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**CENTRE
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INTERNATIONALES**

No 2007 – 21
December

Does FDI in Manufacturing Cause FDI in Business Services? Evidence from French Firm-Level Data

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DOES FDI IN MANUFACTURING CAUSE FDI IN BUSINESS SERVICES?

NON TECHNICAL SUMMARY

In most developed economies the services sector accounts for approximately two thirds of GDP and is its most dynamic component. While consumer services as retail or entertainment mainly satisfy final demand, a large share of the output of business services sectors as telecommunication, IT or consulting is used as an intermediate input in the manufacturing sector. It is therefore often claimed, both by academics and by policy makers, that the opening of services sectors to international competition would not only benefit the services sectors themselves but also downstream manufacturing sectors. One channel through which such benefits may materialise is through the international relocation of efficient services firms to economies in which the services sector is comparatively inefficient.

This paper uses a large French firm-level dataset to evaluate the determinants of location choices in services. In a first step, estimates for four broad services sectors are compared to the estimates for the manufacturing sector in a gravity type of framework. It is shown that the parameter estimates of a gravity type of model for services are fairly close to the ones in manufacturing. Location choice probabilities in services decrease with distance but increase with cultural proximity, a shared border and market potential. The effect of GDP per capita varies across services subsectors. While it is negative for total services and transport, it is insignificant for business services, retail and finance.

In a second step, we check whether similarity in estimated parameters for manufacturing and services is due to a complementarity, in the sense that manufacturing location choices may influence location choices in services. A particularly appropriate services sector for this purpose is the business services sector for which input-output linkages with the manufacturing sector are strong. It is found that the downstream demand of French manufacturing affiliates has a positive effect on the location choice probabilities of French business services affiliates. In the preferred specification a doubling of downstream demand in a location would lead to an 20% increase in the probability of French business services affiliates of choosing this location. This effect is robust to controlling for unobserved determinants of the choice probabilities that may possibly be correlated with the downstream demand variable. Granger causality tests provide further evidence on a causal effect of manufacturing downstream demand on business services FDI in the sense that manufacturing downstream demand causes FDI in business services but that the reverse does not hold true. In contrast, there is no empirical evidence for a complementarity in location choices between manufacturing and retail, a services sector for which input output-linkages with manufacturing are weak. This lends plausibility to the proposed mechanism underlying the complementarity in location choices between manufacturing and business services that depends critically on strong input-output linkages between the two sectors.

The obtained results weaken the view often advanced by policy makers that developed economies can be expected to increasingly specialise in services whereas developing economies can be expected to specialise in manufacturing. While the empirical analysis supports this view for services sectors depending mainly on local final demand, as for instance retail, it is not supported for the business services sector that depends strongly on demand from manufacturing. A continuing trend in manufacturing offshoring may be accompanied by increased business services offshoring.

ABSTRACT

This paper uses a large French firm-level dataset to evaluate the determinants of location choices in services. In a first step, estimates for four broad services sectors are compared with the estimates for the manufacturing sector in a gravity type of framework. Using a discrete choice model it is found that this framework does fairly well in explaining location choices in services and that the parameter estimates for services are close to the ones for manufacturing. It is then investigated whether the similarity in estimated parameters is due to a complementarity between location choices in manufacturing and in services, in the sense that manufacturing location choices may cause the location of services. A particularly appropriate services sector for this purpose is the business services sector for which input-output linkages with the manufacturing sector are particularly strong. It is found that the downstream demand of French manufacturing firms has a positive effect on the location choice probabilities of French business services firms. This effect is robust to controlling for unobserved determinants of the choice probabilities that may possibly be correlated with the downstream demand variable.

JEL Classification: F13, F15, L80

Keywords: FDI, Services, Gravity Model, Discrete Choice Model

**LES INVESTISSEMENTS MANUFACTURIERS L'ÉTRANGER CAUSENT-ILS CEUX DANS
LES SERVICES AUX ENTREPRISES ?**

RÉSUMÉ

Dans la plupart des pays développés, le secteur des services représente environ les deux tiers du PIB et constitue sa composante la plus dynamique. Alors que les services au consommateur tel que le commerce de détail ou les activités récréatives satisfont plutôt une demande finale, une part importante de la production des services aux entreprises comme les télécommunications, les activités de conseil en systèmes informatiques ou de consultant est employée comme consommation intermédiaire par le secteur manufacturier. Dès lors, il est souvent affirmé à la fois par les universitaires et les décideurs publics que l'ouverture des secteurs de service à la concurrence internationale ne serait pas bénéfique seulement à ces secteurs, mais également aux secteurs manufacturiers avals, grâce à la rélocalisation d'entreprises productives de service vers des économies où ce secteur est relativement inefficace.

Cet article utilise une base de données d'entreprises françaises pour estimer les déterminants des choix de localisation dans les services. Dans une première étape, on compare les résultats obtenus pour quatre secteurs de service à ceux du secteur manufacturier dans un cadre d'équation de gravité. On montre alors que les coefficients estimés pour les différents secteurs de service sont proches de ceux obtenus pour le secteur manufacturier. La probabilité de localiser l'activité dans un pays étranger donné diminue avec la distance et augmente avec la proximité culturelle, l'existence d'une frontière commune et le marché potentiel. L'effet du PIB par habitant varie entre secteurs de service. Alors que l'effet est négatif pour l'ensemble des secteurs de service et les transports, il s'avère non significatif pour les services aux entreprises, le commerce et la finance.

Dans une seconde étape, nous examinons si la similarité entre les coefficients estimés pour le secteur manufacturier et ceux de services est due à une complémentarité entre la localisation des entreprises de ces secteurs. En effet, il se peut que les choix de localisation dans le secteur manufacturier influencent ceux des entreprises des secteurs de service. Un secteur pertinent pour examiner cette question est celui des services aux entreprises pour lequel les liens amont-avals avec le secteur manufacturier sont particulièrement forts. On montre alors que la demande avale de filiales françaises manufacturières dans un pays donné a un impact positif sur la probabilité de localisation des filiales françaises de service dans ce pays. Dans la meilleure spécification, un doublement de la demande avale dans une localisation se traduit par une hausse de 20% de la probabilité de choisir cette localisation pour une filiale française de service. Cet effet est robuste lorsqu'on contrôle pour la présence éventuelle de variables inobservées susceptibles d'être corrélées à la demande avale. Des tests de causalité montrent que la demande avale a un effet causal sur la localisation des filiales de service aux entreprises, mais que l'inverse ne semble pas vérifié. A l'inverse, les résultats empiriques ne confortent pas la complémentarité entre les choix de localisation des filiales dans le secteur manufacturier et dans la distribution, entre lesquelles les relations amont-avals sont faibles. Ce résultat renforce la plausibilité du mécanisme proposé reliant complémentarité entre localisation des filiales de service et manufacturières, et importance des liens amont-avals entre les deux secteurs.

Les résultats obtenus fragilisent l'argument fréquemment avancé par les décideurs publics quant à la spécialisation des économies développées dans les services, et des pays en dé-

veloppement dans les secteurs manufacturiers. Si les résultats empiriques confortent cette position dans le cas des services tournés vers une demande finale, ce n'est pas le cas d'autres secteurs comme celui des services aux entreprises, qui dépendent largement de la demande adressée par le secteur manufacturier. Ainsi, une augmentation progressive des délocalisations dans le secteur manufacturier pourrait être accompagnée d'une tendance similaire dans le secteur des services aux entreprises.

RÉSUMÉ COURT

On utilise une base de données d'entreprises françaises pour évaluer les choix de localisation dans les secteurs de services. Dans une première étape, les coefficients estimés pour quatre secteurs de services sont comparés à ceux du secteur manufacturier dans un cadre d'équation de gravité. Sur la base d'un modèle de choix discrets, nos résultats suggèrent que ce cadre rend relativement bien compte des choix de localisation dans les services et que les coefficients estimés sont assez proches de ceux obtenus pour le secteur manufacturier. Dans une seconde étape, nous examinons la possibilité que la similarité entre les coefficients estimés pour le secteur manufacturier et ceux des services soit due à une complémentarité entre la localisation des entreprises de ces secteurs. En effet, il se peut que les choix de localisation dans le secteur manufacturier influence ceux des entreprises des secteurs de services. Un secteur pertinent pour examiner cette question est celui des services aux entreprises pour lequel les liens amont-avals avec le secteur manufacturier sont particulièrement forts. On montre alors que la demande avale de filiales françaises manufacturières a un impact positif sur la probabilité de localisation des filiales françaises de services dans un pays donné. Cet effet est robuste lorsqu'on contrôle pour la présence éventuelle de variables inobservées susceptibles d'être corrélées à la demande avale.

Classification *JEL* : F13, F15, L80

Mots Clefs : Commerce International, Services, Modèle de Gravité, Modèle de Choix Discrets

DOES FDI IN MANUFACTURING CAUSE FDI IN BUSINESS SERVICES?

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1 Introduction

In most developed economies the services sector accounts for approximately two thirds of GDP and is its most dynamic component. While consumer services as retail or entertainment mainly satisfy final demand, a large share of the output of business services sectors as telecommunication, IT or consulting is used as an intermediate input in the manufacturing sector. In 2002, for instance, 3% of the output of French retail firms went to downstream manufacturing firms as compared to 20% of the output of French business services firms. It is therefore often claimed, both by academics and by policy makers, that the opening of services sectors to international competition would not only benefit the services sectors themselves but also downstream manufacturing sectors.³ One channel through which such benefits may materialise is through the international relocation of efficient services firms to economies in which the services sector is comparatively inefficient.

While the location choices of multinational firms in the manufacturing sector are relatively well understood, there exists virtually no evidence on location choices of services firms.⁴ Manufacturing firms locate in a foreign country to access the market (horizontal FDI) or to access lower cost production factors (vertical FDI). It is well known that empirically the model underlying the location choices of manufacturing firms can be approximated by a gravity relationship that links bilateral FDI in manufacturing to proxies for bilateral trade costs between two locations and their respective economic masses as proxied by GDPs. At first glance, there is no reason to expect the model driving location choices of services firms to be fundamentally different from the one driving location choices in manufacturing even though some determinants of location choices in manufacturing may have a quantitatively different effect in services.⁵ However, this would not take into account that services firms are suppliers of manufacturing firms and that there may be an interdependence between their location choices. When a manufacturing firm decides to relocate its production to a foreign country through foreign direct investment (FDI), this increases the probability of its services suppliers to engage in FDI in the same foreign country if the supply of services requires geographic proximity. Even though this argument is valid for manufacturing firms as well, it is likely to be more relevant for services firms given the higher degree of non

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³See, for instance, Hoekman (2006) or Arnold et al. (2006) for academic contributions and WTO (2001) or EC (2002) for the views of policy makers.

⁴On the location choices of manufacturing firms see Head et al. (1995), Head & Mayer (2004), Amiti & Javorcik (2006), or Mayer et al. (2007) among others.

⁵Barba Navaretti and Venables (2004:136) point out that trade costs are prohibitively high in some services sectors so that supplying foreign markets through exports is not a viable alternative to FDI. For instance, this could result in a different effect of distance on location choices.

tradeability of its output. While a manufacturing supplier does not necessarily have to follow its downstream customer after relocation but can instead supply it through exports, many services cannot easily be traded internationally. On July 12, 2007, for instance, the French newspaper *Le Monde* reported that the French automobile constructor Renault plans to open an R&D affiliate close to an assembly plant in India to develop a low cost automobile for the Indian market. In contrast to the classical notion of services offshoring, this planned investment is not determined by factor cost reducing motives but by the downstream demand for R&D services of the assembly plant.

The objective of this paper is twofold. Firstly, it investigates whether the traditional empirical location choice model for manufacturing firms is applicable to services firms and to which extent parameter estimates differ between services and manufacturing. Secondly, it tests whether the location choices of manufacturing firms and services firms, in particular business services, are interdependent.⁶ Policy makers often advance the argument that the current offshoring trend in manufacturing reflects different patterns of comparative advantage in developed and developing countries. Developed economies are expected to specialise increasingly in services whereas developing economies are expected to specialise in manufacturing. However, this argument is weakened if it is shown that FDI decisions in services are closely related to FDI decisions in manufacturing. In the presence of a complementarity, the countries attracting the largest shares of manufacturing FDI would also attract the largest shares of services FDI.

To estimate the determinants of location choices of services firms and the interdependence between manufacturing and services FDI, we fit several discrete locational choice models to a large dataset of French multinational firms. First, we estimate a conditional logit model including the standard ‘gravity’ variables separately for aggregate services and for four disaggregate services sectors. Then, we construct a variable measuring the downstream demand of French manufacturing affiliates for every host country. To this end, we combine the detailed information on employment and sector of the French firm-level data with French input-output tables. We augment the specification for the business services sector by the downstream demand of French manufacturing affiliates and find that it has a positive effect on the choice probability of French business services firms. This result is robust to a number of changes in specification. Importantly, we find that it is robust to controlling for unobserved determinants of the choice probability that may possibly be correlated with the downstream demand variable. While we do not include country fixed effects to control for fixed unobserved determinants of the choice probability because the time dimension of our panel is short, we are able to devise various ways to deal with potential omitted variable bias. First, we control for time-invariant determinants of a country’s attractiveness by including the initial stock of business services affiliates and find that the estimated effect of downstream manufacturing demand on business services FDI remains unchanged. Second, we compute a yearly indicator of a country’s ‘revealed attractiveness’ from aggregate FDI inflow data, which allows us to partly control for unobserved shocks to a country’s attractiveness. Again, we find that size and statistical significance of the estimated effect of manufacturing demand on the choice probability of business services FDI remain unchanged. The positive effect on the choice probability is also robust to a nested logit specification that appropriately takes into account the sequential structure of firms’ location decisions. To disentangle causality

⁶In this paper a broad definition of business services is adopted. It encompasses postal & telecom services, rental of transport equipment & machinery, IT services, R&D and business services in the narrow sense (legal, accounting, consulting, personnel, marketing, etc.)

between FDI in business services and manufacturing downstream demand, we finally run Granger causality tests and find that it is indeed downstream manufacturing demand that causes FDI in business services in the Granger sense and not vice versa.

This paper contributes to the literature in three ways. Firstly, it shows that the model explaining location choices of manufacturing firms does reasonably well in explaining location choices of services firms. There does therefore not appear to be a fundamental difference in the model underlying location choices of the two types of firms. Secondly, this paper demonstrates that the location choices of manufacturing firms and services firms are interdependent in the sense that the probability of FDI in business services increases with the downstream demand generated by FDI in manufacturing. While anecdotal evidence on this complementarity abounds, this paper is the first to provide statistical evidence on this complementarity by constructing detailed indicators of downstream manufacturing demand from firm-level data. Thirdly, this paper weakens the argument that developed economies can specialise in services in the face of increased offshoring in manufacturing. If services location choices are to a large extent determined by manufacturing location choices, then domestic services production will decrease together with domestic manufacturing production.

The remainder of the paper is structured as follows. Section 2 sets out a simple model that guides the empirical analysis. Section 3 describes the data and section 4 presents descriptive statistics on correlations between location choices in manufacturing and business services and input-output linkages between these two sectors. The econometric results on the complementarity between location choices in manufacturing and in business services are presented in section 5. We check for the plausibility of the proposed mechanism by estimating a model for FDI in retail services, for which input-output linkages with manufacturing are weak and for which the complementarity with manufacturing FDI is therefore expected to be low. The results which confirm this conjecture are reported in section 6 together with the results for total services FDI and further robustness checks. Section 7 concludes.

2 Econometric Model

Our econometric model of the determinants of location choices of French business services affiliates draws on recent derivations of structural location choice models (see, for instance, Head & Mayer, 2004). In these models operational profits of an affiliate from market i that locates in market j depend log-linearly on marginal costs and demand or market potential:

$$\pi_{ij} = \beta_0 + \beta_1 c_{ij} + \beta_2 mp_{ij}, \quad (1)$$

π_{ij} denotes operational profits of an affiliate from market i locating in market j , β_0 is a constant, c_{ij} its marginal cost and mp_{ij} the market potential faced by the affiliate. All variables are expressed in natural logarithms. For ease of exposition, in the following we will denote country i as France and consider the example of a business services affiliate.

In the calculation of market potential in market j for a French business services affiliate, there is, in general, no distinction between demand exerted by French firms and consumers and demand exerted by firms and consumers of other countries. This does not take into account that French firms or consumers may have a consumption bias in favour of French affiliates located in their country of establishment, which may be particularly relevant for the business services demand of French manufacturing affiliates located abroad. Instead of consuming business services from foreign providers or importing business services from

France, they may prefer to consume business services from French providers that are located in the same foreign country. The rationale is that business services are often specifically tailored to the manufacturing firms' demands and often require a high level of complex 'face to face' communication. In the presence of such a consumption bias, standard measures of market potential may be an insufficient measure of market potential for French business services firms. Even if the standard measure of market potential is small, market potential for a French business services firm may be large if there is a disproportionately large number of French manufacturing firms demanding French business services located in this market. We therefore decompose the standard market potential measure into a component emanating from final consumers and firms from all countries except France and a component emanating from French final consumers and firms: $mp_{ij} = mp_{ij}^{-i} + mp_{ij}^i$, where mp_{ij}^{-i} denotes market potential from all countries except France and mp_{ij}^i market potential emanating from French final consumers and firms. A market potential measure corrected for consumption bias may be written as $mp_{ij} = mp_{ij}^{-i} + (1 + \lambda)mp_{ij}^i$, where $\lambda > 0$ measures the strength of the consumption bias. The expressions for the standard market potential measure and the consumption bias corrected market potential can be combined to yield $\tilde{m}p_{ij} = mp_{ij} + \lambda \cdot mp_{ij}^i$. With $\lambda > 0$ there is a positive consumption bias and the standard measure of market potential is underestimated. The larger the demand of final consumers and affiliates from country i , in our case France, that are established in country j , the larger is the absolute value of the underestimate.⁷ Only a small part of business services production is consumed by final consumers so that it appears plausible to interpret mp_{ij}^i as a measure of downstream demand of French manufacturing affiliates for the output of French business services affiliates located in their country of establishment. It is thus convenient to re-label mp_{ij}^i as dd_{ij}^i , a mnemonic for downstream demand. Substituting the consumption bias corrected measure of market potential for the standard measure of market potential in equation (1) then yields:

$$\pi_i = \beta_0 + \beta_1 c_{ij} + \beta_2 mp_{ij} + \gamma dd_{ij}^i, \quad (2)$$

where $\gamma \equiv \beta_2 \lambda$. Note that equation (2) is a generalisation of equation (1), in the sense that the latter is a special case of equation (2) with $\lambda = 0$. For $\lambda > 0$ profits of a French business services affiliate from locating in market i decrease not only with marginal costs of production and increase with market potential but also increase with downstream demand from French manufacturing affiliates located in market i .

In the empirical implementation the three main profit determinants in equation (2) are proxied as follows. Marginal costs of production in business services are mainly determined by local wages which are proxied by GDP per capita. Further, they may depend on transaction costs with the parent company in France which can be proxied by geographical distance, indicator variables for common language and common border and other indicator variables for cultural proximity as, for instance, colonial ties in the past. Market potential for business services is proxied by the Head & Mayer (2004) market potential variable.⁸ It is essentially a weighted sum of expenditures in all markets, where the weights are given by market access and the inverse of the degree of competition.

The second term in equation (2), the downstream demand from French manufacturing firms is proxied by the following variable:

⁷In general, the underestimate will be largest in absolute value for mp_{ii} , i.e., in the affiliate's origin country, in our case France.

⁸This variable has kindly been made available by Thierry Mayer.

$$dd_i = \frac{\beta^b}{\tau_{ii}} \sum_{m=1}^M a^m y_i^m, \quad (3)$$

where β^b is the share of business services output that is used as intermediate input in other sectors, a^m is the share of manufacturing sector m in intermediate demand for business services, and y_i^m is output of manufacturing sector m in country i . The coefficients β^b and a^m are obtained for every year from French input-output tables. This amounts to assuming that the unit input demands of French manufacturing affiliates abroad are similar to the input demands of manufacturing establishments located in France. Production of foreign manufacturing affiliates is not available in the French firm-level data so that it is chosen to proxy production by employment.⁹ One concern with the downstream manufacturing variable is simultaneity: An unobserved variable may determine both profits in business services and employment in downstream manufacturing. In a first attempt to address potential endogeneity concerns we choose to lag the downstream demand variable by one period so that transitory shocks that affect simultaneously profits in business services and employment in downstream manufacturing do not bias our estimated coefficients. In the econometric analysis below we devise further means to control for time-invariant and time-varying unobserved variables that may determine simultaneously profits in business services and employment in downstream manufacturing.

3 Data

The dependent variable in this paper is FDI by French firms. Information on date and destination country of FDI is from the French annual survey on Financial Linkages (LiFi for *Liaisons Financieres*) that has been conducted every year by the French statistical office since 1985. Firms above given size thresholds are interviewed and asked to report the country of establishment and the financial participations in their affiliates in France and abroad. There are three size thresholds above which groups are recorded by LiFi: Either the group has at least 1.2 millions of euros of portfolio participations, at least 60 millions of euros of shipments, or at least 500 employees.¹⁰ Even though information on the year of investment is not directly available in LiFi, it can be constructed by assuming that the investment takes place in the year the mother company reports the affiliate for the first time. To make sure the affiliate is not erroneously assigned the year of entry of the mother company into LiFi, only new affiliates of pre-existing mother companies are considered as investments. LiFi further contains information on affiliates' employment and sector of activity. From this information a variable measuring sector specific supplies or demands from affiliates of French multinationals can be constructed. Firms that are interviewed once are systematically interviewed in the following years. The number of surveyed firms therefore increases over time. In 2002 the survey provides information on 193,895 manufacturing establishments, both in France

⁹In order to allow for some local trade in business services, y_i actually includes both employment of French manufacturing affiliates in country i and in its immediately neighbouring countries.

¹⁰The following information on financial linkages between parent firms and affiliates is available in LiFi: The country of establishment of the affiliate, the identification number of the French parent firm, share held by the parent in the affiliate, "rank" of the affiliate, defined as the number of firms between the parent and the affiliate.

and abroad, compared to 25,674 in 1985. Since LiFi's coverage is significantly expanded in 1993 we decide to use information on the stock of affiliates from 1993 onwards and consider as FDI only new affiliates of pre-existing mother companies from 1994 onwards.

Over the time period 1994-2002, originally 8605 foreign investments in manufacturing and services in 177 different countries can be identified in LiFi. Affiliates with a missing sector code and affiliates in agriculture, extractive industries and the public sector are not used for the present study.¹¹ Small islands and other countries for which there are not at least ten foreign investments over the sample period are dropped from the sample which results in the loss of 336 foreign investments. Affiliates reporting to be a holding are also dropped from the sample which results in the further loss of 345 observations.¹² The rationale to drop these affiliates is that they can be viewed as pure financial umbrellas that consolidate national balance sheets at a regional level but do not provide any input into the production process.¹³ The final dataset consists of 7804 foreign investments in 76 countries over the period 1994-2002.

Information on destination countries is gathered from different sources. GDP per capita in current dollars is from the World Bank World Development Indicators and the trade cost proxies (distance, common language, common border, former colony) from CEPII's distance database. The aggregate FDI inflow data used to construct the index of a country's 'revealed attractiveness' that is described in the Appendix are from the United Nations Conference on Trade and Development (UNCTAD) FDI database.

4 Descriptive Statistics

The weight of business services in French GDP is increasing. This reflects partly an actual increase in the output of the business services sector and partly an increase in 'outsourcing'. Having the choice between providing business services internally to satisfy the demand for business services generated by their own manufacturing operations or 'outsourcing' to external contractors, it is well documented that manufacturing firms have recently increasingly resorted to the latter.¹⁴ While internally provided business services are often not recorded as business services output but as output of the manufacturing firm, 'outsourced' business services are actually recorded as such if this is the external contractor's main sector of activity. The increase in the weight of business services in French GDP is illustrated in Figure 1.

This trend towards increased 'outsourcing' of business services is also reflected in the French FDI data. Over the sample period the share of affiliates in business services forming part of diversified groups, in the sense that they are active both in manufacturing and in business services, is decreasing. This is shown in Figure 2

Whereas some business services affiliates thus may be set up mainly to supply manufacturing

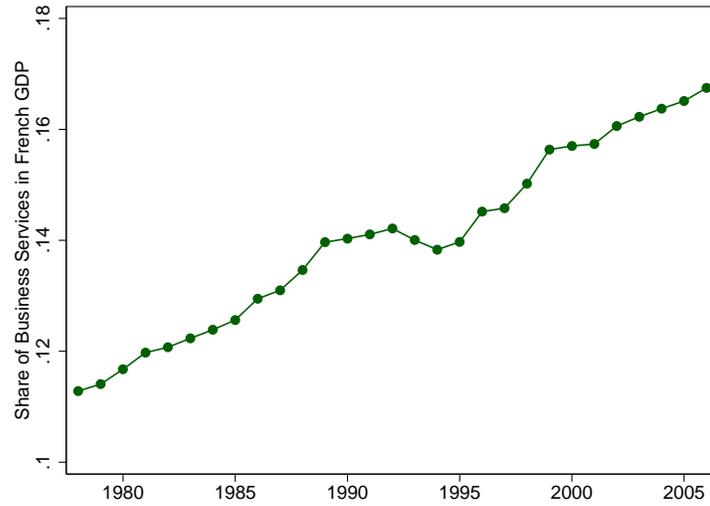
¹¹If the activity code of the affiliate is missing, the LiFi administration replaces it by the activity code of the head in France. When the latter is a holding, the affiliate is assigned the activity code "740A". It is decided to drop all affiliates with this sector code since it is uninformative on the affiliate's sector of activity.

¹²Activity code "741J".

¹³We thank the LiFi administration for pointing this out.

¹⁴See, for instance, Jones & Kierzkowski (2001).

Figure 1: Share of business services in French GDP



Source: INSEE

Figure 2: Share of business services affiliates forming part of diversified groups

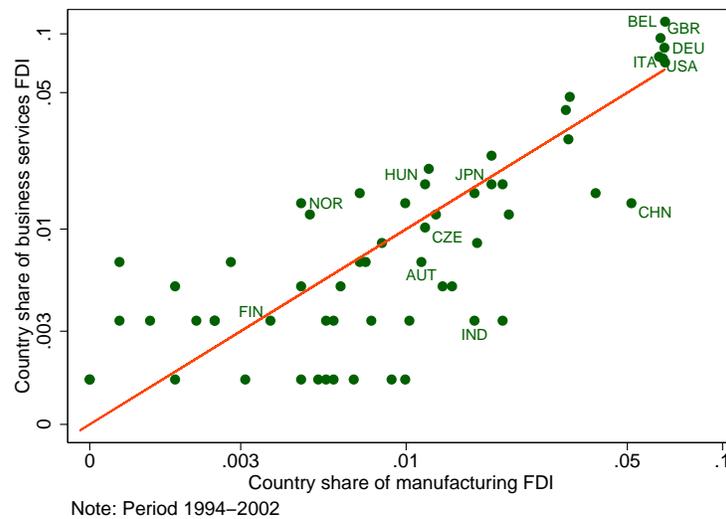


Source: LIFI

affiliates of the same group, it appears that most business services affiliates produce for extra group (French or foreign) establishments. The model in Section 2 generates the prediction

that French business services affiliates locate nearby French manufacturing affiliates, independently of whether they form part of the same group or not. The underlying mechanism is that French manufacturing affiliates have a consumption bias in favour of French business services affiliates located in their country of establishment, due to a high degree of specificity of business services and the ensuing complexity of interactions between provider and customer. This consumption bias holds regardless of whether business services affiliates and manufacturing affiliates form part of the same group. In the empirical analysis it is therefore not distinguished between intra and extra group relationships. Figure 3 shows that there is a strong correlation between a country's share of French affiliates in business services and its share of affiliates in manufacturing. Even though some countries, as for example China and India, appear to receive a disproportionately high amount of manufacturing FDI and some, as for example Hungary and Norway, a disproportionately high amount of business services FDI, most countries are close to the 45 degree line.

Figure 3: Country shares of French business services and manufacturing FDI

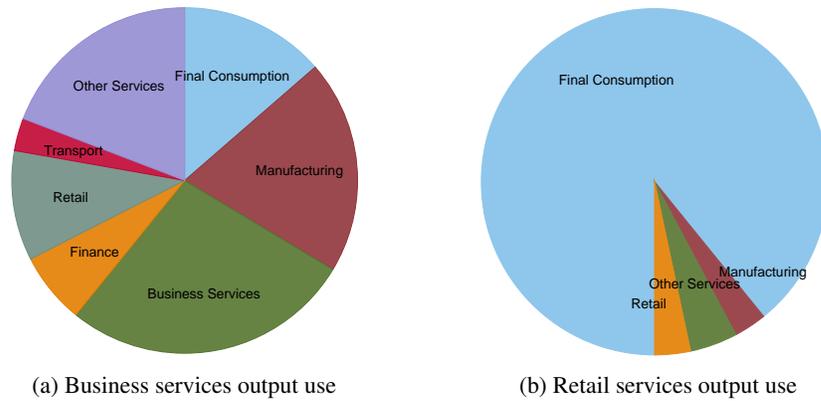


Source: LIFI

Of course Figure 3 is a statement on correlations between FDI in manufacturing and FDI in services that does not allow causal inference. Nevertheless, it suggests that the mechanism outlined in Section 2 is not implausible in the light of the descriptive evidence: French business services affiliates locate where there are many French manufacturing affiliates. The econometric analysis below will spend some effort on testing whether there is indeed a causal link between FDI in manufacturing and FDI in services. Before moving on, Figure 4 provides some further descriptive evidence for the plausibility of the causal link between FDI in manufacturing and FDI in services. Namely, panel (a) of Figure 4 shows that, next to the business services sector itself, manufacturing is the main user of business services. This means that the location of French manufacturing affiliates can plausibly be expected to have

an effect on the location choices of French business services affiliates. This becomes even more apparent if the output use of business services is compared with the output use of retail services in panel (b) of Figure 4. In contrast to business services, the lion's share of the retail service's output goes to final consumption and only a small share is used as an input into manufacturing.

Figure 4: Input output linkages



Source: INSEE

5 Empirical Analysis

5.1 Discrete Choice Models

In Sections 5.2 and 5.3 we estimate conditional logit and nested logit models. In the conditional logit model the dependent variable is a binary variable that takes the value of one if FDI is observed to take place in a particular location and a value of zero if not. McFadden (1974) has shown that under the *Independence of Irrelevant Alternatives* (IIA) assumption the expected probability of investing in a particular location can be restricted to a value between zero and one by expressing it in the form of a conditional logit:

$$P_i = \frac{e^{\theta X_i}}{\sum_{n=1}^N e^{\theta X_n}} \quad (4)$$

The IIA assumption states that the relative probabilities between location choice alternatives depend only on the choice attributes of the alternatives under consideration and not on those of other available alternatives. This is equivalent to the statement of Hensher et al. (2005) that ‘all pairs of alternatives are equally similar or dissimilar’. This statement is unlikely to be valid in the context of location choice since locations with similar income levels or within broad geographical zones are likely to be more similar among themselves than other locations. The validity of the IIA assumption can be tested by using a nested logit model.

In contrast to the conditional logit model, the nested logit model does not rely on the IIA assumption. Instead, it considers a firm’s location choice to be a hierarchical process. In the upper level, the firm is supposed to choose a broad geographical region or broad income level zone and in the bottom level a particular country nested within the upper level nest. The probability of choosing a particular country can then be expressed as the product of the probability of choosing broad income level zone z and the probability of choosing country c conditional on having chosen z . The probability of choosing broad income level zone z is a function of the attributes of that zone and the attributes of all countries within that zone. The latter attributes can be summarised in an inclusive value index that essentially sums over all expected profits of investing in the countries c forming part of z . The inclusive value index measures the sensitivity of the upper level nest with respect to the composition of the bottom level choice set of countries. If the inclusive value index is close to one, the upper level choice is fully dependent on the composition of the bottom level choice set and the choice of country dominates the upper level choice. Adding an alternative to the bottom level choice set of countries increases the probability of choosing the upper level nest one to one. This means that adding an alternative does not reduce the relative probabilities of other available alternatives in the bottom level choice set and that the IIA assumption is valid. On the contrary, if the inclusive value index is close to zero, adding an alternative to the bottom level choice set of countries reduces the relative probabilities of the other available alternatives within this choice set. Put differently, countries within broad income level zones have some locational attributes in common and the IIA assumption is not valid. One drawback of the nested logit model is that the choice of nest structure is somewhat arbitrary. For the present purpose, we have experimented with various nest structures and we have obtained the most satisfactory results by considering as upper level the choice between high, middle and low

income level zones and as bottom level choice the choice of countries.¹⁵

5.2 Determinants of FDI in Services

For the purpose of comparing the estimated coefficients on the determinants of FDI in services to those of FDI in manufacturing, we choose to present only the estimates from a parsimonious conditional logit model on the grounds that unreported results from different specifications of nested logit models are qualitatively the same.¹⁶ Table 1 presents the results from the estimation of this conditional logit model for six different sectors of the French FDI data.

Table 1: Conditional logit by sector

Dependent variable	Choice of Location					
	(1)	(2)	(3)	(4)	(5)	(6)
Sector	Manufacturing	Tot. Services	Bus. Services	Retail	Finance	Transport
In distance	-0.247*** (0.023)	-0.407*** (0.019)	-0.508*** (0.055)	-0.368*** (0.035)	-0.421*** (0.036)	-0.517*** (0.064)
ex Colony	0.182*** (0.055)	0.629*** (0.045)	0.794*** (0.131)	0.242*** (0.091)	0.887*** (0.084)	0.770*** (0.138)
common border	0.634*** (0.056)	0.678*** (0.044)	0.575*** (0.117)	0.814*** (0.079)	0.529*** (0.083)	0.699*** (0.143)
In GDP per capita	-0.143*** (0.021)	-0.037** (0.018)	0.077 (0.055)	0.019 (0.033)	0.009 (0.037)	-0.118** (0.057)
In market potential	0.480*** (0.016)	0.451*** (0.014)	0.471*** (0.039)	0.386*** (0.024)	0.564*** (0.027)	0.384*** (0.044)
N	243,726	345,324	44,398	107,488	93,332	34,402
Investments	3,223	4,570	588	1,421	1,236	455
Likelihood Ratio Index	0.10	0.14	0.18	0.14	0.17	0.11

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 1 illustrates that location choices in services appear to be reasonably well explained by a traditional gravity equation. The likelihood ratio index (LRI) is higher in services than in manufacturing. According to Train (2003) it ranges from zero if the model does no better than a model with zero coefficients in predicting the observed location choice to one if the model predicts the observed location choice perfectly. With respect to the estimated coefficients, it can be shown that with explanatory variables expressed in logarithms and a large number of potential choices the estimated coefficients in the conditional logit model can be interpreted as elasticities of the choice probability with respect to the explanatory variables.¹⁷ The differences in coefficients between the conditional choice models for manufacturing and for services can thus be interpreted as differences in elasticities. Overall, the coefficients on the determinants of location choice in services are similar to those in manufacturing: Distance from France is found to have a negative effect on the probability of investing whereas

¹⁵ Applying a geographical nest structure instead of an income level zone nest structure yields qualitatively similar results (available upon request).

¹⁶ Available upon request.

¹⁷ With the explanatory variable of interest expressed in logarithms, the elasticity of the choice probability with respect to the explanatory variable is given by $\sigma = \beta(1 - P)$, where β is the estimated coefficient and P the choice probability. For a large number of choices the average choice probability is $P \approx 0$ so that the elasticity at the average choice probability is approximately β .

cultural proximity as proxied by an indicator variable for colonial ties in the past, the existence of a common border and market potential are found to have a positive effect. Note that cultural proximity appears to have a larger positive effect on the probability of investing in services than in manufacturing, perhaps because services require a higher degree of face to face communication.¹⁸ The only notable difference between location choices in manufacturing and services appears to be in the estimated coefficient on per capita GDP. Whereas it takes a negative value in manufacturing and may therefore reflect a negative effect of higher wage costs on the probability of investing in manufacturing, it is not statistically significant for business services, retail and finance. There are two possible explanations. Firstly, this result may be due to the fact that per capita GDP does not only proxy for a country's production costs at a given level of skills but also for the country's average skill level. Business services, as for instance IT, and financial services often require highly skilled workers so that the latter effect may prevail in these sectors and a higher per capita GDP increases the probability of investment. Secondly, the GDP per capita variable also captures the stylised fact that countries with high GDP per capita tend to have a larger relative demand for services.

5.3 Does the Location of Manufacturing Determine Business Services Location Choices?

Table 2 illustrates the dependence of business services FDI on manufacturing FDI. In columns (1)-(3) the parsimonious conditional choice model for business services of Table 1 is augmented by a lagged downstream manufacturing demand index, the lagged number of business services investments and a lagged downstream other services demand index. Columns (4)-(6) check the robustness of the obtained results to the IIA assumption by estimating nested logit models of specifications (1)-(3).

Column (1) shows that downstream manufacturing demand of French affiliates appears to exert a positive effect on the probability of business affiliates of choosing a particular location. The estimated elasticity of the choice probability with respect to the downstream manufacturing demand index is around 0.2 and statistically significant at the 1% level.¹⁹ Taken at face value, this estimated elasticity would imply that doubling the downstream demand of French manufacturing affiliates in a particular location would lead to a 20% increase in the probability of French business services affiliates of choosing this location.

Note that the specification in column (1) may suffer from omitted variable bias. The econometrician may fail to observe a variable that jointly determines the profitability of investing in business services and downstream manufacturing employment and erroneously attribute the effect on business services investment to downstream manufacturing demand. Since the time dimension of our panel is short, variation in the downstream demand variable is predominantly cross-sectional so that we do not include a full vector of country fixed effects to address this issue. Instead, the specification in column (2) of Table 2 includes the initial

¹⁸The results remain qualitatively unchanged if cultural proximity is proxied by a common language indicator instead of an indicator for colonial ties in the past. Note that adding the common language dummy to the above specification would lead to multicollinearity between common border, colonial ties and common language.

¹⁹To avoid to drop observations due to zero downstream manufacturing demand in some locations in some years, we add one to the downstream manufacturing index before taking logarithms.

Table 2: Business services location choices

Model	Dependent Variable: Choice of Location					
	(1) Cond Logit	(2) Cond Logit	(3) Cond Logit	(4) Nested Logit	(5) Nested Logit	(6) Nested Logit
In distance	-0.398*** (0.077)	-0.195** (0.085)	-0.240*** (0.089)	-0.394*** (0.078)	-0.190** (0.086)	-0.248*** (0.091)
ex Colony	1.039*** (0.158)	0.646*** (0.172)	0.212 (0.215)	1.051*** (0.159)	0.663*** (0.174)	0.206 (0.217)
common border	0.489*** (0.137)	0.186 (0.141)	0.262* (0.143)	0.488*** (0.137)	0.199 (0.142)	0.286** (0.144)
In GDP per capita	0.199 (0.134)	0.278** (0.140)	0.201 (0.140)	0.201 (0.134)	0.274* (0.140)	0.185 (0.140)
In market potential	0.451*** (0.050)	0.233*** (0.059)	0.168*** (0.063)	0.448*** (0.051)	0.236*** (0.061)	0.174*** (0.064)
In lag downstr demand manuf	0.202*** (0.062)	0.222*** (0.065)	0.200*** (0.067)	0.211*** (0.063)	0.236*** (0.067)	0.206*** (0.069)
In bus serv affiliates 1993		0.817*** (0.122)	0.660*** (0.130)		0.777*** (0.127)	0.593*** (0.137)
revealed attractiveness index			1.113*** (0.305)			1.194*** (0.309)
income zone fixed effects	Yes	Yes	Yes	No	No	No
	Dependent Variable: Choice of Nest					
inclusive value				0.885*** (0.055)	0.831*** (0.050)	0.884*** (0.054)
Observations	32,086	32,086	32,086	11,742	11,742	11,742
Investments	426	426	426	426	426	426
Likelihood ratio index	0.20	0.21	0.22	0.14	0.16	0.16

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

stock of business services firms in a particular location.²⁰ This variable can be thought of as capturing time-invariant determinants of profitability in business services that are unobserved by the econometrician. If the downstream manufacturing demand index survives the inclusion of the initial stock of same sector affiliates, this weakens the case for an omitted variable driving its significance. Of course, the inclusion of the initial stock of business services firms raises the issue of endogeneity: It is akin to including a lagged dependent variable in the estimating equation. We therefore choose to restrict the estimation sample to the years 1997-2002 and to use the information on French affiliates in business services in the year 1993 as the initial stock.²¹ The coefficient on the initial stock of business services affiliates in 1993 is only biased to the extent that an unobserved shock determining simultaneously the latter and profitability of business services FDI between 1997 and 2002 persists more than three periods. The initial stock of business services firms in 1993 turns out to be highly significant. However, its inclusion does not affect the economic and statistical significance of the downstream manufacturing demand index: The estimated elasticity of the choice probability remains roughly constant at around 0.22.

While the initial stock of business services affiliates in 1993 may be thought of as capturing time-invariant unobserved determinants of a country's attractiveness, it does not pick up year-specific unobserved shocks to a country's attractiveness. We therefore construct a time-varying index of a country's 'revealed attractiveness' using aggregate FDI inflow data from

²⁰To avoid to drop observations due to zero business services affiliates in 1993 in some locations, we add one to the initial stock of business services affiliates before taking logarithms.

²¹As mentioned in Section 3, we consider LiFi's coverage as satisfactory from 1993 onwards.

UNCTAD: The index is normalised between zero and one, where the country with the lowest multilateral FDI inflow in a given country and year is assigned a value of zero and the country with the highest inflow a value of one.²² To the extent that the other explanatory variables in our estimating equation do not capture transitory shocks on a country's multilateral attractiveness, these should be captured by our index of a country's 'revealed attractiveness'. The positive and statistically significant coefficient on our index in column (3) of Table 2 indicates that it indeed picks up a positive determinant of the choice probability not captured by the other explanatory variables. However, the coefficient on the downstream manufacturing demand index remains statistically significant at the 1% level and the size of the estimated elasticity is hardly affected: It decreases from 0.22 to 0.2.

The results from the conditional logit model in columns (1)-(3) are confirmed by the results from the nested logit model in columns (4)-(6). The inclusive values of around 0.9 support the chosen nest structure but indicate that the estimated nested logit models are fairly close to the corresponding conditional choice models. The fact that the estimated coefficients on the downstream manufacturing demand index are very robust with respect to the specification of the econometric model is an indication that its positive effect on the location choice probability of business services affiliates is not a simple artifact of the IIA assumption.

5.4 Granger Causality

The results in the preceding section suggest that an increase in downstream manufacturing demand of French firms increases the probability of French business service firms to choose a given location. This result appear to be robust to unobserved country heterogeneity in the sense that our results do not appear to be driven by an unobserved attribute of a country's attractiveness determining simultaneously the choice probability in business services and in manufacturing. In other words, the results suggest that FDI in business services and FDI in manufacturing are not merely correlated but that there is a causal relationship between the two, with the direction of causality going from manufacturing FDI to business services FDI. In order to formally test for the causal relationship between FDI in business services and FDI in manufacturing, we use the concept of Granger causation: Granger (1969) defines a variable X as being non causal for Y if X does not help to forecast Y. In the present context, it can be tested for Granger causality by running two separate vector autoregressions of the number of business services affiliates and downstream manufacturing demand. Practically, we estimate

$$\begin{aligned}
 BusAff_{it} &= \sum_{k=1}^3 \beta_k^1 BusAff_{it-k} + \sum_{k=1}^3 \gamma_k^1 ManDD_{it-k} + \epsilon_{it}^2, \\
 ManDD_{it} &= \sum_{k=1}^3 \beta_k^2 ManDD_{it-k} + \sum_{k=1}^3 \gamma_k^2 BusAff_{it-k} + \epsilon_{it}^2,
 \end{aligned}$$

where $BusAff_{it}$ denotes the number of French business services affiliates in country i and year t and $ManDD_{it-k}$ denotes the downstream manufacturing demand emanating from French manufacturing affiliates in country i in year t . The time dimension of our panel is

²²The algebraic formula for the 'revealed attractiveness index' and a descriptive statistic on its relation with the real market potential variable are reported in the appendix.

relatively short so that we choose three lags for the Granger causality tests.²³ The Wald tests for the joint significance of the coefficients on the three lagged values of the variable that is not on the left hand side of the respective vector autoregression are reported in Table 3. Joint significance can be interpreted as rejection of the null hypothesis of Granger non causation since the right hand side variable helps to forecast the dependent variable significantly better than lagged values of the dependent variable alone.

Table 3: Granger causality tests

Dependent variable	Null hypothesis	F-statistic
<i>BusAff_{it}</i> (Current Number of Business Affiliates)	(1) $ManDD_{it-1} = 0$	F(2,2273) = 6.04
	(2) $ManDD_{it-2} = 0$	Prob > F = 0.0004
	(3) $ManDD_{it-3} = 0$	
<i>ManDD_{it}</i> (Current Manufacturing Downstream Demand)	(1) $BusAff_{it-1} = 0$	F(2,2273) = 1.08
	(2) $BusAff_{it-2} = 0$	Prob > F = 35.42
	(3) $BusAff_{it-3} = 0$	

It can be seen from Table 3 that lagged values of French downstream manufacturing demand help to forecast the current number of French business services affiliates. The coefficients are jointly significant at the 1% level.²⁴ Conversely, the number of French business services affiliates does not help to forecast French downstream manufacturing demand at any conventional level of statistical significance. We can therefore reject the null hypothesis that manufacturing demand is non causal for business services FDI but cannot reject the converse hypothesis that business services FDI is non causal for downstream manufacturing demand. We interpret this as evidence that manufacturing downstream demand is causal for business services FDI but that business services FDI does not have a causal effect on manufacturing downstream demand.

²³The results remain qualitatively unchanged if two lags are used instead.

²⁴The sum of the coefficients on the three lags of the downstream manufacturing demand are positive. The detailed regression output is available from the authors upon request.

6 Plausibility and Robustness Checks

6.1 Retail

The simple model in Section 2 yields the result that profits of French business services firms in a particular country increase with the downstream demand of French manufacturing affiliates. This result is derived from the assumption that French manufacturing affiliates have a demand bias in favour of French business services affiliates located in their country of establishment. Given that a large share of the output of business services firms goes to manufacturing firms, it is expected that the downstream demand of manufacturing firms exerts a positive effect on the probability of business services firms to locate in a particular country. This is confirmed in the empirical analysis in Section 5.3. As shown in Figure 4, this argument does not hold for French retail affiliates. Even if French manufacturing affiliates had a demand bias in favour of French retail affiliates located in their country of establishment, it is therefore implausible that French retail firms base their location choices on the downstream demand of French manufacturing affiliates. There is also less reason to expect a demand bias of French manufacturing affiliates in favour of French retail affiliates located in the same country since the required degree of face to face communication due to the specificity of the service is less pronounced than in business services. This is confirmed in Table 4 that shows different specifications of locational choice models for the retail sector.

Table 4: Retail location choices

Model	Dependent Variable: Choice of Location					
	(1)	(2)	(3)	(4)	(5)	(6)
	Cond Logit	Cond Logit	Cond Logit	Nested Logit	Nested Logit	Nested Logit
In distance	-0.281*** (0.049)	-0.252*** (0.049)	-0.264*** (0.050)	-0.243*** (0.049)	-0.208*** (0.050)	-0.221*** (0.051)
ex Colony	0.271** (0.111)	-0.203* (0.122)	-0.445*** (0.135)	0.299*** (0.112)	-0.175 (0.123)	-0.425*** (0.137)
common border	0.910*** (0.100)	0.277** (0.113)	0.359*** (0.114)	0.914*** (0.100)	0.278** (0.114)	0.361*** (0.116)
In GDP per capita	0.042 (0.075)	-0.109 (0.079)	-0.109 (0.079)	0.043 (0.075)	-0.108 (0.080)	-0.110 (0.079)
In market potential	0.355*** (0.031)	0.226*** (0.034)	0.161*** (0.037)	0.343*** (0.031)	0.216*** (0.034)	0.152*** (0.037)
In lag downstr demand manuf	0.116*** (0.039)	0.005 (0.043)	-0.000 (0.044)	0.177*** (0.043)	0.086* (0.047)	0.076 (0.048)
In retail affiliates 1993		0.521*** (0.056)	0.472*** (0.056)		0.510*** (0.057)	0.459*** (0.057)
revealed attractiveness index			0.945*** (0.202)			0.955*** (0.206)
income zone fixed effects	Yes	Yes	Yes	No	No	No
				Dependent Variable: Choice of Nest		
inclusive value				0.878*** (0.041)	0.840*** (0.038)	0.848*** (0.039)
Observations	74,200	74,200	74,200	27,684	27,684	27,684
Investments	983	983	983	983	983	983
Likelihood ratio index	0.14	0.15	0.15	0.11	0.12	0.12

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

While in column (1) the downstream manufacturing demand of French affiliates appears to exert a positive effect on the choice probability of French retailers, it turns out that this

effect is not robust to the inclusion of the number of French retailers in 1993 in column (2): The coefficient on the downstream manufacturing demand index is reduced to a value close to zero and not significant at any conventional level of significance. Instead of picking up an actual demand effect, the downstream manufacturing demand index in column (1) thus merely picks up an unobserved determinant of a country's attractiveness that drives both FDI in business services and FDI in manufacturing. This conclusion remains unchanged if our index of 'revealed attractiveness' is included in column (3). These results are confirmed by different specifications of the nested logit model in columns (4)-(6). The coefficient on the downstream manufacturing demand index remains positive and significant at the 10% level when the number French retailers in 1993 is included but vanishes once it is controlled for a country's 'revealed attractiveness'.

The result that the location decisions of French retail firms are found to be independent of the location decisions of downstream manufacturing firms gives further plausibility to the mechanism identified in Section 2. A positive effect of French downstream manufacturing demand on the location decisions of French upstream services firms can only be expected to be identifiable empirically under the following conditions: If downstream manufacturing demand represents a large share of the output of upstream services firms and there is a demand bias of French manufacturing affiliates in favour of French services affiliates established in the same country. Neither condition is satisfied in retailing. In contrast to business services, only a small fraction of retail output goes to manufacturing and retail services do not require the complex 'face to face' communication that may yield a demand bias in favour of French business services affiliates.

6.2 Total Services

The services sector as an aggregate encompasses both subsectors that produce highly specific services mainly for the manufacturing sector and subsectors that produce generic services mainly for final consumers. While the mechanism highlighted in our model in Section 2 applies to the former, French business services firms follow French manufacturing firms, it does not apply to the latter, French retail services firms do not follow French manufacturing firms. For the services sector as an aggregate we therefore expect an effect of downstream manufacturing demand on location choice probabilities in the intermediate range between the estimated effect for business services and the estimated effect for retail services. The results reported in Table 5 confirm this expectation.

In column (1) French downstream manufacturing demand has a statistically significant effect on the choice probability of French services firms. According to this specification doubling French manufacturing demand in a location would result in a 16.4% increase in the location choices probability of French services firms. This is only slightly lower than the corresponding estimate for business services of 20.2%. However, the size of the estimated coefficient is not robust to controlling for unobserved determinants of the choice probability. While the estimated coefficient remains statistically significant at the 1% level, including the number of services affiliates in the same services subsector in 1993 reduces the estimated elasticity to 10.2%. Additionally including our 'revealed attractiveness index' further reduces the estimated elasticity to 9.6%. This is about one half the estimated elasticity in the corresponding specification for business services and confirms our expectation that the estimated elasticity for services as an aggregate should lie in the intermediate range between the estimate for business services and the one for retail services. Estimates for the nested logit models in

Table 5: Total services location choices

Model	Dependent Variable: Choice of Location					
	(1) Cond Logit	(2) Cond Logit	(3) Cond Logit	(4) Nested Logit	(5) Nested Logit	(6) Nested Logit
In distance	-0.295*** (0.027)	-0.191*** (0.027)	-0.214*** (0.028)	-0.278*** (0.027)	-0.176*** (0.028)	-0.201*** (0.029)
ex Colony	0.723*** (0.055)	0.264*** (0.059)	-0.025 (0.069)	0.735*** (0.055)	0.207*** (0.060)	-0.081 (0.070)
common border	0.638*** (0.055)	0.127** (0.058)	0.189*** (0.058)	0.640*** (0.055)	0.074 (0.058)	0.137** (0.059)
In GDP per capita	0.060 (0.043)	0.005 (0.044)	-0.017 (0.044)	0.057 (0.043)	-0.026 (0.045)	-0.048 (0.045)
In market potential	0.422*** (0.018)	0.277*** (0.019)	0.204*** (0.021)	0.417*** (0.018)	0.268*** (0.019)	0.196*** (0.021)
In lag downstr demand manuf	0.164*** (0.022)	0.102*** (0.023)	0.096*** (0.024)	0.192*** (0.023)	0.107*** (0.024)	0.099*** (0.025)
In serv affiliates 1993		0.596*** (0.028)	0.542*** (0.029)		0.666*** (0.031)	0.610*** (0.032)
revealed attractiveness index			0.951*** (0.107)			0.944*** (0.110)
income zone fixed effects	Yes	Yes	Yes	No	No	No
inclusive value				Dependent Variable: Choice of Nest		
				0.873*** (0.054)	0.827*** (0.050)	0.880*** (0.054)
Observations	237,936	237,936	237,936	87,488	87,488	87,488
Investments	4,581	4,581	4,581	4,581	4,581	4,581
Likelihood ratio index	0.13	0.15	0.15	0.11	0.13	0.14

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

columns (4) to (6) are similar.

6.3 Simultaneity

In the above econometric analysis we have devised various means to deal with the issue that an unobserved country attribute may be determining simultaneously FDI in business services and downstream manufacturing demand. Time invariant country specific attributes are captured by the number of French business services affiliates in 1993. We deal with transitory shocks by lagging the index of downstream manufacturing demand by one period and controlling for a country's multilateral 'revealed attractiveness'. Yet, if unobserved shocks affecting simultaneously business services FDI and downstream manufacturing demand are persistent, it may not be sufficient to lag the downstream manufacturing demand index by one period. While even the unobserved shock in period $t - 3$ may be correlated with the unobserved shock in period t , the correlation can arguably be expected to weaker than in the case of period $t - 1$ and t . Table 6 therefore presents results for the downstream manufacturing demand index lagged by three periods. None of the above results are affected qualitatively.

Table 6: Business services location choices using three period lags

Model	Dependent Variable: Choice of Location					
	(1) Cond Logit	(2) Cond Logit	(3) Cond Logit	(4) Nested Logit	(5) Nested Logit	(6) Nested Logit
In distance	-0.370*** (0.078)	-0.175** (0.086)	-0.216** (0.091)	-0.361*** (0.079)	-0.166* (0.088)	-0.218** (0.093)
ex Colony	1.029*** (0.157)	0.637*** (0.172)	0.202 (0.215)	1.045*** (0.158)	0.656*** (0.174)	0.197 (0.217)
common border	0.495*** (0.137)	0.201 (0.140)	0.276* (0.142)	0.495*** (0.137)	0.216 (0.141)	0.301** (0.144)
In GDP per capita	0.192 (0.134)	0.263* (0.139)	0.186 (0.140)	0.195 (0.134)	0.259* (0.139)	0.172 (0.140)
In market potential	0.442*** (0.050)	0.232*** (0.059)	0.165*** (0.063)	0.438*** (0.051)	0.234*** (0.060)	0.169*** (0.064)
In 3rd lag downstr demand manuf	0.228*** (0.062)	0.238*** (0.066)	0.222*** (0.068)	0.242*** (0.064)	0.256*** (0.068)	0.234*** (0.070)
In bus serv affiliates 1993		0.801*** (0.121)	0.644*** (0.130)		0.758*** (0.126)	0.574*** (0.136)
revealed attractiveness index			1.123*** (0.305)			1.206*** (0.309)
income zone fixed effects	Yes	Yes	Yes	No	No	No
	Dependent Variable: Choice of Nest					
inclusive value				0.873*** (0.054)	0.827*** (0.050)	0.880*** (0.054)
Observations	32,086	32,086	32,086	11,742	11,742	11,742
Investments	426	426	426	426	426	426
Likelihood ratio index	0.20	0.21	0.22	0.15	0.16	0.16

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

7 Conclusions

This paper provides empirical evidence on the location choices in services using a large French firm-level dataset. In a first step, it is shown that the parameter estimates of a gravity type of model for services are fairly close to the ones in manufacturing. Location choice probabilities in services decrease with distance but increase with cultural proximity, a shared border and market potential. The effect of GDP per capita varies across services subsectors. While it is negative for total services and transport, it is insignificant for business services, retail and finance. Since GDP per capita captures both a country's average skill level and its average production cost, one possible explanation for this finding is that for the latter services sectors access to human capital outweighs production cost considerations in the location choice decision. Another explanation is that the GDP per capita variable captures the stylised fact that the relative demand for services tends to increase with a country's level of economic development.

In a second step, we check whether similarity in estimated parameters for manufacturing and services is due to a complementarity, in the sense that manufacturing location choices may influence location choices in services. Descriptive statistics show that a particularly appropriate services sector for this purpose is the business services sector for which input-output linkages with the manufacturing sector are strong. It is found that the downstream demand of French manufacturing affiliates has a positive effect on the location choice probabilities of French business services affiliates. In the preferred specification a doubling of downstream demand in a location would lead to an 20.2% increase in the probability of French business services affiliates of choosing this location. To reduce potential omitted variable bias the preferred specification includes the number of French business services affiliates in 1993 and a 'revealed attractiveness index'. These variables pick up unobserved determinants of the choice probabilities which may be correlated with the manufacturing downstream demand variable. It is further shown that there is no empirical evidence for a complementarity in location choices between manufacturing and retail, a services sector for which input output-linkages with manufacturing are weak. This lends further plausibility to the proposed mechanism underlying the complementarity between manufacturing and business services that depends critically on strong input-output linkages between the two sectors. A robustness check supports the view that the obtained results are not driven by endogeneity of the downstream manufacturing demand variable.

With respect to the present paper's relation the current policy debate, the obtained results weaken the view often advanced by policy makers that developed economies can be expected to increasingly specialise in services whereas developing economies can be expected to specialise in manufacturing. While the empirical analysis supports this view for services sectors depending mainly on local final demand, as for instance retail, it is not supported for the business services sector that depends strongly on demand from manufacturing. A continuing trend in manufacturing offshoring may be accompanied by increased business services offshoring.

References

- Amiti, M. & Javorcik, B. (2006), 'Trade costs and location of foreign firms in China', *Journal of Development Economics*, forthcoming.

- Arnold, J., Smarzynska Javorcik, B. & Mattoo, A. (2006), Does services liberalization benefit manufacturing firms?, CEPR Discussion Papers 5902, C.E.P.R. Discussion Papers.
- EC (2002), The state of the internal market in services, Report from the commission to the council and the european parliament, European Commission, Brussels. Available at http://europa.eu.int/eur-lex/en/com/rpt/2002/com2002_0441en01.pdf.
- Granger, C. (1969), 'Investigating causal relations by econometric models and cross-spectral methods', *Econometrica* **37**, 424–438.
- Head, K. & Mayer, T. (2004), 'Market potential and the location of japanese investment in the european union', *The Review of Economics and Statistics* **86**(4), 959–972.
- Head, K., Ries, J. & Swenson, D. (1995), 'Agglomeration benefits and location choice: Evidence from japanese manufacturing investments in the united states', *Journal of International Economics* **38**(3-4), 223–247.
- Hensher, D. A., Rose, J. M. & Green, W. H. (2005), *Applied Choice Analysis*, Cambridge University Press, New York.
- Hoekman, B. (2006), Liberalizing trade in services : a survey, Policy Research Working Paper Series 4030, The World Bank.
- Jones, R. W. & Kierzkowski, H. (2001), A framework for fragmentation, in S. W. Arndt & H. Kierzkowski, eds, 'Fragmentation: New production patterns in the world economy', Oxford University Press, Oxford, pp. 17–34.
- Mayer, T., Mejean, I. & Nefussi, B. (2007), The location of domestic and foreign production affiliates by french multinational firms, Working Papers 2007-07, CEPII.
- McFadden, D. L. (1974), Conditional logit analysis of qualitative choice behavior, in P. Zarembka, ed., 'Frontiers in Econometrics', Academic Press, New York, pp. 105–142.
- Train, K. (2003), *Discrete Choice Models with Simulation*, Cambridge University Press, New York.
- WTO (2001), Gats - fact and fiction, Manual, World Trade Organization, Geneva. Available at http://www.wto.org/english/tratop_e/serv_e/gatsfacts1004_e.pdf.

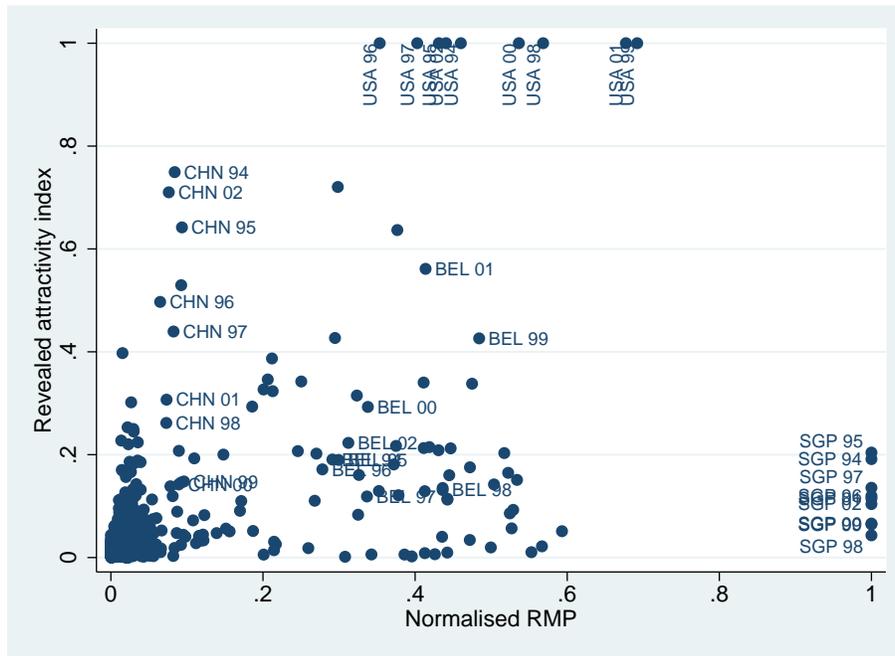
A Appendix

A.1 Construction of the 'Revealed Attractiveness Index'

The 'revealed attractiveness index' is constructed from aggregate FDI inflow data obtained from UNCTAD's FDI Database by the normalisation $AttInd_{it} = (InwFDI_{it} - \underline{InwFDI}_t) / (\overline{InwFDI}_t - \underline{InwFDI}_t)$, where $InwFDI_{it}$ denotes inward FDI from the world in country i in year t and \underline{InwFDI}_t and \overline{InwFDI}_t denote inflows for the country with minimum and maximum FDI inflows in a given year, respectively. It picks up unobserved time-varying determinants of a country's attractiveness that are not captured by the other explanatory variables. For instance, neither our real market potential variable nor the number of business services affiliates in China fully capture the increasing attractiveness of China as a destination for both business services and manufacturing FDI in the 1990s. This is illustrated in

Figure A.1 in which we plot our ‘revealed attractiveness index’ against a normalised measure of ‘real market potential’.

Figure A.1: ‘Revealed Attractiveness Index’ and real market potential



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