beta\rho} a(\omega)\tilde{\tau}(\omega), \tag{6}$$

with $(\beta\rho)^{-1} > 1$ the total markup over effective marginal costs. The proof of this assertion is in the Appendix.

As in Grossman and Helpman (2002), the consumer price indicated in equation (6) reflects the presence of *double marginalization*: the price paid by the foreign consumer is driven up by the usual markup $1/\rho$ earned by the GI, and by the markup $1/\beta$ that results from Nash bargaining. Note that the additional distortion depends on β: the larger the producer's bargaining power, the closer (6) comes to the price obtained if the producer would sell directly to the foreign market, i.e., $a(\omega)\tilde{\tau}(\omega)/\rho.$ Also note that the bargained transaction price is independent from the market tightness θ, which is a direct corollary from the fact that both parties' outside options are driven to zero on the one hand by free entry of GIs and on the other hand by the absence of any alternative use of the output quantity delivered by the producer to the foreign market.

The value of the joint surplus can be obtained by substituting (6) into the definition of $J(\omega)$:

$$J(A) = \sigma B\left(\overline{\tau}\beta^{-1}A\right)^{1-\sigma} - f^{M}. \tag{7}$$

The joint surplus is larger the bigger the size of the export market adjusted for transportation costs $\overline{\tau}^{1-\sigma}B,$ and the smaller the match-specific fixed costs f^{M}. The surplus is larger the stronger the producer's bargaining power β: the closer

β is to unity, the smaller is the detrimental effect of double marginalization. Clearly, higher marginal costs, lower tradability and lower brand reputation also reduce the surplus, since they translate into a higher value of A.

Similarly, we can now express the additional profits from *selling abroad through a general importer* by inserting $p^G(\omega)$ into the producer's objective function:

$$\pi^{MP}(A) = \beta^{\sigma} B(\overline{\tau} A)^{1-\sigma} - \beta f^M. \tag{8}$$

Note that we use the superscript MP to make clear that only matched producers have access to those profits. When talking about producers' choice of export modes, we will have to link $\pi^{MP}(A)$ to the additional profits that a producer expects to make when engaging into the costly search for a partner.

Comparing (8) to $\pi^F(A)$, the profits of direct exporting to the foreign market, it is clear that the term $B(\overline{\tau} A)^{1-\sigma}$ appears in both expressions. But, since $\beta^{\sigma} < \beta < 1$ for given distance-adjusted market size $B\overline{\tau}^{1-\sigma}$ and firm characteristics A, intermediated exporting (8) involves lower variable profits than direct exporting (5). However, fixed costs of direct exporting have to be shouldered by the producer alone, while fixed costs (if any) are shared by both parties in the indirect mode.

4. Choice of Export Modes with Given Market Tightness

4.1 Zero Cutoff Profit Conditions

Firms select endogenously into different export modes. However, as in the standard Melitz (2003) model, the presence of fixed production costs implies that some firms with the highest realizations of A will choose not to start production at all, and some firms with high values of A prefer to sell only on the domestic market. Finally, firms willing to export face a choice between direct exporting, which is fixed cost intensive but yields high unit revenues, and indirect exporting via a GI, which saves fixed costs but involves lower unit revenues. Hence, we expect that firms with intermediate realizations of A prefer indirect exports and those with lowest A sell directly through own sales affiliates. Under conditions to be made explicit below, there is a unique sorting of firms along their A characteristics, with all possible regimes being active in equilibrium. Firms with realizations $A > A^D$ have so high marginal costs, low brand reputation and tradability, that their revenue generated from the domestic market cannot suffice to cover the fixed costs of production. *A fortiori*, they cannot find it optimal to export, neither. Firms with characteristics $A^{SP} < A \leq A^{D}$ produce only for the domestic market. Either way of serving the foreign market involves too high entry costs and too little revenue. Firms with characteristics $A^{F} < A \leq A^{SP}$ find it optimal to start searching for a GI. At any point in time, a fraction of those firms will be matched and therefore generating export revenues in top of domestic income. Firms with $A \leq A^{F}$, that is the best firms (with lowest marginal costs, highest tradability and strongest brand names) establish own sales affiliates.[15] Note that the same firm can find it optimal to serve different markets using different modes.

The thresholds A^{D}, A^{SP}, and A^{F} are determined by a series of indifference conditions, which, given the sorting described above, can be described by *zero cutoff profit conditions*. The marginal firm A^{D} that finds entry into operations worthwhile is defined by setting domestic profits (4) zero:

$$\left(A^{D}\right)^{1-\sigma} = \frac{f^{D}}{B}. \tag{9}$$

That threshold A^{D} is lower the higher f^{D} and the lower B, reflecting the fact that higher fixed costs and smaller market sizes make it harder for firms with bad (i.e., high) realizations to survive.

The value of A below which firms find it worthwhile to search for producers (and ultimately be matched to a GI) is slightly more involved to pin down, because of the inherently dynamic nature of the search and matching process: searching for a GI involves an uncertain investment, as the duration of costly search is uncertain. Hence, the producer has to trade off immediate search costs against future profits from foreign sales. Denote the value of a producer that searches for a GI by V^{SP} and the value of a matched producer by V^{MP}. Then, we can establish the following system of value equations:

$$\delta^{P} V^{SP}(A) = -c^{P} + \eta(\theta)\left[V^{MP}(A) - V^{SP}(A)\right], \tag{10}$$

$$\delta^{P} V^{MP}(A) = \pi^{MP}(A) + \delta^{G}\left[V^{SP}(A) - V^{MP}(A)\right]. \tag{11}$$

Since δ^{P} is the only source of discounting from the producer's perspective, $\delta^{P} V^{SP}$ is the flow return to searching. That return has to be equal to the flow costs of searching $-c^{P}$ and the expected capital gain when the search has been successful. That gain $\left[V^{MP}(A) - V^{SP}(A)\right]$ occurs with Poisson rate $\eta(\theta)$ so that

[15] To break ties, we assume that firms that are indifferent between two regimes, chose the next highest (in terms of the ranking of regimes discussed above).

equation (10) follows. In turn, the flow value of a matched producer $\delta^P V^{MP}$ is given by the flow profits of selling through a GI, $\pi^{MP}(A)$, and the expected capital loss of being separated from the GI, $\delta^G \left[V^{SP}(A) - V^{MP}(A)\right]$.

We can solve for V^{SP} from the system (10) and (11), which yields an expression for the flow value of a searching producer:

$$\delta^P V^{SP}(A) = s(\theta)\pi^{MP}(A) - \left[1 - s(\theta)\right]c^P, \tag{12}$$

where the term $s(\theta) \equiv \eta(\theta)/\left[\delta + \eta(\theta)\right]$ denotes the average fraction of time that a producer expects to be matched and earning profits π^{MP} and $1 - s(\theta)$ is the fraction of time that she is searching and hence incurring search costs c^P. We determine the producer, who is just indifferent between engaging into searching for a GI and concentrating on exclusively domestic sales, by the condition $V^{SP}\left(A^{SP}\right) = 0$. Using the expression for profits $\pi^{MP}(A)$, (8) in (12), we obtain the zero cutoff profits condition for entry into search as

$$\left(A^{SP}\right)^{1-\sigma} = \frac{\overline{\tau}^{\sigma-1}}{\beta^{\sigma} B}\left[\frac{c^P}{\eta(\theta)} + \beta f^M\right]. \tag{13}$$

The effective fixed costs of foreign market access consist of two terms: expected total search costs $c^P/\eta(\theta)$ and the producer's share of match-specific fixed costs βf^M. The threshold A^{SP} is lower the higher the sum of those fixed costs is; i.e., the marginal searching producers needs to exhibit lower marginal costs, higher tradability and a stronger brand name. If the distance-adjusted market size $\overline{\tau}^{1-\sigma} B$ goes up, the threshold goes up. Similarly, when the size of the double marginalization distortion, captured by β, falls (i.e., β goes up), the threshold rises, and the marginal searching producer can features a worse realization of A.

Finally, we determine the remaining cutoff level, A^F, by solving $V^{SP}\left(A^F\right) = V^F\left(A^F\right)$. The marginal direct exporter is exactly indifferent between searching for a GI or establishing her own subsidiary. Equating (12) and (5), and using (8) one gets

$$\left(A^F\right)^{1-\sigma} = \frac{\overline{\tau}^{\sigma-1}}{B}\frac{f^F - \left[1 - s(\theta)\right]c^P}{1 - \beta^{\sigma} s(\theta)}. \tag{14}$$

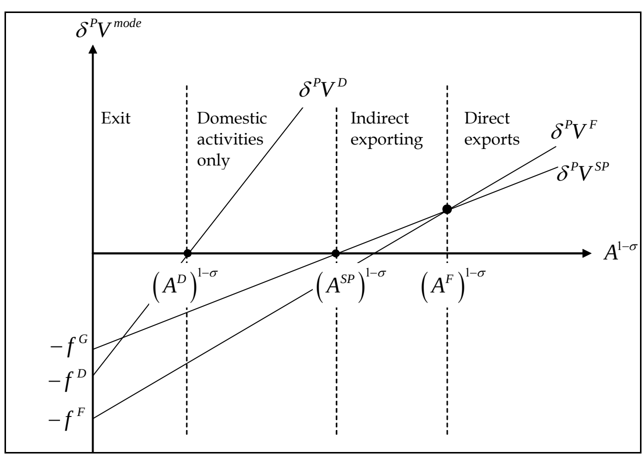
Again, higher distance-adjusted market size $\overline{\tau}^{1-\sigma} B$ allows for firms with worse (i.e., higher) realizations of A to select into direct exporting. The higher the term

$f^F - [1-s(\theta)]c^P$, the higher are the opportunity costs of direct exporting relative to the next best alternative, and the lower the maximum realization of A can be. Also, the lower β, the larger is the double marginalization problem that arises in the indirect export mode, and the lower the threshold A^F becomes.[16]

4.2 Equilibrium Sorting of Firms over Export Modes

Before turning to a full general equilibrium analysis with θ and B endogenous, it is worthwhile to illustrate the sorting of firms over different regimes as a function of their characteristics $A^{1-\sigma}$ in chart 2, which is a modified version of figure 1 in Helpman et al. (2004). Expressing flow profits as annuities using the producers' discount rate, we associate an `expected profit line' $\delta^P V^{\text{mode}}$ to each mode, where *mode* either takes the value D (domestic sales only), SP (search for a GI) and F (direct exports through an own affiliate). Note that for modes D and F we have $\delta^P V^{\text{mode}} = \pi^{\text{mode}}$; this is however not true for the SP mode. The chart plots (4), (5), and (12), taking aggregate variables B and θ taken as constant.

Chart 2: Equilibrium Sorting for Given Tightness



Source: Authors' calculations.

16 For (14) to be well defined, i.e., $(A^F)^{1-\sigma} > 0$, we need that $f^F - [1-s(\theta)]c^{SP} > 0$. This implies $\delta c^{SP}/[\delta + \eta(\theta)] < f^F$, an inequality that will be verified in condition (14) below.

The lines differ with respect to their respective intercepts (representing fixed costs) and slopes (representing net revenues for unit productivity). In the chart, the flow profits (4) associated to purely domestic operations have an intercept of $-f^D$ and slope B. Expected additional (on top of the profits from the home market) flow profits of searching for a GI involve expected fixed costs consisting of the producer's share in match-specific fixed costs and expected search costs, $f^G \equiv s(\theta)\beta f^M + \left[1-s(\theta)\right]c^P$, and a slope $B\overline{\tau}^{1-\sigma}\beta^{\sigma}s(\theta)$. Finally, additional profits (5) from direct export sales involve fixed costs f^F and a slope $B\,\overline{\tau}^{1-\sigma}$. Clearly, the slope of the $\delta^P V^{SP}$ line is smaller than the one of the $\delta^P V^F$ line due to the existence of double marginalization, $\beta^{\sigma} < 1$ and due to the fact that positive sales revenue accrues only if the producer is actually matched to a GI, which is not always the case. The $\delta^P V^D$ line is steepest: compared to the other regimes, marginal net revenues are higher as there are no transportation costs.

For given θ, a non-zero mass of firms is active in each of the three regimes (D,SP,F) if the hypothesized ranking $\left(A^D\right)^{1-\sigma} < \left(A^{SP}\right)^{1-\sigma} < \left(A^F\right)^{1-\sigma}$ holds. This requires that the effective fixed costs of searching for a GI lie in a bracket between the fixed production costs f^D and the costs of establishing an own foreign sales affiliate f^F.

For given market tightness θ, a partial sorting equilibrium exists if the following condition holds

$$\overline{\tau}^{1-\sigma} f^D < \beta^{-\sigma}\left[\beta f^M + \frac{\delta c^P}{\eta(\theta)}\right] < f^F. \qquad (15)$$

That is, strictly positive non-overlapping masses of producers find it optimal to sell domestically only and to sell both domestically and in the foreign market. Among exporters, there are strictly positive, non-overlapping masses of producers that search for a general importer and that own foreign sales subsidiaries.

This condition follows directly from using the definitions of $\delta^P V^D, \delta^P V^F$, and $\delta^P V^{SP}$ in chart 2. Note that for a segmentation of firms into non-exporters and owners of own sales affiliates, it is enough that $\overline{\tau}^{1-\sigma} f^D < f^F$, which is exactly the respective condition in Melitz (2003). Also as in Melitz, we do not require the existence of variable trade costs $\overline{\tau} > 1$; neither the sorting of firms into exporters and non-exporters, and the sorting of exporters into direct and indirect exporters hinges on $\overline{\tau}$. The only reason to allow for $\overline{\tau} > 1$ is for the purpose of conducting comparative statics.

Condition (14) has a fairly intuitive interpretation. The term in square brackets amounts to the expected effective costs of accessing the foreign market through a GI, since βf^M are match-specific fixed costs to be borne by the producer, and $\delta c^P / \eta(\theta)$ are the expected, annuitized search costs. The term $\beta^{-\sigma}$ that premultiplies effective expected search costs is related to the elasticity of expected profits of a searching producer with respect to $A^{1-\sigma}$. Hence, the condition requires that adjusted expected costs of market access in the intermediate mode should neither be too larger nor too small. Clearly, we can restate the above condition in terms of market tightness θ. If θ is high, producers find GIs quickly, expected search costs fall, and so do total effective GI-mediated access costs. However, as long as $f^M > 0$, indirect exporting remains viable, at least for some combinations of parameters, even if θ approaches infinity. However, if θ falls to zero, search costs become infinite and so do GI-mediated access costs: indirect exporting is no longer feasible. Hence, from the producers' perspective, condition (14) implies a lower bound for θ. However, for high θ, fewer GIs find it optimal to enter, which puts an upper bound on the equilibrium θ.

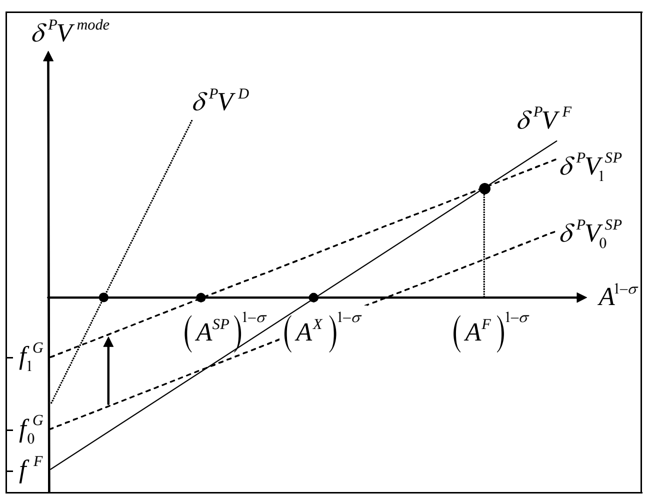
Note the difference of the proposed theory to the *proximity-concentration* model in Helpman et al. (2004). There, the sorting of firms into foreign direct investment and exports depends crucially on systematic transportation costs. In their model, as transportation costs fall, exporting becomes more attractive relative to local production. This is an empirically counter-factual implication (Neary, 2007), that our model does not have. Rather, a change in systematic transportation (distance) costs does not directly affect the sorting of firms into different export modes, but would have indirect implications through the market tightness (see below). However, since we allow firms to differ with respect to the genuine tradability of their varieties, we can make statements on how the idiosyncratic (variety specific) transportation costs affect the sorting of firms. We can now state the following:

Under the condition stated in equation (14), producers endogenously select into export modes according to their product characteristics. Firms with high levels of productivity, easily tradable variants, or a strong brand reputation, establish own subsidiaries, while those with intermediate values of the above characteristics search for general importers. Firms with low values of the above characteristics do not export.

Chart 3 looks at the comparative statics of an increase in θ. From (12), both the slope and the intercept of the $\delta^P V^{SP}(A)$ line change. The reason is that a higher θ implies a higher matching rate for producers. Hence, the fraction of time that any producer is actually matched goes up. This leads to a stronger marginal effect of a change in $A^{1-\sigma}$: as firms have better characteristics, their export profits rise faster if they are more frequently matched. Hence, the slope of the (12) line is steeper if θ goes up. The effect on the intercept, however, is ambiguous. On the one hand, a higher θ rises the fraction of time in which a firm with characteristics $A^F < A \leq A^{SP}$ is matched and hence paying its share of match-specific costs βf^M. On the other hand, a higher θ also means that the firm finds itself less frequently paying search costs c^P. Whether the first effect dominates the latter depends on the sign of $\beta f^M - c^P$. Since $f^M = 0$ is perfectly compatible with a meaningful equilibrium but $c^P = 0$ is not, we set $f^M = 0$ in the following analysis.

We can now do comparative statics with respect to θ: if $f^M = 0$, an increase in market tightness θ makes indirect exporting more attractive relative to both, the purely domestic mode, and direct exports through own affiliates. That is, the lower cutoff in the indirect exports mode, $\left(A^{SP}\right)^{1-\sigma}$, falls while the upper cutoff, $\left(A^F\right)^{1-\sigma}$, rises. The proof of this statement is in the Appendix.

Chart 3: Increasing Market Tightness and Equilibrium Sorting



Source: Authors' calculations.

4.3 Intermediation, Missing Trade, and the "Mittelstand"

We can use chart 3 to discuss a number of interesting implications that result from the option of producers to export via GIs. To that end, we compare the standard Melitz (2003) model, in which intermediation is not a feasible option, to a model where that latter option exists. Condition (14) suggests that there are several ways to render indirect exporting an option which is always dominated either by non-exporting or by exporting through own affiliates: either β is too small, or c^P and/or f^M are too high, or θ is too low. In all those cases, the intercept of the $\delta^P V^{SP}(A)$ line in chart 3 is so large (in absolute values), that the cutoff level $\left(A^{SP}\right)^{1-\sigma}$ does not exist. We focus on the case of a reduction in search costs c^P, either through technological change (the improvement of information and communication technologies) or through measures of indirect trade promotion (e.g., through the construction and public maintenance of trade fairs, or trade missions in consulates or embassies).[17] There is ample empirical evidence for both facts, see Cummins and Violante (2002) and Rose (2007).

In chart 3, if c^P is prohibitively high, only three regimes exist: firms with the lowest values of A export, firms with intermediate values of A are active only domestically, and firms with the highest A never take up operations. Hence, the cutoff $\left(A^D\right)^{1-\sigma}$ is not affected by the parameter c^P. However, if c^P is prohibitively high, the exporting cutoff $\left(A_0^F\right)^{\sigma-1}$ is determined by the condition $\delta^P V^F\left(A_0^F\right)=0$. This is the case where the $\delta^P V^{SP}(A)$ line cuts the x-axis.

When c^P falls, the intercept of the $\delta^P V^{SP}(A)$ starts to fall in absolute values, and at some point indirect exporting becomes an option for firms. This has two consequences. First, the "best" firms (those with high $A^{1-\sigma}$) that have not exported before start selling abroad. This generates additional exports. Second, the "worst" firms that have been exporting through an own affiliate before now prefer to use the GI instead. This switch of mode is optimal for producers: they give up some variable revenue, but in turn save fixed market entry costs (associated to FDI). Holding $A^{1-\sigma}$ constant, firms achieve higher export sales in the direct relative to the indirect mode. Hence, the switch into indirect exporting leads to a contraction

[17] Any change in c^P triggers an adjustment in θ if it is not offset otherwise. However, there exists a scalar λ such that $dc^P = \lambda dc^G$ for which θ remains constant even in full general equilibrium.

of trade. The overall effect of the fall in c^P on total export values – new firms take up exporting, while switchers export less – is a priori ambiguous. In contrast to received wisdom, ignoring the existence of GIs and the mechanism discussed in this paper, the effect of technological or institutional change on trade can be smaller (and, theoretically, negative).

Another implication of the existence of GIs is that variance in c^P (or any other exogenous determinant of the $\delta^P V^{SP}\left(A\right)$ line) affects the exporting behavior of different types of firms differently. Business surveys reveal that there is sizeable cross-country variance in the export behavior of firms of given productivity. For example, while in Germany medium-sized companies, the so-called "Mittelstand", are very active exporters, in France this is much less the case: only 5% of all small and medium sized firms in France export, while that number is 18% in Germany (The Economist, February 8th, 2007). On the other hand, large firms seem to achieve higher international sales in France than in Germany. Our model can relate this empirical fact to cross-country heterogeneity in the drivers of the expected fixed costs of exports through GIs. Exporters that for some reason face high expected costs of market access through GIs have less exporting firms, but those that export are on average more productive and, hence, larger.

Finally, and related to the last observation, we can use our model to make claims on the aggregate productivity of countries. Closing down $\tau\left(\omega\right)$ and $\zeta\left(\omega\right)$ heterogeneity, the emergence of GI intermediated exports makes large exporters that switch from the direct to the indirect mode achieve smaller export sales. Therefore, they contribute less to per capita GDP (which is proportional to a measure of average productivity). On the other hand, some relatively small firms that have preferred to sell domestically only, now find it optimal to export. They receive additional weight in the calculation of average GDP. Again, the overall effect is ambiguous. However, there is the possibility that the emergence of GIs actually lowers the aggregate productivity level. In other words, export promotion need not be good for GDP even if there are more exports. *A fortiori*, a welfare perspective that accounts for resources used in foreign market access, delivers an even bleaker picture.

5. Closing the Model

In the above discussion, we have treated θ and real income level B as given. However, θ is itself an important endogenous variable, since it reflects the entry of GIs and producers into searching mode. Moreover, free entry of both GIs and producers is crucial to close the model: the free entry conditions hold in expectations so that entry occurs until expected profits are zero.

5.1 Free Entry of GIs

Free entry of GIs implies that in an equilibrium situation, the expected gains from starting a new GI firm are just zero. That condition pins down the equilibrium number of GIs. When GIs decide to start searching for a foreign producer, they incur search costs. They are matched according to the matching technology described above, with $\eta(\theta)/\theta$ the Poisson arrival rate of a successful match. However, any GI faces *ex ante uncertainty* since the characteristics of the producer that it will ultimately be matched to are known only when the match has occurred. Clearly, since the size of the joint surplus is strictly decreasing in A, a GI is strictly better off with a partner featuring a lower A.

The value equations of a GI can be written as

$$\delta^G E[V^{SG}] \;=\; -c^G + \frac{\eta(\theta)}{\theta}\left(E[V^{MG}] - E[V^{SG}]\right), \tag{16}$$

$$\delta^G E[V^{MG}] \;=\; (1-\beta)E\left[J(A)\right] + \delta^P\left(E[V^{SG}] - E[V^{MG}]\right), \tag{17}$$

where $E[V^{SG}]$ denotes the expected value of a searching GI and $E[V^{MG}]$ that of a matched GI. As with producers, there is no discounting other than through the exogenous separation rate δ^G, which measures the rate at which a match is broken and the GI goes out of business. Equation (16) shows that the expected flow return to searching consists of a flow search costs $-c^G$, and a positive capital gain $E[V^{MG}] - E[V^{SG}]$, which materializes when the GI switches from searching to being matched. This happens with Poisson rate $\eta(\theta)/\theta$. Equation (17) shows that the expected flow value of a matched GI consists of the GI's share of the joint surplus generated in the match, $(1-\beta)E\left[J(A)\right]$, and the capital loss $E[V^{SG}] - E[V^{MG}]$, which happens when the producer is hit by an exogenous exit shock δ^P.

Free entry implies that the GIs' ex ante value of searching for a producer $E[V^{SG}]$ is zero. Using equation (16), this implies that the expected value of a matched GI $E\left[V^{MG}\right]$ just equals expected search costs of a GI $c^G\theta/\eta(\theta)$. Moreover, it follows from equation (17), that the expected value of a matched GI is equal to the GI's share of the joint surplus, appropriately discounted $E[V^{MG}] = \frac{1-\beta}{\delta} E\left[J(A)\right]$. Thus, the free entry condition for GIs is given by

$$\frac{c^G}{\eta(\theta)/\theta} = \frac{1-\beta}{\delta} E\left[J\left(A\right)\right]. \qquad (18)$$

This condition equates the expected search costs of a GI on the left-hand-side with the present value of the share of the expected surplus that accrues to the GI.

Note that the GIs' entry decision is formally isomorphic to the producers decision whether or not to pay the fixed costs that reveal their characteristics A. However, while the producers draw from a sampling distribution $G(A)$, GIs sample the characteristics of their partners from a distribution that is endogenously truncated by the producers' decisions whether or not to search for a GI. Producers who have drawn characteristics $A \leq A^F$ find it optimal to establish a foreign sales representation. Firms with characteristics $A > A^D$ do not find it worthwhile to take up operations at all: their entry fee is simply foregone. In contrast, GIs always find it optimal to start cooperating with the producer $A \in \left[A^F, A^{SP}\right]$ that they have been randomly matched with. The reason for this is straightforward. A necessary and sufficient condition for producers to search for a GI is that their share of the surplus is larger than expected search costs, i.e., $\beta J\left(A\right) \geq \delta^P c^P / \eta\left(\theta\right) > 0$. GIs, in turn, take up cooperation with their producer if their share of the ex post surplus is non-negative, i.e. $\left(1-\beta\right) J\left(A\right) \geq 0$. Hence, the producers' condition is also sufficient for GIs not to refuse cooperation with a randomly matched producer. Search specific fixed costs f^M are collectivated in the bargaining process and are therefore paid by both parties in the match. It follows that in a rational expectations equilibrium, the criterion of producers to enter into searching for a GI, and of GIs not to reject a successfully matched producer, coincide. Hence, in equilibrium, a general importer never finds it optimal to reject a producer once a match has occurred.

At this point, the crucial assumption that producers can credibly commit to *exclusive dealership arrangements* becomes clear. The problem without such an arrangement is that producers have an incentive to sell to more than one GI, since competition among GIs would allow them to sell larger quantities to the foreign market. However, if one variety is sold by at least two importers, they would enter into Bertrand competition. This would annihilate any ex post profits so that GIs' would never find it worthwhile to start searching for a producer in the first place. Hence, the mode of exporting through a GI can only exist if producers can credibly commit to *exclusive dealership arrangements*, that grant the GI the exclusive right to sell the producers specific variety in the foreign market.

5.2 Free Entry of Producers

Free entry of producers ensures equality between the present value of average profit flows of a potential entrant and the entry costs f^E. Recall that the value of a searching producer consists of two components: a first that collects profits from exporting when being matched to a GI, and a second that comprises search costs, occurring regardlessly of the characteristics A. Then, the fee entry condition can be expressed as

$$\begin{aligned}\delta^P f^E &= \int_0^{A^D} \pi^D(A)\,dG(A) + \int_0^{A^F} \pi^F(A)\,dG(A) \\ &+ s(\theta)\int_{A^F}^{A^{SP}} \pi^{MP}(A)\,dG(A) - (1-s(\theta))\left(G\left(A^{SP}\right)-G\left(A^F\right)\right)c^P,\end{aligned} \tag{19}$$

where the first and second integral of the above expression reflect, respectively, the expected profits of domestic operations and from exporting through an own subsidiary, and the remaining expressions capture the value of a searching producers.

5.3 Equilibrium Existence and Uniqueness

The system of equilibrium conditions (9), (13), (14), (18), and (19) implies the equilibrium cutoffs A^D, A^{SP}, A^F, the equilibrium market tightness θ, and the equilibrium real income level B. Assume that all components of A are random realizations from independent distribution functions following the Pareto law. Then, A is also Pareto distributed. More precisely, we let the c.d.f. $G(A) = A^k$, with a shape parameter k and the support $(0,1]$.[18] Under our Pareto assumption, the expected surplus is independent of B, which immediately leads to recursivity. More precisely: if A follows the Pareto distribution with shape parameter $k > \sigma - 1$, the zero cutoff profit conditions plus the free entry condition of GIs, solve for the equilibrium cutoff points A^D, A^{SP} and A^F as well as for the market tightness θ independently from $\overline{\tau}$ and B. The value of B then adjusts such that the free entry condition of producers is met. The proof of this recursivity property is relegated to the Appendix.

[18] The Pareto assumption has been made in a large number of related papers (e.g. Helpman et al. (2004), Helpman et al. (2007), Bernard et al. (2006).

Given recursivity, in order to show existence of the equilibrium, it is sufficient to substitute the zero cutoff profit conditions (9), (13), and (14) into the GIs' free entry condition and search for the value of θ that solves that equation. Since expected search search costs are increasing in θ, for uniqueness it is sufficient to show that the expected surplus is increasing in θ. While our simulations suggest uniqueness of the equilibrium, it is hard to prove it formally, since the expected surplus is a fairly complicated function of the market tightness.

A change in the cost of search of either the producers of the GIs has direct and indrect effects in this model. Focusing on direct impacts, it is clear that any reduction in c^G makes it less costly for GIs to operate, and therefore leads to more entry. It follows that θ has to go up, which, in turn, lowers expected search costs from the producers' perspective. With lower expected foreign market access costs, more producers choose to export through intermediaries. As shown in the graphical illustration above, and made more explicit in Felbermayr and Jung (2008b), the emergence of new exporters and the switching of incumbent ones from wholesale FDI into intermediation has ambiguous consequences for average productivity and for total export sales.

A reduction in c^P is more complicated, since its effect on θ is not clear. However, the total effect on expected search costs is usually negative, so that the overall consequences are similar to what we have described above: the effect on average productivity and export sales is ambiguous. Similarly, if the matching efficiency rises, productivity and export sales need not go up. However, our simulations show that an increase in export sales is very likely while negative effects on average productivity are probable, too (see Felbermayr and Jung, 2008b, for more details). It follows that trade promotion by subsidizing the matching process, e.g., through publicly financed trade fairs, may appear superficially successful in that exports go indeed up, but may turn out to fail with respect with the intended productivity and growth effects.

6. Conclusions

The model is close to the frontier of analytical tractability. Hence, theoretical extensions require to restrict the analysis to certain channels, thereby reducing complexity in some elements and enriching the setting in some other areas. This has be done in some companion papers. In Felbermayr and Jung (2008a) we set up a general equilibrium model, where GIs endogenously emerge, but following Chaney (2008) the number of producers is fixed. However, in that framework producers are given an outside option in the bargaining, namely to recycle a certain fraction of the goods produced if the match fails. We analyze the role of distance and country size for the relative prevalence of export modes.

Second, in Felbermayr and Jung (2008b), we find that a reduction in fixed foreign market entry costs may lower industry productivity. This result qualitatively continues to hold in the framework of the present paper, where market conditions endogenously determine market access costs, and also affect variable trade costs simultaneously.

This paper provides a general equilibrium framework with heterogeneous firms, in which trade in goods may occur in an indirect mode, via specialized general importers, or directly, via producers' sales affiliates in foreign countries. We therefore offer a theoretical explanation for a key stylized fact, namely, the existence of trade intermediation. This fact has not been explored systematically in the recent trade literature.[19]

In our extension of the Melitz (2003) model, producers have the option to search for foreign general importers and use them as trade intermediaries or access the foreign market through an own sales affiliate. Relative to the second option, the first option saves fixed costs but requires sharing profits with the intermediary. Importantly, our model partly endogenizes trade costs, since expected the expected costs of searching for a general importer are endogenous in the model and determined by the entry decisions of both producers and importers. Hence, our framework contributes towards a better understanding of trade costs that are not covered by tariffs or transportation costs and that may differ systematically across countries.

Compared to the received literature, we broaden the notion of firm heterogeneity and allow firms to differ with respect to the degree of tradability of their goods, the strength of their brand names, and their marginal costs of production. Our key result shows that exporting via a general importer is an attractive way to access foreign markets when firm characteristics lie in an intermediate range.

Another central result is that the effect of institutional change, such as improving the access to trade fairs, on the volume of trade can theoretically be negative, since some firms that have been exporting through a sales affiliate may find it optimal to use the GI instead, thereby giving up variable revenue, but saving fixed market entry costs. Moreover, our model can relate cross-country heterogeneity in export behavior to the drivers of expected fixed costs. Finally, we find that the emergence of GIs may lower the aggregate productivity level. This result is related to Felbermayr and Jung (2008b), where we analyze the direct effect of fixed-cost liberalization on productivity,

We believe that there are two main avenues of developing the model further. First, general importers usually are multi-product firms. This is true for producers, too, but the incentives to develop product portfolios is stronger for GIs. Eckel and Neary (2006) and Feenstra and Hong (2006) offer promising frameworks to tackle

[19] There are, of course, some notable exceptions, e.g., Schröder et al. (2005).

this extension. Second, we have not modeled the rich incentive problems that arise when a general importer has to exert effort to sell a producer's goods to a foreign market. A formalization of that issue is promising since the fruits of investment in marketing and sales promotion would be shared with the producer. Third, and related to the second potential extension, in the present paper, we have restricted our analysis to the case where contracts are not enforceable altogether. A natural extension lies in a more flexible approach, where the degree of contractability is variable. In reality there is a rich panoply of different arrangements between producers and foreign retailers, ranging from licensing to franchising agreements. All this alternative forms of interaction involve some way of solving the double marginalization problem inherent in our analysis. We believe that bringing the rich industrial organization literature into a model of our type could further cast light on the structure of trade costs between two countries.

Regarding empirical analysis, the present paper would motivate a formal econometric study that analyzes the choice of export modes in the presence of heterogeneous firms. As firm level data becomes more widely available for a larger array of countries and a richer set of variables, empirical analysis of our mechanism should become viable in the close future.

References

Alessandria, George (2004). International Deviations from the Law of One Price: the Role of Search Frictions and Market Share. *International Economic Review* 45(4): 1263–1291.

Anderson, James E. and Eric van Wincoop (2004). Trade Costs. *Journal of Economic Literature* 42(3): 691–751.

Antras, Pol and Elhanan Helpman (2004). Global Sourcing. *Journal of Political Economy* 112(3): 552–580.

Baldwin, Richard E. (1988). Hysteresis in Import Prices: The Beachhead Effect. *American Economic Review* 78(4): 773–785.

Bergin, Paul R. and Reuven Glick (2007). Tradability, Productivity, and Understanding International Economic Integration. *Journal of International Economics* 73(1): 128–151.

Bernard, Andrew, J. Bradford Jensen and Peter K. Schott (2006). Transfer Pricing by U.S.-Based Multinational Firms. *Tuck School of Business Working Paper* 2006-33.

Besedeš, Tibor and Thomas J. Prusa (2006). Ins, Outs, and the Duration of Trade. *Canadian Journal of Economics* 39(1): 266–295.

Casella, Alessandra, and James E. Rauch (2002). Anonymous Markets and Group Ties in International Trade. *Journal of International Economics* 58: 19–48.

Chaney, Thomas (2008). Distorted Gravity: The Intensive and Extensive Margins of International Trade. *American Economic Review*. forthcoming.

Combes, Pierre-Philippe, Miren Lafourcade and Thierry Mayer (2005). The Trade Creating Effects of Business and Social Networks: Evidence from France. *Journal of International Economics* 66: 1–29.

Cummins, John and Gianluca Violante (2002). Investment-Specific Technical Change in the U.S. (1947–2000): Measurement and Macroeconomic Consequences. *Review of Economic Dynamics* 5(2): 243–284.

Drozd, Lukasz A. and Jaromir B. Nosal (2007). Marketing Frictions and International Pricing Anomalies. Mimeo: University of Minnesota.

Eckel, Carsten and Peter Neary (2006). Globalization and Multi-product Firms. Mimeo: Oxford University.

Egan, M. L. and A. Mody (1993). Buyer Seller Links in Export Development. *World Development* 20(3): 321–334.

Feenstra, Robert C. Gordon H. Hanson and Songhua Lin (2004). The Value of Information in International Trade: Gains to Outsourcing through Hong Kong. *Advances in Economic Analysis & Policy* 4(1): Article 7.

Feenstra, Robert C. and Gordon H. Hanson (2004). Intermediaries in Entrepôt Trade: Hong Kong Re-Exports of Chinese Goods. *Journal of Economics and Management Strategy* 13: 3–36.

Feenstra, Robert C. and Hong Ma (2007). Multiproduct Firms Under Heterogeneous Costs and Monopolistic Competition. Mimeo: University of California, Davis.

Felbermayr, J.Gabriel and Benjamin Jung (2007). Business News, Bayesian Updating, and Bilateral Trade. Mimeo: University of Tübingen.

Felbermayr, J. Gabriel and Benjamin Jung (2008a). Trade Intermediaries, Incomplete Contracts, and the Choice of Export Modes. Mimeo: University of Tübingen.

Felbermayr, J. Gabriel and Benjamin Jung (2008b). Sorting It Out: Technical Barriers to Trade and Industry Productivity . Mimeo: University of Tübingen.

Fryges, Helmut (2006). Hidden Champions – How Young and Small Technology-Oriented Firms Can Attain High Export-Sales Ratios. *ZEW Discussion Paper* No. 06-045.

Fryges, Helmut (2007). Change of Sales Modes in International Markets: Empirical Results for German and British High-Tech Firms. Progress in International Business Research 1: 139–185.

Greif, Avner (1993). Contract Enforceability and Economic Institutions in Early Trade: the Maghribi Traders' Coalition. *American Economic Review* 83(3): 525–548.

Grossman Gene M. and Elhanan Helpman (2002). Integration Versus Outsourcing in Industry Equilibrium. *Quarterly Journal of Economics*: 85–120.

Hakansson, Harald (1982). International Marketing and Purchasing of Industrial Goods. IMP Project Group, Wiley and Sons.

Helpman, Elhanan (2006). Trade, FDI, and the Organization of Firms. *Journal of Economic Literature* 44: 589–630.

Helpman, Elhanan, Marc Melitz and Stephen R. Yeaple (2004). Export Versus FDI with Heterogeneous Firms. *American Economic Review* 94(1): 300–316.

Kleinert, Jörn and Farid Toubal (2005). A Structural Model of Export versus Affiliates Production. *Tübingen Discussion Paper* 288.

Kleinert, Jörn and Farid Toubal (2006). Dissecting FDI. Mimeo: Hitotsubashi University Tokyo.

Krautheim, Sebastian (2007). Export-Supporting FDI. EUI Working Papers ECO 2007/24.

Krugman, Paul R. (1979). Increasing Returns, Monopolistic Competition, and International Trade. *Journal of International Economics* 9(4): 469–479.

Melitz, Marc (2003). The Impact of Trade on Intraindustry Reallocations and Aggregate Industry Productivity. *Econometrica* 71: 1695–1725.

Neary, Peter (2007). Trade Costs and Foreign Direct Investment. Mimeo: Oxford University.

Peng, Mike and Anne Y. Ilinitch (1998). Export Intermediary Firms: A Note on Export Development Research. *Journal of International Business Studies* 29(3): 609–620.

Peng, Mike, and Anne Y. York (2001). Behind Intermediary Performance in Export Trade: Transactions, Agents, and Resources. *Journal of International Business Studies* 32(2): 327–346.

Pissarides, Christopher A. (2000). Equilibrium Unemployment Theory. Cambridge, MA.: MIT Press.

Raff, Horst and Young-Han Kim (2005). Optimal Export Policy in the Presence of Informational Barriers to Entry and Imperfect Competition. *Journal of International Economics* 49: 99–123.

Rauch, James E. (1999). Networks versus Markets in International Trade. *Journal of International Economics* 48:7–35.

Rauch, James E. and Vitor Trindade (2002). Ethnic Chinese Networks in International Trade. *Review of Economics and Statistics* 84(1): 116–130.

Rauch, James E. and Watson, Joel (2003). Starting Small in an Unfamiliar Environment. *International Journal of Industrial Organization* 21(7): 1021–1042.

Reed, Robert R. and Trask, Kathleen A. (2006). Decentralized International Exchange. *Canadian Journal of Economics* 39(2): 516–543.

Rose, Andrew (2007). The Foreign Service and Foreign Trade: Embassies as Export Promotion. *World Economy* 30(1): 22–38.

Schröder, Philipp J.H, Harold H. Trabold, and Parvati Trübswetter (2005). Intermediation in Foreign Trade: When do Exporters Rely on Intermediaries? *Applied Economics Quarterly* 51: 2005.

Spulber, Daniel (1999). *Market Micro-structure: Intermediaries and the Theory of the Firm*. Cambridge, UK: Cambridge University Press.
Trabold, Harald (2002). Export Intermediation. An Empirical Test of Peng and Ilinitch. *Journal of International Business Studies* 33(2): 327–344.
Turnbull, P.W. and M.T. Cunningham (1981). *International Marketing and Purchasing*. Palgrave Macmillan.

Appendix

Proof of Equation (6)
The problem of the producer is

$$\max_{x(\omega)} \beta J(\omega) - a(\omega)\tilde{\tau}(\omega)x\left[p^G(\omega)\right] \tag{20}$$

subject to $x(\omega) = H\frac{\zeta(\omega)^{\sigma-1}}{p(\omega)^{\sigma}}$, where $J(\omega) = p^G(\omega)x\left[p^G(\omega)\right] - f^M$. The first order condition

$$\frac{\sigma-1}{\sigma}\beta H^{\frac{1}{\sigma}}\zeta(\omega)^{\frac{\sigma-1}{\sigma}}x(\omega)^{-\frac{1}{\sigma}} = a(\omega)\tilde{\tau}(\omega) \tag{21}$$

implies $p^G(\omega) = a(\omega)\tilde{\tau}(\omega)/(\rho\beta)$..

Proof of Equation (14)
We need to establish the parameter restriction that ensures that for given θ ensures a interior solution to the equilibrium sorting problem. We can write the flow profits associated to each mode of operation, $mode \in \{D, SP, F\}$ as the following set of equations:

$$\delta^P V^{SP}(A) \quad = \quad s(\theta)\beta^{\sigma}B(\overline{\tau}A)^{1-\sigma} - \left\{s(\theta)\beta f^M + \left[1-s(\theta)\right]c^P\right\} \tag{22}$$

$$\pi^F(A) \quad = \quad B(\overline{\tau}A)^{1-\sigma} - f^F \tag{23}$$

$$\pi^D(A) \quad = \quad BA^{1-\sigma} - f^D, \tag{24}$$

We establish a lower and an upper bound, $\underline{f}$ and $\overline{f}$, respectively, to the expected fixed costs of the search mode *SP*. First, to pin down $\underline{f}$, we search for the intercept of $\delta^P V^{SP}(A)$ that solves $\delta^P V^{SP}(A_D) = 0$. That condition yields $s(\theta)\beta^{\sigma}B(\overline{\tau}A)^{1-\sigma} - \underline{f} = B\left(A^D\right)^{1-\sigma} - f^D$. Recognizing from (9) that $\left(A^D\right)^{1-\sigma} = f_D/B$, we find the lower bound

$$\underline{f} = s(\theta)\beta^{\sigma}\overline{\tau}^{1-\sigma} f^{D}.$$

The upper bound is found by finding the intercept $\overline{f}$ for which $\delta^{P}V^{SP}\left(\tilde{A}\right)=0$ with $\tilde{A}$ determined by the condition $\pi^{F}\left(\tilde{A}\right)=0.$ We have $s(\theta)\beta^{\sigma}B\left(\overline{\tau}\tilde{A}\right)^{1-\sigma}-\overline{f}=0.$ Recognizing from (5) that $\tilde{A}=\overline{\tau}^{\sigma-1}f^{F}/B^{j}$, we find the upper bound

$$\overline{f} = s(\theta)\beta^{\sigma} f^{F}.$$

Collecting results, the condition on the intercept of (22) $-\underline{f} < s(\theta)\beta f^{M} + \left[1-s(\theta)\right]c^{P} < \overline{f}$ can be written as

$$\overline{\tau}^{1-\sigma} f_{D} < \beta^{-\sigma}\left[\beta f^{M} + \frac{\delta c^{P}}{\eta(\theta)}\right] < f^{F}, \tag{25}$$

where we have made use of the definition $s(\theta)\equiv\eta(\theta)/\left[\delta+\eta(\theta)\right].$ Condition (25) is the one that appears in condition (14).

Proof of Comparative Statics with Respect to θ.

Consider how an increase in θ affects the $\delta^{P}V^{SP}(A)$ locus (22): first, the locus becomes steeper since $s^{'}(\theta)>0;$ second, the locus shifts up (down) if $\beta f^{M} <(>) c^{P}.$ Focusing on the case where $f^{M}=0,$ the locus always shifts up.

Using "hats" to denote proportional changes, the cutoff levels A_{ij}^{SP} and A_{ij}^{F} change as follows:

$$\hat{A}^{SP} = \frac{\gamma}{\sigma-1}\hat{\theta}, \tag{26}$$

where γ is the elasticity of the matching function with respect to the number of searching GIs. Similarly, we have

$$\hat{A}^{F} = -\frac{\gamma}{\sigma-1}\frac{\delta}{\delta+\eta(\theta)}\beta^{\sigma}\hat{\theta} < -\hat{A}^{SP}, \tag{27}$$

where the inequality follows from the fact that both $\delta/\left[\delta+\eta(\theta)\right]$ and β^{σ} are strictly smaller than unity.

Proof of the Recursivity Result

Consider again the GI's share of the expected surplus. Using (7) and the Pareto assumption, we find an expression for the expected surplus

$$E\left[J\left(A\right)\right]=\frac{k\sigma B\left(\overline{\tau}\beta^{-1}\right)^{1-\sigma}}{k-\left(\sigma-1\right)}\frac{\left(A^{SP}\right)^{k-\left(\sigma-1\right)}-\left(A^{F}\right)^{k-\left(\sigma-1\right)}}{\left(A^{SP}\right)^{k}-\left(A^{F}\right)^{k}}. \tag{28}$$

The independence of expected surplus of the demand level B and the homogeneous part of the trade costs $\overline{\tau}$ directly follows from inserting the cutoff profit conditions (9), (13), and (14) into (28). The in dependence of θ of B and $\overline{\tau}$ immediately follows from the free entry condition (18).