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Managing export complexity: The role of service outsourcing

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Abstract
As manufacturing firms expand globally, business services like advertising and legal support become essential for accessing new markets. This paper investigates how firms organize the provision of such market access services and the implications for foreign market entry costs, international trade, and welfare. Using French firm-level data and exogenous foreign demand shocks, we document that manufacturers increasingly outsource market access services domestically when they export to more destinations. We develop a novel theory of fixed and sunk export costs where firms weigh the managerial strain of internal provision against the adaptation costs of outsourcing—a mechanism that finds empirical support. We embed this endogenous market access cost function into a trade model, quantify its parameters, and study a variable trade cost reduction: the option to outsource doubles the variety gains for consumers and increases the producer surplus of smaller, less productive exporters.

Key words: adaptation, complexity, firm boundaries, firm capabilities, market access costs, sunk and fixed export costs, professional and business services.
JEL: D23; F10; F14; F61; L23; L84

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1 Introduction

Business services like advertising, legal counseling or market research are key inputs for all manufacturing companies in an international business environment, since they are essential for accessing markets abroad.[1] Take the case of Italian motorcycle producer Ducati, who expanded rapidly to several new destination countries in the early 2000s. In order to export its products, manuals and technical documentation had to be translated into various languages and continuously kept aligned with the respective local regulations. This required coordination between engineers and service workers as well as constant monitoring by Ducati's management. Such business services constitute *market access costs*. Internal provision puts severe strain on managers and organizations, however, especially when a company exports to a large and growing number of markets. As a solution, service inputs can be outsourced to external agencies, even if their more standardized inputs may not precisely fit the firm's needs. Indeed, Ducati decided to contract out its document management to Xerox, who subsequently advertised their services prominently: "We focus on translating and delivering Ducati's global publications. [...] Which leaves Ducati free to focus on building amazing bikes" (XEROX, 2010). Clearly, this make-or-buy decision for market access services shaped Ducati's sunk and fixed costs of exporting.

In this paper, we provide the first systematic analysis of how firms organize the provision of market access service inputs. We trace out the implications for market access costs and how the option to outsource shapes the welfare effects of trade cost shocks.

On the empirical side, we use unique French firm-level data to document that manufacturers increasingly outsource market access services, such as advertising or legal services, when they export to more destinations. We do not find such a response for other types of services, for manufacturing of physical inputs, or when firms export more to the same markets. Moreover, market access service outsourcing, and its link to the number of export destinations, depends on the adaptation costs of a particular service and on the managerial capability of the exporter. Motivated by these facts, we propose a novel market access cost function that captures a trade-off between the managerial costs of providing market access service inputs in-house ("make") and the costs of tailoring an inferior input provided by an external agency to a firm's needs ("buy"). As exporters raise their demand for market access services during an expansion abroad, they economize on the convex costs of managing employees by outsourcing service provision. As a consequence of this mechanism, the sunk and fixed costs of entering an *additional* market are firm-specific and increase in a manufacturer's total number of destination markets—entry decisions

[1] Such professional and business services industries are important in the overall economy: they accounted for 16.3 percent of total employment in 2015 in France (the country we study in this paper), and for roughly half of total service sector growth over the period 1975 to 2015 (EU KLEMS). Moreover, with the highest forward linkage of all industries, they play a key role in production networks; 14% of the gross value of French manufacturing exports in 2015 can be traced back to them (OECD IOTs and TiVA, 2021 ed.).

are therefore interdependent across countries. Finally, we embed this market access cost function into a model of exporting, quantify its parameters, and show that the option to outsource market access services strongly amplifies the effects of trade liberalizations for consumers and exporters.

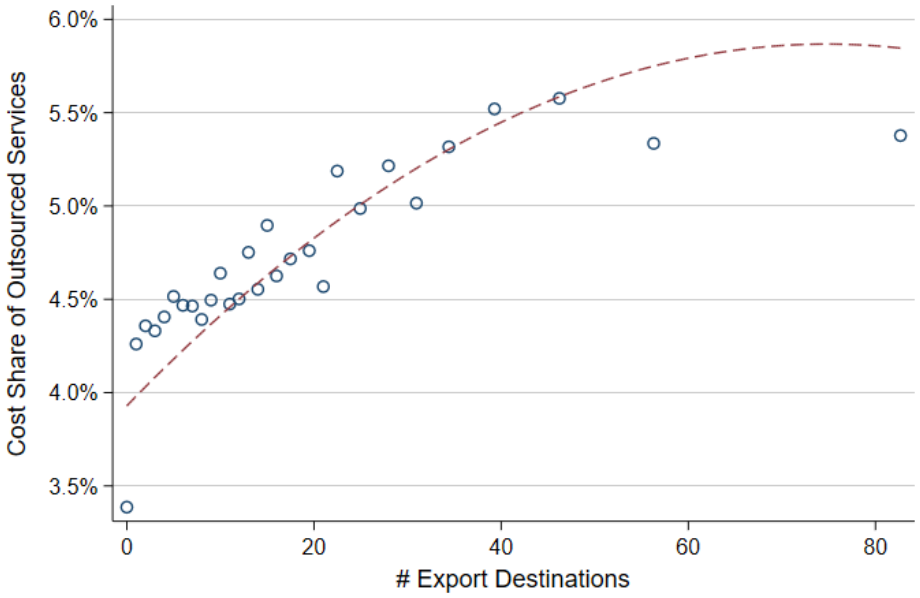
To establish our empirical findings, we make use of several unique and confidential firm-level datasets from France that allow us to assemble direct evidence regarding sunk and fixed market access costs. The first is a panel dataset that covers the near universe of exporters between 1996 and 2007, which we match with customs records. In these data, we observe (1) expenditures on a range of mainly domestically *outsourced* services, including advertising and market research, and (2) the universe of international goods transactions by destination. The second, cross-sectional dataset is based on a survey from 2005, which we augment with the customs data, too. While it lacks the time dimension, it contains information about more than 30 detailed service categories and whether a respondent firm outsourced each service or not. Finally, to investigate the service- and firm-level determinants of the service make-or-buy decision, we use matched employer-employer data as well as O*NET information on occupational task content as described below.

In Figure 1, we relate the share of outsourced service expenditure in total costs to the number of export destinations—the extensive country margin—by means of a bin-scatter for our entire raw panel dataset. On average, firms spend a sizeable 5% of total costs on selected external business services. This is of the same order of magnitude as outsourcing of intermediate input production and roughly twice the share of employment outsourcing. Overall, it amounts to roughly one fifth of a firm's total wage bill in our data. Importantly, there is a strong pattern of heterogeneity: *exporting to more foreign markets goes hand in hand with a significantly higher outsourced cost share of market access services.*

We show that this relationship carries a causal interpretation. We simultaneously account for unobservable firm-level characteristics via fixed effects and instrument the number of export destinations. In particular, we isolate time-varying demand shocks for new varieties in foreign countries at the product level: the increase in the number of supplying countries for each product imported by, inter alia, Eastern European EU member states during their accession transitions. We use these extensive margin shocks to 'treat' our French firms based on their initial product portfolios. Firms that experience a larger demand shock are enticed to add markets to their export portfolios and, in the process, choose to outsource the required services.

This novel stylized fact is highly robust and quantitatively important. For example, it holds conditional on scale, export volumes, and internal production of services. In placebo exercises, we also show that firms do not increase expenditures on external workers or subcontracted industrial production when they expand the range of foreign markets. Quantitatively, our estimates imply that the average firm raised its spending on external provision of market access service inputs by up to 785k€ due to exporting to more markets

Figure 1: Service Outsourcing Cost Shares and the Extensive Country Margin



The figure shows average total external expenditures on market access services, like market research and advertising, as shares of total costs within 29 bins for the number of export destinations. Pooled firm panel 1996-2007 as described below. Due to discreteness and skewness of the number of export destinations, the bins cover unequal shares of the 262,798 observations; the smallest one (21 destinations) contains 2,231.

over the sample period. To put this number into perspective: it is equivalent to supporting an additional 2.2 external service workers per year at a firm's average internal wage and explains up to 30% of the increase in business service employment in France.

Next, we shed even more light on the black box of the sunk and fixed costs of market access by examining individual services in the cross-sectional dataset. For each of the 34 service types, we relate an exporter's indicator for outsourcing to the number of export destinations. We find that advertising, translation, insurance, and legal services are are commonly outsourced by exporters as they expand into more markets. By contrast, outsourcing of services such as data processing, cleaning, machinery maintenance, or warehousing is unrelated to such an expansion at the extensive country margin. To our knowledge, these results constitute the most direct evidence on the nature of the sunk and fixed costs of exporting to date.

To illustrate the implications of these empirical findings, we propose a novel market access cost function that arises from a key trade-off involved in the service make-or-buy decision. The main features implied by this micro-foundation are that *marginal* market access costs are firm-specific and increase in the manufacturer's total number of destination markets, so that entry decisions across countries are interdependent.

In our model, exporters must complete destination-specific service tasks and the resulting output should conform to the manufacturer's overall characteristics and strategy. When they choose in-house provision, a service is closely tailored to the firm's needs

and hence requires little ex-post adaption. To achieve this, managers have to "direct production" (Coase, 1937, p.388) and must therefore engage in costly coordination via communication and monitoring of employees (e.g., Crémer et al., 2007). These activities come with increasing and convex (opportunity) costs. As more destinations are added to an exporter's portfolio, keeping market access services in-house adds business complexity, which in turn creates progressive 'managerial overload' (Lucas, 1978).[2]

Managers can rid themselves of this burden by outsourcing to an external agency. Market access services tend to be more standardized and less fit for the exporter's purposes under outsourcing. In consequence, expensive ex-post adaptation is required to align the purchased service inputs with the company's needs (Bajari and Tadelis, 2001; Dessein and Santos, 2006; Costinot et al., 2011). Overall, however, the convex costs associated with managerial overload increase in the number of destination markets at a higher rate than those associated with ex-post adaptation, so that the minimized market access cost function implies more outsourcing for firms that export to more markets. This result aligns with our empirical findings.

To validate this market access cost function, we confront additional implications of the model with the data. When a service naturally requires expensive ex-post adaptation, the returns from coordinating the production process in-house are high, making it a more attractive option for firms. However, the large number of service employees also implies a high level of managerial strain; when the company starts to access more markets, services with substantial ex-post adaptation costs are therefore more readily outsourced. We test these predictions using novel proxies for the need and costs of ex-post adaptation associated with each of our distinct services in the cross-sectional dataset. For instance, Costinot et al. (2011) suggest that a service input involves high adaptation costs whenever the employees involved in its production (observed in the matched employer-employee data) have occupations with a high non-routine task content (observed in the O*NET database). In line with our predictions, we find that the probability of outsourcing a particular service is generally lower for high adaptation cost services, but increases more in the number of export destinations compared to highly standardized services. We also present empirical evidence that, consistent with our model, firms with higher managerial capability can rely more on in-house production.

Finally, we demonstrate that a firm's ability to economize on market access costs by reorganizing service procurement is a quantitatively significant margin for aggregate exporting patterns and welfare. We enrich a Chaney (2008)-type model with our endogenous market access cost function and calibrate it to our data. This is challenging, because

[2]In the taxonomy of models of the boundary of the firm by Gibbons (2005), our framework belongs to the "adaptation" class of Transaction Cost Economics (TCE) models (Simon, 1951; Williamson, 1975): integrated organizations have an inherent advantage for coordinated adaptation. Our context allows us to take a precise stance on the costs of integration, namely managerial overload when coordination and monitoring activities proliferate.

managerial inputs and task-level activities are notoriously hard to observe. We therefore parameterize the model to match a range of across-firm patterns in our data for 2006 by means of the Method of Simulated Moments (MSM, McFadden, 1989). Specifically, we target the distribution of the number of export destinations (the country extensive margin) as well as outsourced expenditures per destination market and outsourced cost shares conditional on export profiles.

In our main counterfactual exercise, we reduce bilateral trade costs by 25% across-the-board and compare several outcomes of the baseline model to a version where firms do not have the option to outsource. We find that optimal reorganization allows firms to expand their destination portfolios significantly more than in the standard case of exogenous market access costs: aggregate entry into foreign markets is around 110% higher when firms do not have to employ all service workers directly. In other words, the variety gains from a trade liberalization are twice as high. The effects for producers, on the other hand, are more nuanced. The most productive manufacturers can only access new markets with low potential compared to their infra-marginal ones. Accordingly, the option to outsource has a limited relative impact on their profits. By contrast, we find that small- and medium-sized exporters do benefit significantly from outsourcing.

This paper makes two main contributions. First, despite the fact that sunk and fixed costs of foreign market access are needed to rationalize many of the salient empirical patterns in international trade,[3] very little is known about their nature and how they behave. We shed light on this black box of market access costs with the help of direct empirical evidence. Second, in doing so, we study a new organizational margin for companies that has important implications for aggregate trade patterns and welfare.

To delineate the first contribution, it is noteworthy that most recent structural models feature market access costs that vary across companies, either exogenously and in a reduced-form way (e.g., Das et al., 2007; Moxnes, 2010; Bernard et al., 2011; Eaton et al., 2011; Adão et al., 2020), or endogenously through (past) firm decisions (e.g., Arkolakis, 2010; Morales et al., 2019; Arkolakis et al., 2021; Alfaro-Urena et al., 2023). While the sunk and fixed costs of exporting are usually interpreted as payments for service inputs such as advertising (see especially Arkolakis, 2010), market research, translation, or legal services, the distributional assumptions for these firm-specific cost shocks are usually ad-hoc. This paper provides direct empirical evidence on market access services and their procurement and therefore contributes towards a better foundation for assumptions about the sunk and fixed costs of exporting. In particular, it suggests that the *marginal* costs

[3]The list is long: For instance, only the most productive firms typically export and international production networks tend to be sparse (e.g., Bernard and Jensen, 2004; Bernard and Moxnes, 2018). A higher number of firms exports to larger markets; exit rates from markets abroad are relatively low; the exporter size distribution overlaps substantially with that of domestic firms (e.g., Eaton et al., 2004; Alessandria et al., 2021). Sunk and fixed export costs have also been linked to hysteresis in international trade and are crucial to understand gravity equations and welfare (e.g., Baldwin, 1988; Chaney, 2008; Impullitti et al., 2013; Chaney, 2014).

of accessing a market are firm-specific for two reasons: both the exporter's current portfolio of countries and its managerial capability influence which services to outsource and therefore the sunk and fixed expenditures. Moreover, marginal market access costs react to an exporter's set of destinations, so that entry decisions across export markets are interdependent. The service make-or-buy decision is therefore a novel mechanism that can explain "extended gravity" and export market complementarities (see, for example, Morales et al., 2019; Alfaro-Urena et al., 2023, and the literature reviews therein).

Regarding our second contribution, it is already well-documented that globalization and trade integration shape how firms organize production (Antràs and Rossi-Hansberg, 2009). For instance, they rearrange *internal* hierarchies and human capital, and thus become more productive in the face of increased demand from abroad (e.g., Garicano and Rossi-Hansberg, 2015; Caliendo and Rossi-Hansberg, 2012; Caliendo et al., 2015, 2020). They adjust their *external* firm boundaries across the task spectrum, too (for a review, see Antràs, 2015). This last body of research studies how manufacturers take make-or-buy decisions in international production networks that involve *tangible* goods. By contrast and to the best of our knowledge, we are the first to study how they organize the production of business *services* needed as a result of demand shocks due to globalization.

2 Market Access Service Outsourcing and Exporting

2.1 Data and Empirical Approach

We provide evidence on service input outsourcing for the entire manufacturing sector by means of two firm-level data sets from France. The first is based on the Enquête annuelle d'Entreprise (EAE), which collects balance sheet data and other information for all French firms with more than 20 employees and for a sample of smaller firms. We make use of an unbalanced *panel* of manufacturing companies (NACE Rev1.1 category D) that export, covering 12 years between 1996 and 2007, an episode of strong globalization for France.

In this data set, our main measure of market access service outsourcing, $\mathcal{O}^C_{ft}$, is defined as firm f's share of expenditure on professional and business services (PBS) in total costs in year t. The service items included are purchases of studies (i.e., market research), purchases of IT services and software (e.g., adjustments in ERP systems or production processes), and advertising expenditure. All these accounting items involve expenditures that are *external to a firm* according to the French accounting code (Plan Comptable Général, see Online Appendix D.2 for more details) and that are predominantly domestic.[4] As shown in Online Appendix Table E.1, in 1996 a manufacturer has a service

[4]This baseline outsourcing measure captures both domestic and foreign service purchases, which allows for a comprehensive analysis. To what extent firms rely on offshore providers, especially in the target market for exports, is an interesting question beyond the scope of our paper (for related work on service offshoring, see, for example, Berlingieri et al., 2021). At the same time, aggregate statistics imply that

outsourcing cost share of 4.5% on average, with a standard deviation of 7 percentage points. Covering only a subset of service inputs, this cost share is sizeable and comparable with total expenditures on industrial outsourcing (8.8%) and employment outsourcing (1.8%). Moreover this share increases over time, especially in the right tail of the distribution. Since the outsourcing cost share is typically non-zero and right-skewed, we take logs throughout.[5]

Second, we work with information from the Enquête Recours aux Services par l'Industrie (ERSI), a survey of firms with more than 20 employees (exhaustive above 250 employees), which collected detailed information about service outsourcing for a single *cross-section* in 2005. The 4,933 respondent firms accounted for over 50% of the total turnover of the French manufacturing sector and in all our regressions we make use of official sampling weights to account for stratification and oversampling of larger firms. Inter alia, this survey provides information on whether or not a manufacturing firm outsourced any one of 34 different types of service inputs, allowing us to gain insights into firms' sourcing strategies at a highly granular and detailed level (further details are given in Online Appendix D.2.3 and basic summary statistics are shown in Online Appendix Table E.2). Examples include Advertising, Translation, and Legal Services, but also Cleaning, Security and Warehousing.

To obtain firm-level information on international trading activities, we make use of customs data provided by the French Customs Agency, which we match with the panel and cross-sectional data sets by means of the unique administrative identifier for French firms, the SIREN. Since the customs data cover the near universe of international transactions of goods, we can identify all individual destination markets for each firm, N_{ft}. In our panel data, the average manufacturer exports to around 12 destinations in 1996, which increases by around 20% to 14.1 in 2007—a substantial rise in a matter of a decade. As is well-known, the distribution is highly skewed, with few large firms serving a very large number of markets; accordingly, the median firm only exports to 6 and 7 markets in 1996 and 2007, respectively.[6]

foreign sourcing accounts for a small share of service spending. For example, data from the OECD Input-Output database show that, in 2005, business services purchased internationally by French firms accounted for 7% of the total output of this sector. Using firm-level data from Belgium, Ornaghi et al. (2021) find that imported services account for only 0.5% of the average manufacturing firm's turnover, and that imports of business services represent on average less than one quarter of the total. Consequently, we interpret our results as pertaining to domestic procurement.

[5]In the EAE, we cannot distinguish between true zeros and missing information, so we do not analyze the outsourcing extensive margin. By taking logs, the number of observations drops from 188k to 175k. In unreported regressions we verify that including this outsourcing extensive margin does not affect our estimates. Moreover, all results are unchanged when we use the (logged) *expenditure* on outsourced business services as a dependent variable and control for total costs or when we use the level of the expenditure share as dependent variable.

[6]When we explore the nature of service tasks in Section 2.5 below, we also employ other extensive margin measures to take into account that countries are heterogeneous along several relevant dimensions (Morales et al., 2019; Arkolakis et al., 2021).

To study the relationship between foreign market access and how the procurement of market access services is organized, we first run the following descriptive OLS regression on our panel data set:

$$\mathcal{O}_{ft}^{C} = \beta_1 N_{ft} + \boldsymbol{X}_{\boldsymbol{ft}}^{'}\boldsymbol{\vartheta} + \gamma_{jt} + \gamma_f + \epsilon_{ft}, \tag{1}$$

where γ_{jt} and γ_f are 3-digit industry $\times$ year and firm fixed effects, $\boldsymbol{X_{ft}}$ is a vector of firm-level controls described below, and we cluster standard errors at the firm level (results are robust to clustering by 3-digit industry, see Online Appendix Table E.3).

The fixed effects and controls address the following concerns about a causal interpretation of the main estimate of interest, $\hat{\beta}_1$. First, industry-level supply or demand conditions may affect both a firm's exporting profile and its sourcing strategy for service inputs. Among these, changes in the availability or productivity of service providers upstream are likely to play a role.[7] To address this challenge, we compare firms that belong to the same narrowly-defined industry in a year by including industry $\times$ year fixed effects in our regressions.[8]

Second, firm characteristics like scale or technology typically affect the level of internationalization of firms and simultaneously determine a firm's boundary decisions. A large number of employees, for example, may allow a company to solve many tasks internally and, at the same time, access new markets at large and with higher probability of success. A similar argument can be made regarding the skill level of employees or a firm's technological set-up. Consequently, we rely on firm fixed effects, which can purge the influence of such factors to the extent that scale and technology are stable over time. Since at least for some firms these factors may experience more significant changes over our 12-years sample period, we also control directly for employment, skill intensity and capital intensity throughout.[9]

In our second set of main exercises, we zoom in and study the service make-or-buy decision at the detailed firm-service level. To do so, we use our cross-sectional survey data to estimate the following linear probability model with OLS *by service type*:

$$\mathcal{O}_f = \beta_1 N_f + \boldsymbol{X}_{\boldsymbol{f}}^{'}\boldsymbol{\vartheta} + \gamma_j + \epsilon_f. \tag{2}$$

$\mathcal{O}_f$ is an indicator equal to one if a firm outsourced a particular service in 2005, and equal to zero otherwise; X_f is a vector of firm controls (employment, skill intensity, and

[7] Indeed, Hsieh and Rossi-Hansberg (2023) document that increasing returns have led to a rapid emergence of 'superstar' service providers in the US.

[8] Additionally, results are virtually identical when we control for potential differences in service supply at the local level through a full set of département by year fixed effects, see Online Appendix Table E.3. As a side remark, our fixed effects hold relative upstreamness between manufacturers and service providers as well as contract intensity constant across firms. Mechanisms related to incomplete contracting in value chains therefore do not drive our results (Antràs and Chor, 2013; Alfaro et al., 2019).

[9] In this context, we have checked that the results are unchanged when lagging these variables or including other covariates like contract intensity, see Online Appendix Table E.3.

capital intensity); γ_j is a 3-digit industry fixed effect; and ϵ_f is an error term that may be correlated across firms within sampling strata of the survey. All results are fully robust to estimating an analogous probit model, but since we investigate interaction effects below, we present OLS results for consistency here.

2.2 Main Empirical Findings

The results of our baseline regression exercise with the panel data set are presented in the first four columns of Table 1. Moving across the specifications, we introduce the different fixed effects and complete our preferred OLS model specification with controls in column (4). Consistent with Figure 1, firms that extend their sets of export markets also increase their expenditure shares on outsourced market access services (for a graphical representation of this result, see Online Appendix Figure E.1). This conditional correlation implies that the average firm's increase in the number of export destinations explains around 13% of its increase in service outsourcing. We interpret this number as a lower bound to the true causal effect as discussed below.[10]

Figure 2 presents the results by service type using the cross-sectional data set. It shows point estimates and 95% confidence intervals for the coefficients on the number of export markets. Services directly connected to foreign market access in Panel 2a tend to respond markedly: advertising, legal services, provision of technical studies and translation are all typical examples of tasks required for exporting and are more likely to be provided by an external agency the more destinations a company serves. By contrast, warehousing, after-sales services, data processing, cleaning and security are all either related to the scale of foreign operations—and therefore constitute variable cost components—or not connected to exporting at all.[11]

2.3 Instrumental Variables Estimation

At least three more potential concerns about this conditional correlation persist, even taking into account our demanding fixed effects and control strategy. First, outsourcing is often associated with a cost reduction or productivity gain, which may enable a firm

[10]We have implemented several further robustness checks. In column (6) of Online Appendix Table E.3, we add non-exporters to our sample, which allows us to investigate how firms organize their 'going international'. Since $N = 0$ for these firms, we swap the log transformation for the inverse hyperbolic sine. The coefficient estimate is very similar to our baseline. Moreover, a complete declaration for an international transaction within the EU must only be filed if its value exceeds a certain threshold. In Online Appendix Table E.3 we confirm that excluding simplified declarations for EU exports leaves our baseline result unaffected. Finally, in column (8) of Online Appendix Table E.3, we focus on firms with more than 20 employees, where the EAE is exhaustive. Our findings are highly robust both qualitatively and quantitatively.

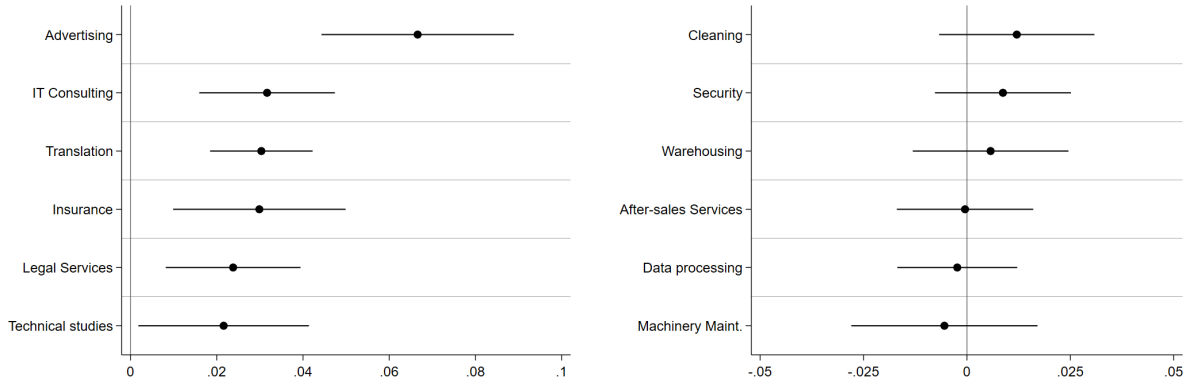
[11]The results for all individual service types are reported in Online Appendix Table E.7. In that table, we also show that outsourcing of individual services is generally not systematically related to a firm's TFP, alleviating concerns about reverse causality, i.e., that outsourcing improves productivity and induces firms to export to more destinations.

Table 1: Baseline Results

	(1)	(2)	(3)	(4)	(5)	(6)
N	0.197	0.197	0.092	0.083	0.087	0.301
	(0.009)	(0.009)	(0.010)	(0.010)	(0.011)	(0.101)
Observations	175,564	175,564	175,564	175,564	163,269	163,269
Number of firms	25,665	25,665	25,665	25,665	23,938	23,938
R-Square	0.126	0.131	0.746	0.746	0.745	0.744
Controls				Yes	Yes	Yes
KP-Stat						246.4
IV Type						NewEU-Imp exFRA
Firm FE			Yes	Yes	Yes	Yes
Year FE	Yes					
Industry FE	Yes					
Ind#Year FE		Yes	Yes	Yes	Yes	Yes

The dependent variable is the (log) share of purchased services in total costs. The main regressor N is the (log) number of export destination countries at the firm-year level. The instrument is a firm-year-level proxy for exposure to the demand shock from new Eastern European EU member states in 2004, see equation (3). Coefficient estimates for the control variables employment, skill intensity, and capital intensity (all in logs) are not shown. The full baseline sample contains all French manufacturing exporters in the EAE during 1996-2007. Common sample is imposed across columns (1)-(4). Column (5) repeats the baseline OLS specification for the IV sample in column (6). Standard errors in parentheses are clustered at the firm level, except in column (6) where they are clustered at the 3-digit industry level.

Figure 2: Outsourcing Responses to Market Access by Service Type



(a) Market Access Services (b) Placebo Services

The figure shows point estimates and 95% confidence intervals for the effect of the (log) number of export destinations on the probability to outsource any given service covered by the ERSI, a cross-section of manufacturing firms in 2005, based on empirical model (2). All underlying results are reported in Online Appendix Table E.7. All regressions contain the control variables employment, skill intensity, and capital intensity (all in logs), and 3 digit downstream industry fixed effects. Each sample contains all exporters in ERSI. Standard errors for confidence intervals are clustered at the downstream sampling strata level.

to expand the number of foreign markets they serve (reverse causality). Second, even after controlling for a number of firm characteristics, one can think of several firm-level shocks that are difficult to observe in the data and that could induce a spurious correlation between the exporting profile and firm boundaries (omitted variables). In particular, an unobserved improvement in managerial capability may lead a company to export to more markets (Bloom et al., 2021) and may also reduce the need for outsourcing service tasks. The result is a downward bias in the OLS estimates.[12] Finally, the number of export destinations may be a crude proxy for the complexity of a company's foreign activities and, to the extent that it introduces noise, attenuates our results (measurement error).

The ideal experiment to trace out the causal effect of international market access on outsourcing of business services despite these concerns is the following. Take two otherwise identical groups of exporters, "force" one of them to ship some of their output to an additional market, and measure whether this treated group increased the extent of market access service outsourcing compared to the untreated control group. Since we are not in a position to conduct such a randomized controlled trial, we exploit natural experiments.

In particular, we instrument for the number of destination countries using plausibly exogenous demand shocks for new varieties in foreign countries—a strategy consistent with, and motivated by, our conceptual framework in Section 3.2 below. In our main IV exercise, we rely on increases in foreign demand for new varieties due to the process of European integration and economic convergence that started in the early 1990s and continued to accelerate in the decades that followed. We focus on the Eastern European states that joined the EU in 2004, i.e., on by far the biggest enlargement of the union. Soon after the fall of the Iron Curtain, the EU engaged actively with these Eastern European countries. The Czech Republic, for example, applied for EU accession in 1996 and negotiations started in 1998, with the Accession Treaty signed in 2003. With few exceptions, all import tariffs were abolished in the 1993 agreement. By the end of our sample, all ten new member states had gone through similar procedures, they had integrated into European value chains, and had experienced substantial economic growth. It is plausible that these demand shocks for new varieties affected a French firm's decision to outsource service inputs only through changes in its portfolio of export markets.

To have a relevant instrument, our aim is to predict the number of countries a *firm* serves based on exogenous proxies for the demand of new varieties in Eastern European countries. We construct our baseline instrument as

$$IV_N_{ft} = \sum_{p \in P_{ft_0}} s_{fpt_0} \left[N_{fpt_0} + \Delta_{t-t_0} N_{pt}^{\text{ROW}\to\text{EEU}} \right]. \tag{3}$$

[12] Another related concern regarding an aggregate shock may be progressing digitization (Bergeaud et al., 2021). Malgouyres et al. (2021) show that broadband access did not have a large impact on French firms' exporting behavior, however, and so is unlikely to be a confounder in our context.

P_{ft_0} is the set of products firm f exported in the first year it was present as an exporter in our sample; s_{fpt_0} is product p's value share in firm f's total export revenue in t_0; N_{fpt_0} is the number of destination markets for product p that firm f served in t_0. Importantly, $\Delta_{t-t_0} N_{pt}^{\text{ROW}\to\text{EEU}}$ refers to the change in the number of countries that ship product p to one of the new EU member states between t_0 and t, i.e., the total change in "Armington"-varieties excluding France. This instrument follows a standard shift-share idea in that the aggregate demand shock in Eastern European countries over time is 'distributed' across firms according to a pre-determined measure of exposure.[13] Due to the distribution of the instrument we take logs throughout.

In column (5) of Table 1, we re-estimate our baseline model by OLS using the sub-sample of firms for which our instrument is available and report the 2SLS estimate of interest in column (6).[14] Focusing on firms that expand their sets of export destinations due to the exogenous demand shock for new varieties in Eastern Europe, we continue to find a positive and highly statistically significant effect on the outsourcing share.

The IV estimate is larger than the OLS, which is consistent with two explanations that are not mutually exclusive. First, the instrument addresses the downward bias due to unobserved firm-level developments (e.g., changes in managerial capabilities) and measurement error associated with the proxy N, as discussed above. Second, the population of compliers is likely to consist of relatively smaller firms, since their larger and more productive competitors had already exported to Eastern Europe. These smaller firms are also more likely to rely on external providers for the additional inputs associated with market access, so that their outsourcing shares are more responsive.

The causal effect of business complexity due to an increasing number of export destinations on outsourcing is economically important. To illustrate the magnitudes involved: the average increase in French firms' market access explains 47% of the total increase in the average PBS outsourcing cost share based on the full sample. Spending on external provision of such inputs rose by up to 785k€ due to additional market access alone, which is equivalent to supporting 2.2 additional external service workers (at a firm's average internal wage) per firm and year. Out of the total increase in employment in the business services sector in France over the same time period, international market access can explain up to 30%.[15]

[13] This instrument is related to standard procedures in international trade (e.g., Hummels et al., 2014), where total country-product-level import values of all countries in the world over time are weighted to the firm level with pre-determined country-product shares. By contrast, we use the number of origin countries as (extensive margin) shocks and therefore aggregate at the product level. This ensures that no individual company as a world market leader can shape trends in international trade flows.

[14] The number of observations is lower than for the baseline, because for small export flows—i.e., those that are below the full reporting threshold and originate from simplified declarations—we do not observe the product dimension needed for the instrument.

[15] Total employment in business services and ICT increased by 1.35m persons engaged (industries J and M-N in the EU KLEMS database), while our 15,312 firms in the data each add 26 external workers at internal wages. Note, however, that our results do not speak directly to the savings in market access

The instrument is not expected to have the same validity in our cross-sectional exercises, since it lives off the exogenous demand shock from Eastern Europe over time, rather than product shares, as discussed below. Nevertheless, in unreported regressions we have confirmed that our findings are highly robust to instrumenting. In the remainder of this section, we provide additional evidence in support of our instrumental variables strategy.

2.4 Robustness and Alternative Mechanisms

The baseline findings are highly robust and in this section we address a wide range of potential concerns about identification and alternative interpretations. All results are based on the panel data set and reported in Table 2 or as indicated in the text.

Table 2: Alternative Mechanisms

	(1) Base	(2) Out	(3) Ind-Cap	(4) Empl	(5) Out	(6) Out
N	0.301	0.311	0.012	-0.166	0.252	0.305
	(0.101)	(0.106)	(0.009)	(0.102)	(0.107)	(0.101)
Exp Intensive Margin		-0.010				
		(0.007)				
N Imp					-0.017	
					(0.018)	
Imp Intensive Margin					-0.004	
					(0.006)	
Num. Layers						-0.002
						(0.007)
Professional Share (CS3)						0.076
						(0.076)
Observations	163,269	163,269	70,205	132,538	141,699	163,250
Number of firms	23,938	23,938	14,951	20,604	20,931	23,934
R-Square	0.744	0.743	0.678	0.677	0.751	0.744
Controls	Yes	Yes	Yes	Yes	Yes	Yes
KP-Stat	246.4	252.7	70.0	202.7	213.5	247.3
IV Type	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind#Year FE	Yes	Yes	Yes	Yes	Yes	Yes

The dependent variable is the (log) share of purchased services in total costs in columns (1)-(2) and (5)-(6); it is the outsourced cost share in total costs of physical intermediate inputs due to capacity constraints in column (3); it is the (log) total cost share of *external* expenses on labor in column (4). The main regressor N is the (log) number of export destination countries at the firm-year level. Exp Intensive Margin is the (log) average sales across destinations; N Imp is the (log) number of import origin countries; Imp Intensive Margin is the (log) average imported value across origins; Num. Layers is the number of hierarchical layers; Professional Share (CS3) is the share of middle managers and professionals in total employment—all variables are computed at the firm-year level. Coefficient estimates for the control variables employment, skill intensity, and capital intensity (all in logs) are not shown. The full baseline sample contains all French manufacturing exporters in the EAE during 1996-2007. Numbers of observations differ from the full sample and across columns due to data availability. Standard errors in parentheses are clustered at the firm level.

costs brought about by reorganization, which we back out with a structural model in Section 5. However, they do imply that manufacturers shift their firm boundaries substantially and that investigating this channel is important.

Exclusion restriction and alternative mechanisms

Comparing our instrumental variables approach to the ideal experiment, there may be concerns that the quasi-exogenous variation affects outsourcing of professional and business services not only through market access, but also via an increase in firm scale. We offer three pieces of evidence that alleviate such concerns.

First, the instrumental variable in (3) is designed to capture shocks to the demand for varieties of the same product from different countries, i.e., shocks to the extensive country margin for exporters. Moreover, in the baseline regression model (1) we directly control for employment as a proxy for scale. Second, we can include the *intensive* margin of exporting—the average export value per destination market—as a regressor, see column (2) of Table 2. Outsourcing of market access services rises in the number of destinations, but the effect of export scale is close to zero and statistically insignificant. Third, we conduct two placebo exercises based on alternative outcome variables. In columns (3) and (4), we show that the extensive country margin has no effect on the cost share of outsourced physical intermediate inputs to increase production capacity and of outsourced employment (contract labor)—two scale-related activities.[16] In sum, we find no evidence that our main instrument affects market access service outsourcing through a scale mechanism.

Another concern about the exclusion restriction, and indeed the general validity of our interpretation, arises from the fact that many of our exporters are active as *importers*, too. For the results in column (5) of Table 2 we therefore restrict the sample to firms that simultaneously buy from and sell on foreign markets and include the extensive and intensive margins of importing as control variables. Neither the causal effect of international market access nor the first-stage estimates are significantly affected, which confirms our expectations: Marketing a product in a new country typically involves finding many customers in an unfamiliar environment (e.g., Albornoz et al., 2023), complying with a set of potentially unknown legal regulations, and maintaining a broadening customer base (Arkolakis, 2010; Fitzgerald et al., 2023; Argente et al., 2021). By contrast, importing implies a different and significantly less burdening set of tasks, which is underlined by the insignificant estimates in column (5).[17]

[16]These placebo exercises are directly connected to two strands of research. The employment subcontracting variable is used as a proxy for low skill outsourcing in Bilal and Lhuillier (2021). Industrial outsourcing in the French data is similar to the 'contract manufacturing services' reported in the U.S. Census of Manufacturers, in which the buyer provides instructions and technical specifications to a manufacturer who performs the physical production activity. Fort (2017) has used this measure to analyze the role of technology and skill complementarities in the firm's decision to fragment production domestically or abroad.

[17]In unreported results of outsourcing by service type, we show that the set of services that are more likely to be outsourced in relation to the importing activity of the firm is smaller and does not overlap with market access services (the only service input that reacts significantly to both the export and the import extensive margins is transportation, while outsourcing of warehousing services is positively related to both the export and import intensive margins).

More broadly, one might be concerned about correlated shocks or first-order general equilibrium effects between France and the new Eastern European member states. The shocks we exploit in our instrumental variables approach might therefore have affected outsourcing of market access services through indirect channels, for example due to international value chains. To tackle this issue, we start by excluding all EU 15 countries in the computation of the shock variable in (3). The result in column (1) of Online Appendix Table E.5 illustrates that our main finding is fully robust. Moreover, in columns (2) and (3) of the same table, we make use of instruments that leverage the variety shocks due to growth in the BRICS economies and in China.[18] The estimates of interest are highly significant and remarkably similar to those based on our main instrument. Finally, and as recommended by Adão et al. (2019), we cluster at the level of variation of the shocks $\Delta_{t-t_0} N_{pt}^{\text{ROW}}$ to address error correlations in all instrumental variables regression. Since we cannot cluster at the product level, we do so at the 3 digit industry level.[19]

Quasi-random assignment and the nature of exogenous variation

Next, we investigate the validity of our baseline instrument with respect to the underlying randomization. Following the recent advances on shift-share strategies (for example, Borusyak et al., 2022), we compute the concentration/dispersion of firm exposure to the shocks as the inverse of the Herfindahl index of the average shock exposure across firms. The calculations imply that identification comes from around 436 different (product-level) shocks, which is twice as many as in the prominent study of Autor et al. (2013), which Borusyak et al. (2022) consider well-identified. Moreover, in a falsification exercise we

[18] We have also experimented with the change in the number of *destination* countries for US *exports* (excluding France) and have obtained similar results to our baseline findings; the estimates are available upon request. Moreover, it is noteworthy that the different shocks stem from countries with significantly different levels of development and the estimates are similar. It is therefore unlikely that our estimates are driven by quality downgrading at the firm level, which could reduce variable costs and thus increase cost shares. It is also unlikely that quality upgrading induces firms to match with better and more expensive service suppliers (Demir et al., 2024), especially when the variety shocks come from less developed regions.

[19] We address four additional, but minor concerns about the instrument's exclusion restriction. When we restrict the estimation sample to the balanced panel of firms that export in every year with initial exposure shares in the instrument defined in 1996, our main finding is fully robust, see column (4) in Online Appendix Table E.5. This has two useful implications. First, even if the EU enlargement took place in 2004, trade integration had already started early in the 1990s and there was no precise treatment year since the enlargement has been a continuous process. Accordingly, the shock may have led to entry into our sample of exporters over time. The balanced panel exercise shows that this margin does not drive our results. Second, the firm-product shares in the instrumental variable are computed in 1996, so that their potential endogeneity is less of a concern. We want to highlight, however, that we rely on the exogeneity of the variety shocks for identification, which is sufficient (Borusyak et al., 2022). Third, in column (5) of Online Appendix Table E.5, we omit the initial number of destinations N_{fpt_0} in the construction of the instrument and find that the result is fully robust. Finally, one might be worried that the political and regulatory changes in Eastern Europe may have made local sourcing of service inputs there easier. To the extent that offshoring is more prone to outsourcing—costly foreign direct investment can be avoided—, the instrument may have had a direct effect on our outcome. While conceivable, this is unlikely to be a first-order concern due to our industry-year fixed effects approach. Moreover, this threat to identification is virtually absent for the alternative BRICS and China instruments presented above.

regress the 5-year lagged outsourcing share on our instrumental variable, using the same fixed effects and (lagged) controls as in our baseline specification of equation 1 (for a similar approach, see Aghion et al., 2020). A significant correlation would suggest that our outcome predicts the assignment of the instrument conditional on controls, for example because some firms anticipate the developments in Eastern Europe. As column (6) in Online Appendix Table E.5 shows, however, the coefficient of our instrument is precisely estimated and zero. Finally, we address the concern that treatment assignment might be problematic when we control for firm-level variables as in the baseline regression (1) (employment, skill intensity, and capital intensity). We omit all regressors except for the number of destination markets and find that neither the first stage regression nor the instrumental variables estimate are significantly affected, see column (7) in Online Appendix Table E.5.

We also construct an alternative instrument where we focus on the "most successful" product of a firm, which leverages a subset of shocks and thus helps to understand the identifying variation in our baseline instrument. The rationale for using the "most successful" product, instead of the weighted average across all of a firm's products, is based on a stylized fact in the multi-product literature of international trade. Typically, there is a pecking-order for products within the same firm across export destinations: A firm starts exporting its most productive or 'core' product to any given market and adds others in increasing order of marginal costs (Mayer et al., 2014). Since sunk costs of exporting are incurred with the first market penetration—and fixed service input costs are often shared among all products—a firm's 'core' variety is expected to matter most. In line with these considerations, the number of a firm's overall export destinations is highly correlated with the number of export destinations of its most successful product in our data (corr. is 0.97 in 1996, for example). As column (8) in Online Appendix Table E.5 shows, the point estimate and the Kleibergen-Paap statistic for the first stage regression are very similar. This suggests that for the most part we leverage plausible exogenous variation in line with other findings international trade literature.[20]

The boundary of the firm and 'servitization'

We have to ensure that our results do not simply reflect secular trends that are unrelated to globalization or provide little information about the distribution of tasks within and across firms. Many manufacturing firms have become more service oriented over the last few decades (Bernard et al., 2017). An increase in external sourcing of professional and business services may therefore be due to this general 'servitization' and demand for

[20] In another exercise, we restrict the variety shocks $\Delta_{t-t_0} N_{pt}^{\text{ROW}\to\text{EEU}}$ used in our baseline instrument to strictly positive ones. Our causal effect of interest is virtually unchanged (see column (9) of Online Appendix Table E.5). This underlines the partial sunk-cost character of market access costs as most of our firms' outsourcing responses are triggered by market entry, rather than exit. We explore the dynamics in more detail below.

service inputs grows both within and outside the firm—leaving the boundary of the firm unchanged. Related, international market access may be a general driver of increased demand for service inputs and the boundary of firms remains unaffected, too.

Several arguments suggest, however, that neither of these alternative interpretations of our findings applies in practice. First, our dependent variable $\mathcal{O}^C$ is already defined as outsourcing expenditures *relative* to total costs, which include internal production. Our control variables employment and skill intensity, i.e., the ratio of skilled to unskilled employees, also capture internal provision to some extent. Second, in column (6) of Table 2 we further proxy for the internal production of services by the number of hierarchical layers and the share of middle managers and professionals employed by the firm (more likely to be associated with the production of services). While firm reorganization has been shown to have important implications for firm growth (Caliendo et al., 2015, 2020), we find that in our context the estimated effect of foreign market access on the outsourcing share is unchanged.[21] In Online Appendix Table E.4, we introduce several other measures for internal production, all of which leave our conclusion unchanged. Alternatively, we can exactly decompose our main outcome, the (log) cost share of outsourced services, into the (log) share of outsourced services in total service expenditure (external and internal) and the (log) share of total service expenditure in total costs; see Online Appendix D.2 for details. The former captures the true shift in the boundary of the firm, while the latter captures the general increase in service-related input provision within the firm. As columns (9) and (10) of Online Appendix Table E.4 demonstrate, exporting to more destinations predominantly causes more outsourcing of market access services and has a statistically insignificant effect on overall service consumption by the firm. Since it is difficult to measure internal service provision, however, we are cautious in interpreting these results and refrain from using the outsourced service share in total service expenditure as a main outcome. Finally, any secular trend like 'servitization' is partially picked up by our firm fixed effects. What is more, in Online Appendix Table E.5, column (10), we show that using firm-specific time-*trends* leaves our conclusions unchanged. We therefore conclude that we detect an actual organizational shift due to international expansion.[22]

[21] As suggested by an anonymous referee, a potential mechanism in line with Caliendo and Rossi-Hansberg (2012) that might explain our main finding could operate through firm-level reorganization: exporting to additional markets expands the task spectrum faced by the manufacturer and firms can outsource such tasks as an alternative to changing their internal structure. Since controlling for the hierarchical structure (number of layers) or for the skill composition (share of professionals) does not affect our estimates, we believe that the degree of freedom provided by internal restructuring is not of first order importance for firms.

[22] An interesting and conceivable scenario is outsourcing to other partners within the same domestic or multinational business group. In this context, we have estimated the baseline specification on subsamples of firms (i) without any reported PBS activity in their business groups or (ii) without any foreign affiliation (see columns (11) and (12) of Online Appendix Table E.5). Since the estimates are statistically indistinguishable from the baseline, the potential presence of organizational specialization at the group-level is not a concern for our conclusions. Finally, our findings may be biased due to the presence of firms that switch to the service sector during the period (and exit our sample), as documented in Ding

2.5 Further Explorations

To conclude this section, we summarize three further explorations that we find noteworthy and describe in detail in Online Appendix B.1.[23] First, we trace out the functional form of our main effect and find that it is indeed significantly concave as suggested by Figure 1. This does not imply, however, that firms that export to a very high number of destinations reduce their outsourced cost share when they enter new markets. Indeed, when we restrict the sample to exporters serving 50 or even 80 foreign markets (95th and 99th percentile in the distribution of destinations) at least once in our sample period, we find that our baseline estimate remains positive and significant, but smaller in magnitude as expected. This is in line with Online Appendix Figure E.1, which is a replication of Figure 1 in deviations from fixed effects and baseline controls.

Second, we closely relate our findings to Arkolakis (2010). Our data allow us to observe (outsourced) firm-level expenditures on market access services (including advertising) and thus to provide direct evidence on the channel proposed by that article. We show that accessing larger markets with a higher market share—using the functional form and calibration suggested by Arkolakis (2010)—indeed leads to higher (outsourced) expenditures on market access services. At the same time, these dimensions are entirely uncorrelated with the *outsourced cost share*, that is, the firm boundary. We conclude that the entry cost channel proposed in this paper is orthogonal and complementary to Arkolakis (2010).

Third, export destinations differ in terms of how much additional complexity they imply for a specific firm. We show that when a firm exports to destinations that are more difficult to access or when it offers more of its products to the average market, it outsources even more. Finally, we present evidence that outsourcing increases just before the number of destinations rises, in the same year, and in the period afterward.[24] Therefore, it is likely that business services and their associated costs have both a sunk and a fixed cost character.

3 Conceptual Mechanism

In this section, we formally model the service outsourcing decision to highlight an important—testable—trade-off for companies and to micro-found an endogenous market access cost function. For clarity, we outline the make-or-buy decision of a representative firm and study the implied relationship between the number of destination markets to be served

et al. (2022). However, our results are virtually unchanged when we remove such "pivoting" firms from the sample (column (13)).

[23] Since we operate with a range of additional regressors, we do not instrument in these exercises.

[24] Given these findings, we have also estimated a long-difference specification for 1997 and 2006 to take into account that reorganization may take time or could be transitory. The result in column (9) of Online Appendix Table E.3 suggests that firms adapt substantially and permanently within a short window around a foreign market access event.

and the firm's organizational choices.

3.1 General Set-up and the Market Access Cost Function

A manufacturer—a single manager and her employees—intends to serve a continuum of N foreign markets. A country-specific input i is needed to export to any such destination and a firm that serves N countries must source an equal measure of *service inputs*, independently of the quantity it ships there (e.g., Helpman et al., 2008; Eaton et al., 2011).[25] A company that supplies many destinations and thus manages the procurement of a large number of service inputs faces high 'export complexity'. The model is static at its core, so that there is no difference between sunk and fixed expenses.[26]

Rendering a market access input requires a single worker and no capital, in line with the idea that services are knowledge-intensive and property rights considerations play little role. Workers supply their labor inelastically with an outside option normalized to zero. There is a large pool of workers who can potentially supply any service input i. As a result, their ex-ante expected equilibrium profits $E[\pi^s(i)]$ are zero. The workers' payoff function is

$$\pi^s(i) = P(i) - (a(i) - \theta(i))^2 - f, \tag{4}$$

In producing the input, an employee or agent is generally free to do so in a way she pleases—formally, she takes an action $a(i)$ to maximize her personal payoff. Ceteris paribus, she tries to take an action as close to $\theta(i)$ as possible, where the latter is a realization of an i.i.d. random variable with mean $\hat{\theta}(i)$ and variance ν^2. We refer to it as the *input condition* and it characterizes the *worker's* most efficient way of producing input i. For instance, $\theta(i)$ may capture a translator's or advertiser's knowledge vis-a-vis a particular destination market for a firm's exports. To the extent that the worker performs an action that deviates from her input condition, she incurs a quadratic cost.

$P(i)$ is the worker's compensation set in her contract with the manufacturer and evidently it can be sensitive to the action $a(i)$. A specific action, or the right to ask for a specific action, can be written into both employment and external contracts; i.e., the action is contractible. Finally, the worker must incur a cost f to learn and practice how to perform task i.

The company can either employ workers directly and produce the input in-house or outsource the input to an external agency. We make the following important assumption about the key difference between outsourcing and integration of service inputs:

Assumption 1. *While the independent agent is free in choosing her action $a(i)$, an employee implements the action specified by her manager.*

[25] In the international business literature, this idea is popular at least since Johanson and Vahlne (1977).

[26] While our empirical findings suggest that the procurement of foreign market access services is likely to have both fixed and sunk aspects, the main insights of this paper do not hinge on this distinction and the benefits from a complex model extension with two or more periods are small in our context.

This reflects the definitions of employment in Black's Law Dictionary (Garner and Black, 2009). An employee is defined as "a person in the service of another under any contract of hire [...], where the employer has the power or right to control and direct the employee in the material details of how the work is to be performed". By contrast, an external agent "contracts to do a piece of work according to his own methods and is subject to his employer's control only as to the end product or final result of his work." Integration therefore gives the manager an opportunity to coordinate actions and control how services are produced.[27]

Turning to the manufacturing company, the market access costs that it has to incur to export to a measure N of countries are given by

$$F = \int_0^N P(i)di + \delta \int_0^N (a(i) - \hat{\theta}^c)^2 di + N^\alpha K^\beta t^\gamma. \tag{5}$$

In the spirit of Dessein and Santos (2006), the adaptation cost $\delta(a(i) - \hat{\theta}^c)^2$ depends on the parameter δ, which scales them relative to other expenses. It increases in the Euclidean distance between the worker's action $a(i)$ and the firm's characteristic $\hat{\theta}^c$, which equals the action that provides the best fit with the firm's overall needs and to which all tasks have to be coordinated (hence the superscript).[28] The additive and quadratic formulation in (5) implies a constant marginal cost of adaptation. This captures the idea that a translator for Ducati manuals spends the same time fixing a paragraph in a motorcycle manual irrespective of inaccuracies in manuals for other destinations, of whether the translator is an employee or an external worker, or of the size of the translating team etc. Formally, a manager's ex-post request to adjust a service input in line with the firm's requirements $\hat{\theta}^c$ creates an additional burden for the worker that has to be compensated by the firm. The marginal costs of such adaptations naturally do not depend on other tasks or workers and, crucially, they require the same managerial attention under integration as they do under outsourcing.

The final term captures relative managerial costs incurred by the manager when she directs in-house production. To be concrete, the manager has to communicate with each worker to advise her about the action she is supposed to take and to monitor the cre-

[27] In Online Appendix A.5, we relax this assumption and pose that managers are not able to rule by fiat, but that the employee's action $a(i)$ must be implemented by the equilibrium employment contract. We show that all insights from the model carry over. This is not surprising, since the manager internalizes the employee's incentive problem through the latter's participation constraint.

[28] In Online Appendix A.4, we study a version of the model where the firm aims to synchronize all inputs with a common action, namely the simple average action across all tasks, $\hat{\theta}^c \equiv 1/N \int_i a(i)\mathrm{d}i$. With a finite and discrete set of export destinations and service input tasks, each action influences all other actions and the non-atomistic workers take this into account. The main features of the market access cost function are unchanged, but the analysis becomes significantly more cumbersome. We also note that in this case of a broader coordination problem, the marginal benefit of integration decreases in the number of tasks internally undertaken, thus pushing a firm even more towards outsourcing when it expands and faces additional export complexity.

ation of the service input. Returning to our example, deviations by Ducati's translators or advertisers, for instance, could thus be detected and rectified immediately, and formal documentation by Ducati's managers could furthermore ensure that any contractual penalties (damages and/or demise) could be enforced in court. These activities are required both under internal and external provision, but supervising employees is generally more time-consuming than managing outsourced procurement (for evidence see, for example, Bandiera et al., 2020) and for the purpose of this paper we simply model the relative managerial costs.

These costs are a function of the total measure of inputs created, N, the capability of the manager, K, and the measure of employees/tasks solved internally, t. The elasticity α can be positive or negative, which captures managerial congestion or relief: a larger number of outsourced tasks for given internal production t may raise or reduce the mental load for the manager. Moreover, the costs of managing a firm of a given size (N, t) naturally decrease in the manager's capability as $\beta < 0$: in line with Crémer et al. (2007), we envisage the coordination and monitoring process as communication-intensive and a better (higher K) manager can establish a more efficient corporate language or code.[29] Last, but not least, the returns to span of control γ determine how managerial costs respond to the number of in-house tasks and employees. As prominently argued in Lucas (1978), these returns are likely positive, but diminishing in practice, so that γ is typically larger than 1. This condition is also required for the cost minimization problem to be well behaved—$\gamma > 1$ will imply convexity of the cost function in t—and from here on we make this assumption.[30, 31]

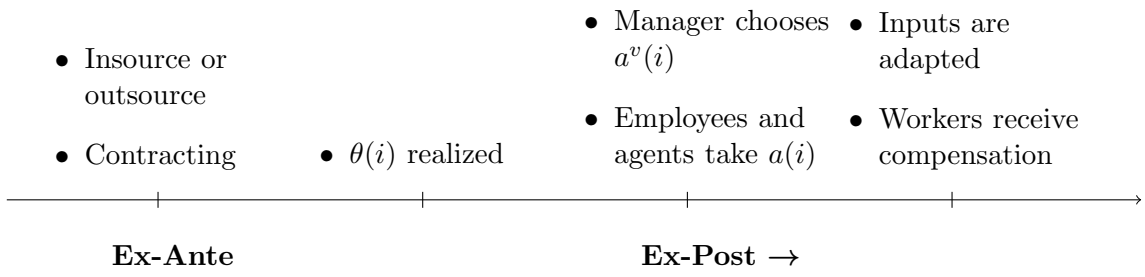
The timing of the game is summarized in Figure 3. Taking the number of destination countries and service tasks N as given, the manager first decides whether to source each

[29]Managerial capability is commonly treated as a fundamental of firm heterogeneity in the international trade literature and we follow suit by keeping it exogenous. While it is an endogenous choice for firms in reality (Mion and Opromolla, 2014; Mion et al., 2022), the market for talent severely restricts a company's ability to adjust and formally modelling a labor market for managers would not add to the insights of this paper.

[30]We have assumed perfect information about all input conditions $\theta(i)$ and actions $a(i)$, regardless of whether the worker is directly employed or active as an external agent. This assumption is strong and potentially counterfactual, since communication with internal staff is typically much more frequent and managers tend to be better informed about employees (e.g., Arrow, 1975). We have solved a version of our model with imperfect information and detection by the manager through communication and, as expected, all results presented below remain unchanged: superior knowledge within firms only increases the advantage that internal provision has for coordination. Consequently, we present the simpler version with a single channel here (managerial overload).

[31]Selection into increasingly complex markets could be an alternative mechanism that does not require any convexity in the managerial cost function: if firms enter increasingly difficult markets as they expand, they might that require increasingly more expertise, which could be obtained more cheaply through outsourced relationships. This mechanism receives relatively little empirical support, however. In Eaton et al. (2011), as in our data, the pecking order of destination markets is very fuzzy due to the important role of country-exporter-specific shocks. Moreover, in Online Appendix B.1, we document that we can control for the complexity of a market and still find a largely unchanged estimate for the effect of the number of destinations on outsourcing. As a result, we abstract from heterogeneity across markets and focus on convex managerial costs.

Figure 3: Timing of the Market Access Cost Game



input i from an external agent or to produce it internally by employing a worker directly. Furthermore, she offers every worker a contract $P(a(i))$, which the employee or agent can accept or reject (in which case the game ends immediately). After this ex-ante stage, the vector of input conditions $\boldsymbol{\theta}$ is realized. In the first ex-post stage, the external agents choose their optimal actions to maximize their payoffs (4) based on the compensation scheme they agreed upon in the beginning. By contrast, the manager instructs her employees on the actions they are supposed to take and thus minimize the company's market access costs (5). In the final stage of the game, the firm adapts all inputs to its requirements and pays both its employees and external ages. For clarity reasons, we introduce the manufacturer's choice of N as well as the goods production and sales processes only where needed, i.e., when we quantify a full model in Section 5.

We solve the game—via backward induction—for the optimal actions of workers when they are employees and when they are agents; for the optimal contracts; and finally for the (expected) market access cost function. The detailed exposition is shown in Online Appendix A.1 and we focus on the main decisions and properties here.

The optimal contract under outsourcing is characterized by a fixed price, while the employment contract compensates the worker fully for her inconvenience cost as she is forced to implement the manager's preferred action. In these environments, the workers take optimal actions

$$\begin{aligned} a^{o*}(i) &= \theta(i) \\ a^{v*}(i) &= \frac{1}{1+\delta}\theta(i) + \frac{\delta}{1+\delta}\hat{\theta}^c, \end{aligned}$$

where o and v indicate actions under **o**utsourcing and under internal production (**v**ertical integration), respectively. Due to the fixed-price contract, the external agent has no incentive to pick any other action than $a^o(i) = \theta(i)$, i.e., the one that benefits her most *individually*. Employees implement the action instructed by the manager, who monitors them and can thus prevent deviations. To set $a^v(i)$ optimally, the manager balances a marginal reduction in adaptation costs—$a^v(i)$ close to $\hat{\theta}^c$—with a marginal reduction

in compensation for an employee—$a^v(i)$ closer to θ_i. Compared to external agents, the manager coordinates better, because she can internalize the negative externality that each worker imposes on the rest of the organization.

Given these actions and the optimal contracts, the expected market access cost function at time zero is:

$$E[F] = fN + \delta\psi^2 N - \frac{\delta^2\psi^2}{1+\delta}t + N^\alpha K^\beta t^\gamma, \tag{6}$$

where the summary parameter $\psi > 0$, indicates the need for adaptation due to the volatility of the input conditions.

This expression captures the trade-off involved when deciding between outsourcing and integration. The second term amounts to the procurement costs incurred under (full) outsourcing. The third and fourth terms capture the costs of integration: By coordinating actions in-house, the manager is able to internalize the externalities caused by workers and achieve lower adaptation costs. This, however, comes at the cost of managerial overload.

3.2 The Service Make-or-Buy Decision and Export Complexity

In deriving further results, we are faced with an extensive taxonomy of cases if the parameters of the managerial cost function are generic. To avoid complications that add little insight, from here on we rely on a specific micro-foundation:

Assumption 2 (Managerial Costs)**.**

$$N^\alpha K^\beta t^\gamma = \frac{t^3}{KN}. \tag{7}$$

In Online Appendix A.2, we provide a formal derivation for this functional form, which is based on the optimal choice of an organizational language in the setting of Crémer et al. (2007). The intuition in our context is the following. A manager must assign words to service input tasks to be able to communicate about them, and the more precisely a word relates to a particular task and not to others, the lower is the probability of miscommunication and of a costly back-and-forth with the employee. Unfortunately, the manager is boundedly rational in the sense that she can only learn K different words to communicate about the continuum of input tasks t within the boundary of the firm; she must therefore apportion these words wisely. The optimal such allocation implies that frequently occurring tasks are assigned very narrow and specific words, while such a precise language is not necessary for infrequent ones. With a simple communication cost function, and given the fact that in our case every country-related task occurs with equal probability, expression (7) can be derived.[32]

[32]In Section 5 below, we quantify the parameters of the generic iso-elastic managerial cost function by

Minimizing the expected market access costs in (6) under the parameterization of Assumption 2 gives the optimal measure of inputs internally produced,

$$t^* = \delta\psi\sqrt{\frac{KN}{3(1+\delta)}}, \tag{8}$$

and the expected market access cost function becomes:

$$E[F] = fN + \overbrace{\delta\psi^2\left(N - t^*\right)}^{F^O} + \overbrace{\frac{3+\delta}{3(1+\delta)}\delta\psi^2 t^*}^{F^I} = fN + \delta\psi^2 N - \frac{2}{3}\frac{\delta^3\psi^3}{(1+\delta)}\sqrt{\frac{KN}{3(1+\delta)}}. \tag{9}$$

F^O is the part of the expected market access costs that is outsourced, while F^I is the in-house component. The total expected market access costs of the firm increase in the need for (ψ^2) and relative cost (δ) of adaptation, as well as in the number of destination markets. Interestingly, as $\delta\psi$ approaches zero, the market access cost function reduces to the exogenous cost function f typically employed in Melitz-type models. Finally, they decrease in the manager's capability to coordinate (K).

We are now in a position to state the first important implication of our model.

Proposition 1 (Outsourced Task Share and Market Access)**.** *The share of outsourced market access service tasks $\mathcal{O} \equiv (N - t^*)/N$ rises in the number of export destination markets, but at a decreasing rate:*

$$\frac{\partial}{\partial N}\mathcal{O} > 0 \quad \textit{and} \quad \frac{\partial^2}{(\partial N)^2}\mathcal{O} < 0$$

Proof. The proof follows directly from the definition of the share of outsourced tasks and the first order condition for the optimal share of in-house tasks (8). □

When a firm expands its destination portfolio, the total number of required service inputs rises. As a result, the increase in managerial strain—which affects all infra-marginal tasks as well—leads managers to rely more heavily on external agents. Moreover, this relationship is concave due to two distinct mechanisms. First, the outsourced task share is mechanically bounded by one. Second, the time saving effect of outsourcing captured by $\alpha < 0$ in Assumption 2 reduces managerial overload as export complexity rises (ceteris paribus). This in turn implies that the number of integrated tasks increases as well and the outsourcing share rises at lower and lower pace. Both implications in Proposition 1 are consistent with our main empirical findings and the additional results regarding concavity in Online Appendix B.1.

matching salient patterns in the data. As it turns out, the micro foundation performs well. To provide an even better fit, managerial costs must be slightly more convex in integrated tasks, outsourcing must lead to a somewhat larger reduction of overload, and managerial capability must play a less significant role overall.

Importantly, these results do not hinge on the functional form we posit in Assumption 2. As long as managerial costs increase sufficiently more sharply in the number of employees t than they decrease in the total number of service input tasks N, the outsourcing share will behave as described in Proposition 1. Consequently, Proposition 1 is robust to different functional form assumptions, for instance to a congestion effect with managerial costs *increasing* in N, which reinforces the result.[33]

Three further observations are noteworthy in this context. First, although Proposition 1 provides a good intuition for our main stylized fact—that firms increasingly outsource PBS as they access new or more foreign markets—it is not perfectly tightly linked to our empirical results for two reasons. First, our main finding above is about outsourced costs shares, which are observable in the data, while Proposition 1 is a statement about task shares, which are not. In Online Appendix A.6, we therefore show that Proposition 1 also holds for cost shares in the standard setting of international trade with CES preferences and constant returns to scale technology (Chaney, 2008), which we also employ in the quantitative exercises in Section 5 below.

Second, the model provides a basis for our main estimating equation (1) in Section 2 and delivers a precise rationale for our instrumental variables strategy. Expressing the first order condition (8) in terms of the outsourced task share, we obtain

$$\mathcal{O} = 1 - \delta\sqrt{\frac{K}{3(1+\delta)N}}, \tag{10}$$

of which the regression model (1) is a first-order approximation. In a fully specified model, there is a second optimality condition that determines N as a function of foreign demand and of market access costs—which in turn depend on the outsourced cost share $\mathcal{O}$ (see Online Appendix A.6.3). This creates a simultaneity problem when taking (1) to the data, as discussed in Section 2 above. Since foreign demand shocks do not enter this expression, they can be used as an excluded instrument to identify the causal effect of N on $\mathcal{O}$.

Third, it is insightful to compare our market access cost function to other approaches in the academic literature. Inspection of (9) shows that the expected market access costs function is monotonic in N, which is consistent with the typical modelling approach applied in international trade.[34] At the same time, in contrast to the standard assumption,

[33] See Online Appendix A.3 for an extension of Proposition 1 to more general cost functions. We stress that Assumption 2 stacks the cards *against* outsourcing service inputs when a firm exports to additional foreign markets. Since $\alpha = -1$, the relative managerial costs under internal production fall in the number of destinations N, for example, because outsourcing some of the additional tasks reduces a manager's overload at the margin. Our micro-founded managerial cost function therefore constitutes a conservative approach and creates a plausible equilibrium that features not only an increase of externally but also internally produced tasks when the total number of inputs goes up.

[34] For the expected market access costs to be weakly positive for any number of export markets, we normalize the measure of N appropriately. That is, the number of inputs internally produced t^* cannot be larger than the total number of inputs N, which is guaranteed if $N \geq \delta^2\psi^2 K/(3(1+\delta))$. Furthermore, it is easy to verify that the market access cost function always increases in N when the function itself is

it grows approximately linearly only when the number of destination markets is large. By reorganizing the provision of their service inputs, firms can economize on market access costs, especially when they are small and in their early stages of internationalization. They do so by outsourcing non-core tasks to external agents, thus alleviating the cost pressure from increased managerial strain due to rising complexity.

Moreover, in our model market access costs depend on the entire portfolio of destinations served, which gives rise to a particular form of 'organizational extended gravity'. While the trade patterns implied by Chaney (2014), Morales et al. (2019), and Alfaro-Urena et al. (2023), for example, follow extended gravity due to country-level heterogeneity—in geography, to be precise—, in our case it is firm-level heterogeneity in the total number of export destinations that affects market access costs.[35]

These considerations are captured in the following corollary.

Corollary 1 (Market Access Costs)**.**

- *Market access costs increase in the number of destination markets, but less than linearly due to firm reorganization.*
- *The marginal benefits of firm reorganization decrease as export complexity increases.*
- *Organizational Extended Gravity: A company's foreign market access costs depend on the export status in all other markets.*

Finally, our specification of market access costs is complementary to the one in Arkolakis (2010). The latter is sensitive to the intensive margin of exporting, because firms that try to reach a larger number of customers in larger markets face higher entry costs. By contrast, our access costs depend only on the extensive margin of exporting, since most of the market access services we consider are truly sunk or imply fixed expenditures.

4 Empirical Evidence for the Mechanism

In this part of the paper, we provide supportive evidence for key features of the market access cost function by confronting two additional implications of the model with the data. We first derive them formally and then describe our empirical findings.

We start with an analysis of how the need for and costs of adaptation shape a firm's make-or-buy decisions and how they affect the reorganization that goes hand in hand with accessing additional markets abroad.

positive.

[35] It is possible and intuitive to introduce country-level heterogeneity in our framework as well. One may envisage that accessing a new market similar or close to an existing one is associated with considerable task-overlap or synergies. Additional managerial strain under integration is therefore smaller, for example since the manager can hold efficient group meetings for employees who work on the same cultural or geographic region. As a consequence, market access related costs are lower at the margin and firms are more likely to export there.

Proposition 2 (Adaptation)**.** *The share of outsourced service tasks $\mathcal{O}$ falls in the need for (ψ) or cost of (δ) adaptation. Moreover, $\mathcal{O}$ increases even more in the number of export destination markets when the expected costs of adaptation are high:*

$$\frac{\partial}{\partial \psi}\mathcal{O} < 0, \quad \frac{\partial}{\partial \delta}\mathcal{O} < 0 \quad \textit{and} \quad \frac{\partial^2}{\partial N \partial \psi}\mathcal{O} > 0, \quad \frac{\partial^2}{\partial N \partial \delta}\mathcal{O} > 0$$

Proof. The proof follows directly from the definition of the share of outsourced tasks and the first order condition for the optimal share of in-house tasks (8). □

First, our model implies a smaller outsourcing share when expected adaptation costs are high. Intuitively speaking, coordinating the production of service inputs is particularly valuable whenever a failure to do so creates substantial costs ex post. This is the case when destination-specific inputs can be produced in a variety of ways and a good match with a given firm's special needs is unlikely (high ψ), or when changing and adapting them ex post is difficult (high δ). The firm cannot influence an external agent's action under outsourcing and is therefore unable to improve coordination even if ex-post adaption is expected to be costly. Within a company, by contrast, some of these adaptation expenses can be avoided (albeit at slightly higher wages).

Second, the model implies that firms are particularly eager to outsource service inputs associated with foreign market access when the need for or costs of adaptation are high. The reason is the following. Adding export destinations is especially taxing for managers when service inputs require substantial and costly adaptation. Infra-marginal inputs for existing markets already exact a company's managerial capability, so that the company operates in the very steep part of the convex managerial cost function. When even more service inputs are needed to export to new countries, there is little scope for a firm to hire and supervise employees. As a result, the outsourcing task share increases more sharply compared to a situation with low expected adaptation costs.

In the same vein, we investigate the role of managerial capability K.

Proposition 3 (Managerial Capability)**.** *The share of outsourced service tasks $\mathcal{O}$ falls in the managerial capability of a company (K). Moreover, $\mathcal{O}$ increases even more sharply in the number of export destination markets when managerial capability is high:*

$$\frac{\partial}{\partial K}\mathcal{O} < 0 \quad \textit{and} \quad \frac{\partial^2}{\partial N \partial K}\mathcal{O} > 0$$

Proof. The proof follows directly from the definition of the share of outsourced tasks and the first order condition for the optimal share of in-house tasks (8). □

When an organization employs managers with a large capacity to coordinate their subordinates, a higher number of tasks can be produced in-house without overloading managers. Accordingly, the costs of producing the service inputs required for exporting

internally are lower and the optimal outsourcing task share is smaller. When a company now decides to expand to additional foreign markets and the range of service inputs widens, better managers are predicted to increase the outsourcing share more significantly. A useful intuition for this second result is that capable managers already coordinate many employees and are therefore more willing to rely on external agents when the task range expands due to foreign market access.[36]

To test our predictions regarding adaptation costs, we continue with the cross-sectional (ERSI) sample with outsourcing information by firm and each of 34 different services.[37] We assume that every (market access) service is potentially necessary to export and that they differ with respect to their adaptation costs. In other words, the service make-or-buy decision and the associated market access cost function apply separately for each service type. We therefore estimate the following linear probability model:[38]

$$OUT_{fs} = \beta_1 Adapt_s + \beta_2 N_f \times Adapt_s + \gamma_f \, (+\gamma_s) + \epsilon_{fs}. \tag{11}$$

$Adapt_s$ is a proxy for adaptation costs and s indexes a service type; firm fixed effects (γ_f) absorb any firm-level control variable; and γ_s denotes service type fixed effects that absorb the level of our adaptation proxies and leave only the interaction with the number of export destinations (N_f) identified. Our prediction corresponds to $\beta_1 < 0$ and $\beta_2 > 0$.

We construct three novel empirical proxies that capture the relevant parameters ψ and δ and it is noteworthy that all rely on fundamentally different ideas. (1) We compute the (non-)routine task share in the upstream service industries that produce each service type, inspired by Costinot et al. (2011). A high non-routine-task share implies that costly ex-post adaptation is both more likely and more expensive. (2) For each upstream service sector, we compute the inverse Herfindahl–Hirschman index of firm-level labor costs: a wide dispersion in service provider size suggests strong differentiation across services produced in the industry and therefore a greater need for ex-post adaptation. As argued by Sutton (1991), differentiation shields companies from price competition and productivity advantages cannot translate into high industry concentration, at least conditional on sunk entry costs. (3) We compute the (inverse) elasticity of service demand estimated following Gervais and Jensen (2019): a low downstream demand elasticity for services implies few possibilities to substitute away from any given input, so that the

[36] Two further implications of this proposition are worth highlighting. First, treating the market access costs as firm-specific—as in, for instance, Arkolakis et al. (2021) or Adão et al. (2020)—is well-grounded in the fact that a firm's managerial staff are a key determinant in the size of these costs. At the same time, they should not be independent of a company's core productivity *to the extent* that the latter reflects more than just manufacturing expertise. Second, market access costs should not be independent across destinations, since organizational choices are made at the firm- and not at the destination market level, and they depend on the common factor managerial capability (see Morales et al., 2019).

[37] As a reminder, in the ERSI, we have direct information on task outsourcing, rather than cost shares, so that we can rely on Proposition 2 without any further assumptions about demand or technology.

[38] Since we are interested in interaction terms, we do not rely on a non-linear model here.

producer is forced to make costly adaptations. For further details on these measures, see Online Appendix D.2.

Measuring the expected costs of adaptation of services is challenging and, to the best of our knowledge, we are the first to propose these proxies. While we acknowledge the limitations of these measures, we believe that their diverse origins render them collectively useful for our purpose and that the opportunity to learn outweighs the risk of misinterpretation.

The results are presented in Table 3. The empirical evidence shown in columns (1) to (3) lends strong support to the first part of Proposition 2: All coefficients are statistically significantly negative and economically important, as predicted. For instance, comparing the most to the least routine service type, the outsourcing probability increases by around 14 percentage points, over a baseline outsourcing probability of 51%. Furthermore, the need for and costs of adaptation play a key role in a firm's decision *which* services to outsources when it serves foreign markets. In columns (4) to (9), we focus on the particular service categories we identified as export-related in the service-by-service exercise reported in Figure 2 above; specifically, we restrict the sample to those with above-median coefficient estimates on N (see Online Appendix Table E.7). The positive and significant coefficients of the interaction terms imply that the increased complexity due to exporting leads to outsourcing of those 'market access' services that require substantial ex-post adaptation.

Next, we provide descriptive evidence on how managerial capability shapes the organization of market access services and therefore the market access cost function. We return to our baseline sample provided by the EAE, where the observable outcome is the outsourcing cost share. As before, we rely on within-firm variation over time; after all, managerial capability is a firm-level variable and the fixed effects address some of the most important concerns about confounders. We re-estimate the baseline specification (1) and include proxies for a firm's managerial capability to show how it correlates with outsourcing. The effect of managerial capability is expected to have a negative sign.

It is significantly more involved to provide evidence on the second prediction, since Proposition 3 only holds for *task* shares, while outsourced *cost* shares are subject to a counteracting effect as formally shown in Online Appendix A.6. To keep our focus, we therefore present results on the direct effect of managerial capability here and discuss our further investigations in Online Appendix C.[39]

As a first proxy for managerial capability we simply use the employment share of top

[39]To give the reader a sense of our exercises: In a Chaney (2008)-type model augmented with our market access cost function as used in Section 5, we formally show that the interaction term between managerial capability and the number of export destinations is more likely to be positive whenever the demand elasticity faced by our firms is low or when variable costs account for a smaller share of a firm's total costs (see Proposition A.3). In Online Appendix Table E.9, we present empirical evidence in support of this prediction.

Table 3: The Need for Adaptation and Service Outsourcing

	(1) All	(2) All	(3) All	(4) Median	(5) Median	(6) Median	(7) Median	(8) Median	(9) Median
Serv. NonRoutiness	-0.030			-0.023					
	(0.010)			(0.010)					
Serv. Dispersion		-0.106			-0.084				
		(0.010)			(0.014)				
Serv. Inv Elasticity			-0.066			-0.070			
			(0.008)			(0.008)			
N × Serv. NonRoutiness							0.009		
							(0.003)		
N × Serv. Dispersion								0.006	
								(0.003)	
N × Serv. Inv Elasticity									0.003
									(0.003)
Observations	126,482	126,482	110,673	59,283	59,283	51,375	59,283	59,283	51,375
Number of firms	3,959	3,959	3,959	3,959	3,959	3,959	3,959	3,959	3,959
R-Square	0.105	0.146	0.124	0.161	0.187	0.181	0.434	0.434	0.423
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Service Cat FE							Yes	Yes	Yes

The dependent variable is an indicator equal one if a firm outsources a particular service in 2005, and zero if not. Serv. NonRoutineness is the non-routine task share for the upstream service input; Serv. Dispersion is the inverse Herfindahl–Hirschman index of firm-level labor cost shares in an upstream service sector; Serv. Inv Elasticity is the (inverse) elasticity of service demand estimated as in Gervais and Jensen (2019). All variables are in logs and standardized. The full sample contains all exporters in the ERSI, a cross-section of manufacturing firms in 2005. The sample for columns (4)-(9) is restricted to upstream 'market access' service types whose estimated elasticity with respect to the (log) number of export destinations is above the median across services in Online Appendix Table E.7. The number of observations for columns (3), (6) and (9) is lower because four service types are not covered in the EAE Services data (Brokerage, Leasing, R&D, Training). Standard errors in parentheses are clustered at the downstream sampling strata by upstream service type level.

managers according to the occupational categories (catégories socioprofessionnelles) provided by matched employer-employee data (DADS). Since many top managers might not be directly involved in the actual provision of service inputs, we study three additional variables. First, we make use of the 2007 O*NET database to obtain information on an *occupation*'s intensity in tasks that relate to a) monitoring, b) coordinating (with) others, and c) communicating. Using occupation-specific employment shares reported in DADS for the firms in our sample, we aggregate these capabilities up to the firm-year level, see Online Appendix D.2. The idea behind these measures is that a company with many employees whose daily work focuses on managerial activities has more capacity to deal with a complex business environment. While in the model we interpreted K as a single manager's innate capability, in a real-world company supervision duties are shared throughout the hierarchy and our approach reflects this consideration. We believe that all four measures are highly appropriate in our context, but at the same time acknowledge that metering managerial capability is exceedingly hard and we have to expect considerable noise.

Column (1) in Table 4 shows that firms with a higher share of top managers indeed have a lower propensity to outsource market access services, controlling for firm characteristics through controls and firm fixed effects. While the effect has the expected sign, this simple measure of managerial capability lacks statistical power. When analyzing our

Table 4: Managerial Capability and Service Outsourcing

	(1)	(2)	(3)	(4)
N	0.083	0.083	0.083	0.083
	(0.010)	(0.010)	(0.010)	(0.010)
Top Managers Share	-0.009			
	(0.006)			
Monitoring		-0.013		
		(0.007)		
Coordination			-0.020	
			(0.007)	
Communication				-0.019
				(0.007)
Observations	175,544	175,544	175,544	175,544
Number of firms	25,661	25,661	25,661	25,661
R-Square	0.746	0.746	0.747	0.747
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Ind#Year FE	Yes	Yes	Yes	Yes

The dependent variable is the (log) share of purchased services in total costs. The main regressor N is the (log) number of export destination countries at the firm-year level. Monitoring/ Coordination/ Communication is a firm-year's employment-weighted monitoring/ coordination/ communication task share based on O*NET. Managerial capability variables are standardized for ease of comparison. Coefficient estimates for the control variables employment, skill intensity, and capital intensity (all in logs) are not shown. The full baseline sample contains all French manufacturing exporters in the EAE during 1996-2007. Common samples imposed across columns. Standard errors in parentheses are clustered at the firm level.

more sophisticated measures for the entire hierarchy, we find that firms whose employment composition includes more workers tasked with typical management functions like monitoring, coordinating and communicating indeed tend to produce market access services in-house. The estimates are statistically significant and similar across the managerial capability variables (regressors are standardized for comparison).

5 Quantitative Assessment

In this section, we embed our market access cost function into a partial equilibrium model of international trade, quantify its parameters, and use it to conduct a counterfactual evaluation of a change in variable trade costs. The purpose of this exercise is to illustrate how much firms and consumers potentially gain from an optimal make-or-buy decision for market access services.

We start from a standard international trade model à la Chaney (2008) of a single French industry where firms can export to a discrete number of destination markets $\bar{N}$ indexed by i (in line with our empirical exercises, we do not study entry into exporting and therefore France as a market is not modelled). Our assumptions on demand, technology and market structure are summarized as follows.

Assumption 3 (Demand, Technology and Market Structure)**.** *We further specify that*

- *demand in every market i is derived from CES preferences/technology with elasticity of substitution $\sigma > 1$, total expenditure $R(i)$ and ideal price index $P(i)$*
- *there are iceberg trade costs $\tau(i) \geq 1$*
- *exporters produce with heterogeneous constant marginal costs $1/\varphi > 0$, where $\varphi \sim$ Pareto with shape parameter $k > \sigma - 1$ and lower bound 1*
- *a large measure of potential exporters produces differentiated varieties and competes under monopolistic competition*
- *there is no free entry as in Chaney (2008)*
- *the foreign market entry decision is taken before the service make-or-buy decision*

The final assumption simplifies our calibration and appears plausible: in practice, firms typically take a strategic decision regarding the set of target markets and then deliberate on how to source the necessary service inputs. This is also in line with the exposition in Section 3 above.

We also make several necessary and largely innocuous assumptions regarding the organization-augmented market access cost function. First, we introduce a parameter $\lambda > 0$ that scales managerial costs relative to other costs. Accordingly, managerial expenses are cardinal and no longer relative to outsourcing. Second, we set $\psi = 1$ and the worker's learning costs $f = 0$, since they cannot be identified separately from δ due to data limitations and the functional forms imposed.[40] Finally, for a lack of sufficiently precise information we assume that managerial capability is perfectly correlated with core productivity φ.

The expected profit function of a firm with productivity φ is

$$E[\pi(N,t,\varphi,K)] = \underbrace{\zeta \sum_i \mathbb{1}(i \in \mathcal{N}) R(i) P(i)^{\sigma-1} \tau(i)^{1-\sigma} \varphi^{\sigma-1}}_{\text{operating profits, } \pi^{op}(.)} - \underbrace{\delta(N-t) - \frac{\delta}{1+\delta} t - \lambda N^{\alpha} K^{\beta} t^{\gamma}}_{\text{market access costs, } F(.)}, \quad (12)$$

where $\zeta \equiv \frac{(\sigma-1)^{\sigma-1}}{\sigma^{\sigma}}$, $\delta, \lambda > 0$, $\beta \leq 0$, $\gamma > 1$. The indicator function $\mathbb{1}(i \in \mathcal{N})$ signifies destination markets that are included in the export market portfolio. Overall, this is a very parsimonious model with few degrees of freedom. It is sufficient to illustrate the

[40] We do not have access to firm-level information about different sources of adaptation requirements, so that δ and ψ are indistinguishable. Moreover, we do not observe the set of tasks that firms complete internally, t. Accordingly, f and δ are indistinguishable and we load all variation on the latter.

potential of the outsourcing mechanism, but also implies that fitting the data as closely as possible is a secondary objective.

This profit function is maximized by choosing the number of integrated tasks to minimize market access costs for each set of destinations and then choosing the set of export destinations to maximize overall profits. In standard Melitz/Chaney-type models, entry decisions across export markets are independent. In our case, exporting entails a high-dimensional discrete choice problem due to interactions between entry decisions—as in Alfaro-Urena et al. (2023)—as a result of the organization-augmented market access cost function. The number of potential export profiles that have to be evaluated is therefore very large. Since countries can be ranked by their market potential $MP(i) \equiv \zeta R(i)P(i)^{\sigma-1}\tau(i)^{1-\sigma}$ and by assumption contribute symmetrically to the market access costs, however, it is possible to solve this problem numerically.[41] To do so, we first compute minimized market access costs for each *number* of export markets N and then calculate productivity cut-offs $\bar{\varphi}_N$ above which firms with $\varphi > \bar{\varphi}_N$ are able to export to the respective set of destination countries.[42]

To quantify the parameters, we use several datasets and target the most recent year in our data, 2006. International trade costs at the country level $\tau(i)$ are estimated as in Waugh (2010).[43] We proxy $R(i)$ by total French export value to destination i. To obtain model-consistent price indices $P(i)$, we target the destination-specific export value of the average firm in our data (denoted by $\tilde{}$):

$$\tilde{X}_c = E(i)\hat{P}(i)^{\sigma-1}\tau(i)^{1-\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}\tilde{\varphi}^{\sigma-1} \iff$$
$$\hat{P}(i) = \tilde{X}_c^{\frac{1}{\sigma-1}} E(i)^{\frac{1}{1-\sigma}}\tilde{\varphi}^{-1}\tau(i)\left(\frac{\sigma}{\sigma-1}\right).$$

These indices do not react to French firm entry endogenously in the model, which is an appropriate assumption given that French exporters tend to have small market shares abroad.

The main firm-level variables we use for the quantification are the number of export destinations from the matched firm-customs data as well as the outsourced expenditure on market access services (as a share of total costs) from our panel dataset. As before, we do not distinguish the different products a firm exports and just count the number of destinations it serves. The outsourced expenditure on market-access services that relates

[41] Indeed, suppose that a set of export destinations $\mathcal{N}'$ does not include a $j|MP(j) > MP(k)$, where $k \in \mathcal{N}'$. Then one could swap j and k to increase operating profits, leaving market access costs unchanged. Therefore, $\mathcal{N}'$ could not have been optimal.

[42] We acknowledge the asymmetry in our treatment of operating profits (heterogeneous across countries) and market access costs (homogeneous). Since we employ an MSM strategy to estimate the parameters in the cost function, however, a more general approach is computationally infeasible for us.

[43] We thank David Torun for providing us with these estimates.

to foreign markets and the total costs of exported goods are harder to measure. We assume that they accrue proportionally to a firm's export share in total sales and multiply both variables by this ratio. Since foreign markets are arguably tougher to access than the domestic one, this should provide us with a lower bound on outsourced expenditure.[44] To minimize negative consequences of this assumption, the moments used to identify the market access cost parameters are not based on levels of these variables, as outlined below.

As a benchmark, we set the final demand elasticity $\sigma = 6$ as in Arkolakis (2010). The Pareto shape parameter is estimated outside of our model. We follow Gabaix and Ibragimov (2011) and focus on trade with the three biggest destinations for French firms, France, Germany, and Spain.[45] This parameter value is similar to the ones presented in Head et al. (2014), who use French exports to Belgium and a different methodology.

Finally, we include the 34 largest foreign markets for French firms measured by total exports as well as a rest-of-the-world aggregate. 35 is equivalent to the 90th percentile in the distribution of the number of export markets and reflects that the high-dimensional discrete choice problem is computationally demanding, even if the model structure allows for substantial time savings. It is noteworthy that restricting the number of foreign markets limits entry opportunities especially for large and productive firms, so that matching the extensive country margin is challenging. Moreover, we systematically underestimate the potential gains of having the option to outsource market access services, since the implied cost savings do not affect export behavior beyond 35 markets.

The parameters $\boldsymbol{\theta} \equiv \{\delta, \lambda, \alpha, \beta, \gamma\}$ that govern the market access cost function are difficult to obtain. Prior research provides no guidance, and task-level service or managerial inputs are notoriously hard to observe. We calibrate these missing parameter values with an MSM algorithm inspired by Eaton et al. (2011) and Chaney (2014) in two different ways. In the first exercise, we resort to Assumption 2 above, which results from the theoretical micro foundation presented in Online Appendix A.2. Accordingly, we assume that $\{\alpha, \beta, \gamma\} = \{-1, -1, 3\}$ and estimate only δ and γ. This exercise is useful to illustrate the implications of the micro-foundation. In the second exercise, we estimate all parameters of the fixed cost function together (the 'full model').

There are three sets of moment conditions based on S mutually exclusive groups of exporters. In particular, we compute $S-1$ percentiles in the empirical distribution of the number of export destinations and assign firms to the S ensuing groups. As a starting

[44] With this proportionality assumption, the outsourced cost share for foreign activities—the ratio of outsourced expenditure to total costs—is the same as the overall one used in the regressions above.

[45] For the two large destination countries Germany and Spain, we regress $log(rank_{f2006} - 0.5)$ on $log(exports_{f2006})$, where the outcome is an exporter's rank in the distribution of exporter-level sales in each destination and the regressor is a firm's logged total export value (the sample is our panel data). The inverse of the coefficient is the Pareto shape parameter. Since the exporter distribution is highly truncated for unusually competitive markets like Germany and Spain, we perform the same exercise for domestic sales of all firms in our sample, including non-exporters. To arrive at a balanced estimate, we take the unweighted average across the three values.

point, we use quintiles, so that we work with 5 sets of firms: exporters that serve a number of markets less than or equal to the first quintile, more than the first, but less or equal to the second quintile and so on. The results change little, however, when we use quartiles or deciles, for example. The moment conditions are:

1. The shares of firms in each group ($S-1$ moments due to the adding up constraint)
2. The average outsourced expenditure on services per export market in the nth group relative to the first group ($S-1$ moments)
3. The average outsourced cost share in the nth group relative to the first group ($S-1$ moments)

The first set of moments captures the extensive margin of exporting. The second set reflects the relationship between outsourcing expenditure in Euros per market and the number of export destinations. The third set is very similar to the second, but the cost shares also take the fixed managerial expenditures into account (besides variable and outsourced fixed costs). These $3*(S-1)=12$ moments "(over-)identify" the five parameters.

We summarize the main aspects of our estimation algorithm here and refer the reader to the replication package for the exact details. We obtain the parameter values, $\hat{\boldsymbol{\theta}}$, by minimizing the objective criterion

$$\left(\frac{\boldsymbol{g}-\boldsymbol{k}(\boldsymbol{\theta})}{\boldsymbol{g}}\right)' \boldsymbol{W} \left(\frac{\boldsymbol{g}-\boldsymbol{k}(\boldsymbol{\theta})}{\boldsymbol{g}}\right),$$

where $\boldsymbol{g}$ is the vector of data moments based on our panel data set in 2006, $\boldsymbol{k}(\boldsymbol{\theta})$ is the same set of moments based on simulated data generated from our model given the set of parameters $\boldsymbol{\theta}$, and $\boldsymbol{W}$ is the identity matrix. To obtain the simulated moment vector, we draw 25 samples of 2,000 firms (i.e., productivity draws from the Pareto distribution), simulate the model for each sample, and calculate the 25 moment vectors. $\boldsymbol{k}(\boldsymbol{\theta})$ is the simple average across these samples. In words, we choose parameter values $\hat{\boldsymbol{\theta}}$ that minimize the squared percent deviations of the simulated from the true data.[46]

The calibrated parameter values are summarized in Table 5. Online Appendix Figure E.2 illustrates how well we fit the data with the micro foundation and the full version of the quantified model. Despite the fact that both are highly parsimonious and feature a very limited set of shocks, they are able to replicate the key patterns of the extensive country margin and of the market access service outsourcing behavior of firms.[47]

[46] Computationally, we implement this procedure with a combination of a particle swarm and an interior-point algorithm in Matlab.

[47] In the full model calibration, we restrict β to be non-positive as suggested by our empirical findings on managerial capability in Section 4 and our micro-foundation of the managerial costs in Assumption

Table 5: Overview Estimated Parameters

parameter	values		interpretation	data/source
	micro foundation	full model		
σ	6		demand elasticity	from Arkolakis (2010)
k	2.495		Pareto shape parameter	estimated (Gabaix and Ibragimov, 2011)
f	0		worker learning cost	set for identification
ψ	1		need for adaptation	set for identification
δ	92,836	137,954	adaptation costs	estimated by MSM
λ	11,470	102,796	managerial cost shifter	estimated by MSM
α	-1	-3.05	managerial cost elasticity wrt. outsourced tasks	micro foundation/estimated by MSM
β	-1	0	managerial cost elasticity wrt. man. capability	micro foundation/estimated by MSM
γ	3	4.59	managerial cost elasticity wrt. in-house tasks	micro foundation/estimated by MSM

Table provides information on all parameters used in the counterfactual exercise.

We now turn to our counterfactual exercises, which are illustrated by Figure 4 and based on the fully calibrated version of our model (the micro foundation version affords very similar insights). We draw productivities for 100 samples of about 15,500 firms each—as many companies as we have in our data—, simulate the model for each of these 100 sets of draws, and compute the average to minimize sampling variation. Each graph in Figure 4 is a bin-scatter with 20 categories, where firm-level productivity is shown on the horizontal axis and different outcomes of interest are plotted along the vertical axis. In the first row, we compare our simulated model ('baseline') to a counterfactual where we deny firms the option to outsource market access services ('integration'). We plot the number of export destinations and the outsourced costs per destination market. In the second row, we analyze how service outsourcing interacts with the gains from a trade liberalization. In particular, we reduce all iceberg trade costs by 25% and examine how firms a) expand at the extensive country margin and b) benefit in terms of profits when they do or do not have access to external service providers.

The option to outsource significantly improves firm-level market access. Under integration, the convexity of managerial costs allows companies to serve a larger number of destinations only when they are highly productive. Their less fortunate peers, however, can only do so if they can source market access services from external agencies. This is reflected in a sizeable and growing outsourced expenditure per destination market, as shown in the North-west graph of Figure 4.

Moreover, the option to outsource significantly amplifies the welfare gains from a trade liberalization *for consumers*, but not for producers. As the South-west graph shows, the cumulative number of firm-export country combinations along the productivity distribu-

2. When we omit this restriction, our algorithm picks a positive β. The reason is that $\hat{\beta} > 0$ alleviates the functional form constraints we impose on the market access cost function and thus slightly improves model fit. However, the welfare implications we discuss below are unaffected and we therefore focus on the restricted quantification.

Figure 4: Counterfactuals

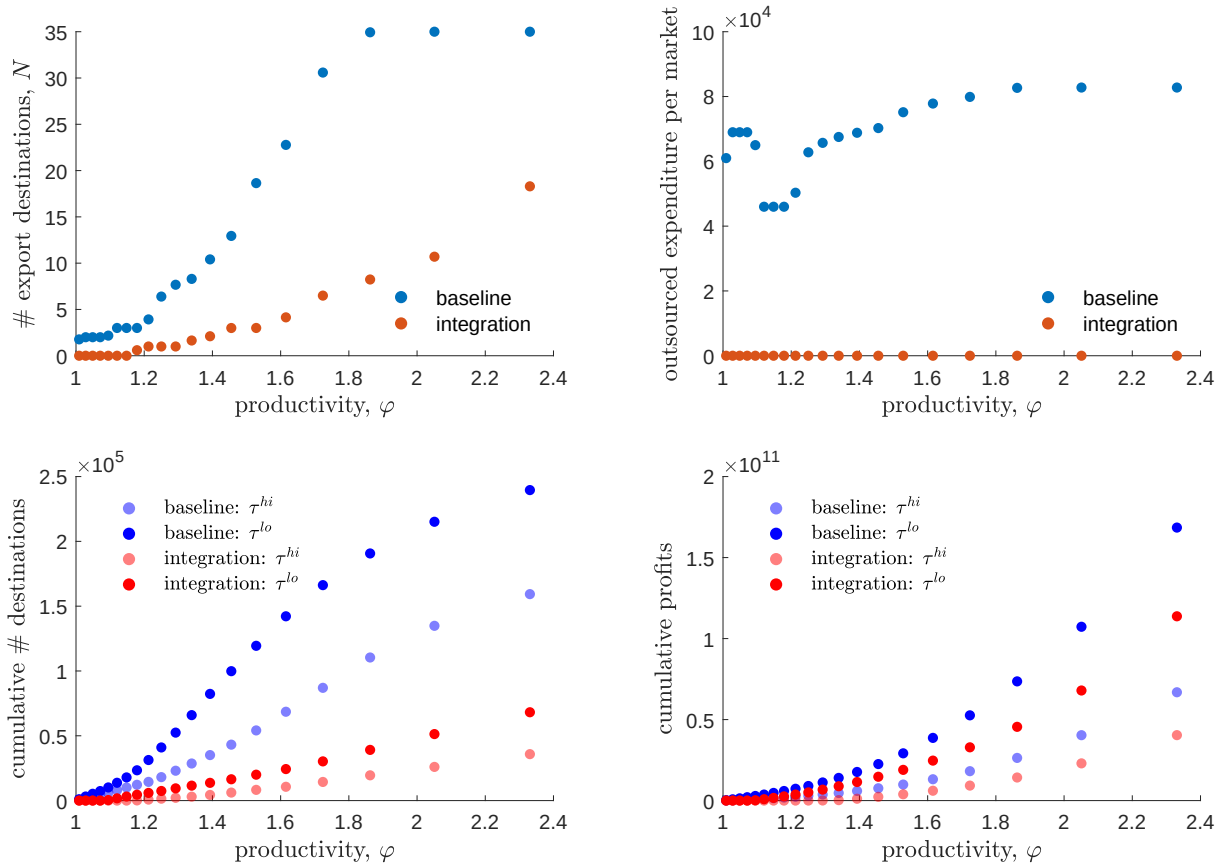


Figure illustrates average outcomes from 100 simulations of the quantified model using the full estimation (see Online Appendix Figure E.3 for the estimation using the micro foundation). 'baseline' refers to the estimated model with the organization-augmented fixed cost function, 'integration' to the counterfactual where firms are forced to employ service workers directly. All graphs are bin-scatter plots with 20 bins. τ^{hi} is the estimated true trade cost at the country level, τ^{lo} is τ^{hi} reduced by 25%. 'Cumulative' refers to the sum across firms along the x-axis/productivity distribution. Only firms with productivity below the 90th percentile shown for visibility.

tion jumps visibly more as a result of the trade cost reduction when firms can outsource services. Overall, the liberalization leads to variety gains of foreign consumers—a natural interpretation in this context—that are between 110 (full model) and 168% (micro foundation) higher.

At the same time, the aggregate producer surplus rises by essentially the same amount irrespective of the optimal make-or-buy decision. This potentially surprising finding is driven by the largest and most productive firms in the economy. When they add destinations, these export markets are small and, as a result, the option to outsource has limited scope to raise their profits. In other words, the lion's share of their gains from freer trade comes from infra-marginal markets, while the extensive margin contributes little. By contrast, small- and medium-sized exporters do experience substantially higher increases in surplus when they can outsource market access services: Firms below the median of the productivity distribution see 8% higher profit gains on average.

Note that the gains from reorganization decrease in the size of the trade cost shock and the reported figures are lower bounds for many trade liberalization episodes. For instance, a 10% across-the-board reduction implies a 123% boost to the variety gains. When τ falls a lot, firms can access many more markets even under integration and variety gains are large. Any given decrease in market access costs due to optimal reorganization therefore implies a smaller percentage change in the number of exporter-destination pairs.[48]

6 Conclusion

When Italian motorcycle producer Ducati accelerated its expansion abroad, it dismounted its sidecar documentation business and outsourced it to Xerox in order to throttle its managerial costs. Motivated by this case, this paper systematically examines how manufacturers organize the provision of business services needed for foreign market access and what their decisions imply for market access costs, trade and welfare. We start with a novel stylized fact that carries a causal interpretation: French companies increasingly outsource market access services domestically when they serve more destinations. We propose a formal model where exporting to more markets raises the complexity of a firm's operations and therefore strains its managerial resources. Market access service inputs are therefore outsourced to external agencies, even if they become less tailored to the exporter and hence require costly ex-post adaptation as a result. To provide additional

[48] We have conducted two unreported exercises to see how robust the quantitative welfare implications are. First, we increase the number of destinations to 120, the maximum number we observe in the firm-level data. Due to computational costs, we use the micro foundation version of the model. We find that the effects of having the option to outsource are more than two times larger. Second, the high demand elasticity $\sigma = 6$ implies that our findings on welfare are conservative. We therefore reduce the demand elasticity σ to 3.34, the median estimate in Berlingieri et al. (2018). In this case, even producers experience a 12% higher increase in profits due to the trade cost reduction when they have the option to outsource.

empirical evidence in support of this mechanism, we successfully test further predictions of the model. For example, services with high adaptation costs are generally produced in-house to ensure their fit, but outsourced with higher propensity when the firm adds export destinations. Finally, we quantify the model and show that a reduction in trade costs implies twice the variety gains for consumers when firms have the option to outsource market access services. On the producer side, it is the small- and medium-sized exporters that benefit from reorganization.

How do these findings affect our understanding of market access costs? This paper highlights three main aspects. First, manufacturers can economize on market access costs by reorganizing the provision of professional and business services required to serve many or additional destinations. By reassigning tasks like advertising or market research from its own employees to independent service providers, firms can free up managerial resources and thus reduce market access costs. Second, this endogenous make-or-buy decision has implications for the functional form of market access costs: they a) have an important firm-specific component; b) are "history dependent" in the sense that the entire destination portfolio determines the average and marginal market access costs; and c) depend on a firm's core productivity to the extent that it correlates with managerial capability. Third, the availability of professional and business services providers is an important determinant of how firms respond to a change in trade costs. If outsourcing is difficult, manufacturers suffer severely from managerial overload and exporting to (additional) destinations after a trade liberalization is costly. Reorganizing the provision of market access services therefore acts as an amplifier for the gains from trade.

To conclude, this paper offers substantive insights for two other active lines of research. First, it suggests a novel channel through which globalization affects within-country inequality. Outsourcing events are typically accompanied by wage reductions for low-skilled service workers (e.g., Katz and Krueger, 2017; Goldschmidt and Schmieder, 2017; Bilal and Lhuillier, 2021) and thus increase wage inequality between firms (e.g., Song et al., 2019), potentially also reducing the labor share of "superstar" employers (Autor et al., 2020). By contrast, our mechanism involves medium- to high-skilled workers in high-wage service occupations. If these workers were to experience pay-cuts, too, one would expect that globalization would *reduce* overall wage dispersion through the channel we propose. Second, an expansion of the number of export destinations contributes to structural change—from the secondary to the tertiary sector—due to increased specialization of companies (Fort et al., 2018; Ding et al., 2022). In line with Stigler (1951) and as suggested by this paper, the rise in demand for market access services like advertising and market research following internationalization is increasingly met by focused professional and business services providers, and less and less by integrated manufacturing companies.

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Online Appendix to

Managing Export Complexity: The Role of Service Outsourcing

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A Theory Appendix

A.1 Solution to the Market Access Cost Minimization Problem

This appendix presents a detailed solution to the market access cost minimization problem. We start with the equilibrium actions taken by employees and agents. We conjecture the optimal contracts to solve the model and then prove that these contracts are indeed optimal at the first stage.

Conjecture 1 (Optimal Contracts)**.** *The prevailing contract with every*

- *external agent is*
$$P(a(i)) = P(i) = f.$$
- *employee is*
$$P(a(i)) = f + (a^v(i) - \theta(i))^2.$$
where $a^v(i)$ is an action specified by the manager.

In the case of outsourcing, the contract is characterized by a fixed price—here equal to the knowledge costs—and this arrangement is well-known: the market gives high-powered incentives for cost reduction to the independent supplier. Employment, by contrast, is characterized by what Bajari and Tadelis (2001) refer to as C+ contracts, i.e., payment of a fixed fee (here zero) plus any cost the agent might incur in producing the service input. This arrangement mimics actual employment contracts; the manager has the authority to tell the employee what to do, but to comply with participation constraints she compensates any additional effort. As a result, the employment contract provides low-powered incentives.

Given these compensation schemes and full information about her state, the external agent has no incentive to pick any other action than $a^o(i) = \theta(i)$, i.e., the one that

benefits her most *individually*. Employees implement the action instructed by the manager, who monitors their actions and can thus prevent deviations. To set $a^v(i)$ optimally, the manager balances the marginal reduction in adaptation costs when she chooses an $a^v(i)$ closer to $\hat{\theta}^c$ with the marginal decrease in compensation for an employee when she chooses an $a^v(i)$ closer to θ_i. Intuitively, the manager better 'coordinates' employees and improves productivity, because she can internalize the negative externality that each employee/input imposes on the rest of the organization.

Formally, manager's problem is

$$\min_{\{a^v(i)\}} \int_0^t (a^v(i) - \theta(i))^2 \, \mathrm{d}i + \delta \int_0^t (a^v(i) - \hat{\theta}^c)^2 \, \mathrm{d}i + \delta \int_t^N (a^o(i) - \hat{\theta}^c)^2 \, \mathrm{d}i. \tag{A.1}$$

The solution is a weighted average of input condition $\theta(i)$ and the coordinating action $\hat{\theta}^c$:

$$a^{v*}(i) = \frac{1}{1+\delta}\theta(i) + \frac{\delta}{1+\delta}\hat{\theta}^c. \tag{A.2}$$

To make further progress, we have to specify the joint distribution of input conditions and the firm's state. In this baseline model, where the coordinating action $\hat{\theta}^c$ is a parameter and the workers' states $\theta(i)$ are random variables, we have two reasons for ex-post adaptation. First, a variance of input conditions $\nu^2 > 0$ implies that random shocks make adaptation necessary, i.e., adaptation to an ever-changing and uncertain environment. In our case of foreign market access, this is the skill or cost distribution of different service workers, which is shaped by their interests, knowledge, availability and so forth. Second, inputs may always require some deterministic tailoring to the exporter's characteristics. For instance, workers often follow standard procedures and produce generic services, which could be targeted at the overall market average and must be customized for any particular company. A simple way of representing this aspect is to assume that all input conditions lie on a circle and that the coordination action $\hat{\theta}^c$ is at the center. Each input condition is a point on the circle that has a circumference of measure $\bar{N}$, which can be interpreted as the maximum measure of countries the firm can export to (i.e. number of countries in the world). In this way the distance between the coordination action and the means of the input conditions is the same for all inputs and is simply pinned down by the length of the circle ($r = \bar{N}/2\pi$). This is captured in the following assumption.

Assumption 1 (Input States)**.** *Input conditions are distributed uniformly on a circle around $\hat{\theta}^c$ with radius $r \geq 0$.*

We now exploit the fact that all input conditions are independently drawn from distributions with the same variance, so that the expected market access costs at time zero are:

$$E[F] = fN + \left[\frac{\delta}{1+\delta}t + \delta(N-t)\right]\psi^2 + N^\alpha K^\beta t^\gamma \tag{A.3}$$

with $\psi^2 \equiv \nu^2 + r^2$.

As a final step of the solution, we prove that the contracts in Conjecture 1 are indeed part of a Nash equilibrium, i.e., optimal for the external agent and the employee. We begin by restating the worker's participation constraint. Since the firm is a full monopsonist vis-a-vis the workers it matches with, this is the key consideration both for the worker and for the company.

Statement 1 (Participation Constraint (PC))**.** *The worker's participation constraint is*

$$\mathbb{E}\left[\pi^s(i)\right] = \mathbb{E}\left[P(i) - (a(i) - \theta(i))^2 - f\right] = \mathbb{E}\left[P(a(i)) - (a(i) - \theta(i))^2\right] \geq 0.$$

The second equality stems from normalizing the costs of training f to zero, and the right hand side of the inequality captures the worker's outside option, which we normalized to zero, too. Just to reiterate, neither of these assumptions is substantive in our model.

Beginning the actual proof, first note that each worker will accept the contract in Conjecture 1 on the first stage if she is hired as an external agent. In the absence of verifiable actions—monitoring is assumed to be impossible under outsourcing—, the expected optimal action by the external agent is $a(i) = \theta(i)$, so that

$$\mathbb{E}\left[\pi^{OUT}(i)\right] = \mathbb{E}\left[P(i)\right] = 0.$$

Not accepting yields the outside option of zero as well and we assume that worker accepts in case of indifference.

A worker faced with the conjectured employment contract is fully compensated for any action the firm demands of her, so that

$$\mathbb{E}\left[\pi^{IN}(i)\right] = 0.$$

Clearly, once again the worker is indifferent between accepting and taking the outside option and we assume she accepts. Due to monopsony power of the firm, workers are not in a position to choose between employment and working as an external agent, so that there is no decision here that needs to be analyzed.

Second, we have to make an additional assumption regarding the firm's outside option, which we left unspecified in the main text. One could consider that a task i is not completed and the company cannot access that particular market abroad if the respective worker's participation constraint is not satisfied by the contract offered ("output lost"). Alternatively, the firm could procure the input on a secondary market at a certain price ("secondary procurement"). Since this second assumption is much more involved and requires substantial detail without adding to the model's insights, we do not pursue this avenue and instead rely on output lost.[1]

[1]One could also assume that the firm offers the employment contract if negotiations for an external

To investigate whether there is a profitable deviation from the conjectured contract for the firm given the workers' participation constraints, first note that it is optimal for the firm to offer a fixed price contract to the external agent, since no action is verifiable by either party. Offering $P(i) > 0$ for any one task i reduces the firm's profits in equilibrium by a positive amount, so that no such deviation is profitable. Imposing the learning costs on, or even taxing any agent for the production of i by choosing $P(i) < 0$ leads to a violation of that agent's participation constraint and output (and profit) is lost. These considerations carry over to alternative strategies where the firm offers different contracts to any non-zero measure of tasks.

Finally, consider the employment contracts. Offering compensation that exceeds the conjectured "buying the shop" or C+ strategy will never be profitable for the firm, since it has no effect on the employee's optimal action under fiat, or provides incentives for an action other than $a^{v*}(i)$, or both. Any compensation scheme that pays less than the full costs of inconvenience caused by the company's fiat action will furthermore violate the worker's participation constraint and output (and profit) is lost.

QED

A.2 A Micro-Foundation for Managerial Costs

In this section, we outline a micro-foundation for the managerial cost functions in equation (5) and in Assumption (2), which is based on organizational communication codes as in Crémer et al. (2007).

The manager has to communicate with every employee $i \in t$ to instruct her on the action she is supposed to take and then monitor during the process. To do so, she can use 'words' or 'code', i.e., a correspondence between real-life task i and an abstract uttering; in other words, a language. If she could attribute a single word to every task, each code would be unique and very precise, so that misunderstandings would be impossible. Designing such a detailed organizational language is, however, extremely inefficient, since managers and workers are boundedly rational and therefore effectively unable to converse in this perfect tongue.

To capture this idea formally, we assume that managers can only learn K words and this number can potentially differ across managers, making it their type. As a consequence, they are forced to use the same word for interacting with multiple employees who work on different tasks. Formally, every word k is connected to a measure of tasks z_k, which we refer to as the "breadth" of word k. This imprecision in organizational code in turn creates miscommunication and therefore "diagnosis costs": there is always a certain amount of 'back-and-forth' between each employee and the manager to verify signals and remove ambiguities in the process of coordination and monitoring, which naturally comes

agency are unsuccessful, and vice versa. Provided both conjectured contracts are optimal, however, this simply shifts the problem of negotiation break-down to a different level.

at certain opportunity costs. The greater the breadth of a word z_k, the higher is the chance of misinterpreting signals and therefore the diagnosis cost $c(z_k)$ for all tasks $i \in t$.

A manager has a total and limited amount of work-time available to her and any resources spent on communication have opportunity costs. Better managers are more productive in all areas, and we capture these ideas by normalizing their work-time to K—Crémer et al. (2007) call the equivalent concept the "diagnosis cost" parameter, which converts communication costs into output units. She splits her resources between in-house communication and monitoring on the one hand, and coordination with external agents on the other. The total communication costs incurred by a firm that exports to N markets are

$$C^{com}(t, N, K) = \underbrace{K \cdot \frac{t}{N} \cdot \sum_{k=1}^{K} p(z_k)c(z_k)}_{\substack{\text{internal} \\ \text{communication}}} + \underbrace{K \cdot \frac{N-t}{N} \cdot 0}_{\substack{\text{external} \\ \text{communication}}}. \tag{A.4}$$

The expected costs of internal communication—to advise on actions to be taken by employees and to monitor them during the production process—are the sum of expected diagnosis costs associated with the different words k in the code. These in turn depend on the time spent using each word, $p(z_k)$ and the broader it is, i.e., the more tasks are assigned to the word, the more time is required. They also depend on the breadth of the word through the imprecision of code described above, $c(z_k)$. The manager devotes a share t/N of her work-time K to internal communication.

Finally, as discussed in the main text, we assume that the managerial costs $M(t, N, K)$ are the *differential* costs of internal management and communication. Employees require instruction and monitoring, while these activities are much more limited in external relationships, which is often a crucial consideration in favor of outsourcing in the first place. Therefore, we normalize communication costs for outsourced tasks to zero.

When designing the organizational language, i.e., attributing tasks to words, the manager minimizes total expected diagnosis costs (A.4) across all in-house tasks, respecting her constraint on the number of words she can learn,

$$\sum_{k=1}^{K} z_k = t.$$

In general, different tasks i could occur with different frequencies, which directly affects how often the manager has to use the associated word, $p(z_k)$. In Crémer et al. (2007), for example, tasks correspond to unforeseen problems or events during daily business, which emerge randomly and with different probabilities. In that setting, an optimal allocation of words involves relatively precise terms for frequent problems and relatively coarse words for bundles of rare ones.

By contrast, in our setting all service inputs have to be provided if the company's

intention is to serve the full measure of countries N. While it is conceivable that there is some prioritization over time especially if service input quality is a concern, in general our "probabilities"—i.e., the share of time a manager has to devote to tasks $i \in t$—are all the same for each task, so that $p(z_k) = z_k/t$.

The diagnosis costs $c(z_k)$ can be modelled in several different meaningful ways and the functional form of the managerial costs $M(t, N, K)$ depends crucially on this assumption. First, let $c(z_k) = z_k^2$, so that diagnosis costs are quadratic in, and therefore increase convexly with, the breadth of a word. In this case, the solution to the minimization problem is

$$M(t, N, K) \equiv \min_{\substack{\{z_k\}_{k=1}^K \\ \text{s.t. } \sum_{k=1}^K z_k = t}} C^{com}(t, N, K) = K \frac{t}{N} \frac{t^2}{K^2} = \frac{t^3}{NK}.$$

This is the explicit functional form we posit in Assumption 2 in the main text. Intuitively, these costs equal the total time spent with employees times the average communication cost. Holding t fixed, outsourcing more tasks as N increases reduces managerial overload by freeing up some of the manager's time.

More generally, there could be economies of scale or congestion effects in communication due to the whole range of service inputs N that need to be produced, so that $c(z_k) = c(z_k, N) = z_k^{\zeta} N^{\eta}$ with $\zeta > 0, \eta \in \mathbb{R}_0$. The managerial cost function for coordination and monitoring becomes

$$M(t, N, K) = \frac{t^{1+\zeta}}{K^{\zeta-1} N^{1-\eta}},$$

which corresponds directly to the general iso-elastic form in equation (5) in the main text if $\alpha = \eta - 1$, $\beta = 1 - \zeta$, and $\gamma = 1 + \zeta$.

A.3 Proposition 1 with General Managerial Costs

In this section we derive Proposition 1 with the general iso-elastic managerial cost function in equation (5) in the main text. Minimizing the market access costs (5) with respect to the measure of in-house tasks t yields

$$t^* = \left[\frac{\psi^2}{\gamma} \frac{\delta^2}{1+\delta} \right]^{\frac{1}{\gamma-1}} N^{-\frac{\alpha}{\gamma-1}} K^{-\frac{\beta}{\gamma-1}},$$

subject to parameter constraints that imply $0 \leq t^* \leq N$ and that the second order condition of minimization is satisfied ($\gamma > 1$).

It is straightforward to verify that, for any $t^* < N$,

$$\frac{\partial}{\partial N} \mathcal{O} > 0 \iff \mathcal{E}_{t^*,N} < 1 \iff \gamma - 1 > -\alpha.$$

The firm therefore outsources additional market access service inputs if managerial overload reacts strongly to complexity, and serving many markets does not lead to strong economies of scope in communication and monitoring. Since one would expect that, if anything, a large number of markets puts *more* strain on managers (perhaps due to communication with external agents and monitoring outsourced tasks), this condition is likely to be satisfied empirically in most settings.

As it turns out, $\gamma - 1 > -\alpha$ is a sufficient condition for *all* propositions provided $\beta < 0$ as discussed in the main text. Taking the relevant derivatives and cross-derivatives shows that as long as the main prediction holds—i.e., the outsourcing task share increases in the number of export markets—all other propositions follow.

It is possible to state the necessary and sufficient conditions under which Proposition 1 holds with a fully generic managerial cost function. The optimal number of inputs produced in-house is pinned down by:

$$\frac{\delta^2}{1+\delta}(\nu^2 + r^2) - M_t(t^*, N, K) = 0$$

where $M_t(t, N, K)$ is the marginal market access cost with respect to an increase in the number of inputs internally produced.

The main finding in the empirical results corresponds to the condition $\mathcal{E}_{t^*,N} < 1$ stated above. This condition is equivalent to a local restriction on the monitoring function:

$$\mathcal{E}_{t^*,N} < 1 \iff -\frac{\mathcal{E}_{M_t,N}}{\mathcal{E}_{M_t,t}}\bigg|_{t^*} < 1 \tag{A.5}$$

where $\mathcal{E}_{M_t,N}$ and $\mathcal{E}_{M_t,t}$ are the elasticities of the marginal cost with respect to the number of countries and the number of inputs internally produced, respectively. A global ranking of these elasticities in line with this condition as in the iso-elastic case is sufficient for Proposition 1.

Assuming that marginal managerial costs rise in t, i.e., assuming that there is managerial overload due to in-house provision of non-core services, the inequality (A.5) is always satisfied if $\mathcal{E}_{M_t,N} > 0$. This is tantamount to a congestion effect due to export complexity, for example if all tasks require managerial resources, regardless of whether they are performed by employees or external agents. Condition (A.5) is also satisfied if scale effects due to N are sufficiently weak, as in the micro-foundation we use in the main text, for example. Even if outsourcing some of the service tasks gives the manager additional room to breathe and reduces overload at the margin, this effect may very well be dominated by the workload afforded by internal communication and monitoring. Only if a higher number of export markets in fact reduces business complexity overall, would the result be overturned.

A.4 Adapting to the Average Action

In this appendix we solve a version of the model where the firm's objective is to coordinate its employees' actions not on an exogenous firm characteristic, but instead on a single and a priori arbitrary common action. For simplicity, we take the average action across employees although other assumptions are of course conceivable. To show the full set of implications, we start with a setting where N is discrete—and the coordination problem particularly interesting—, and then move to the continuous case.

The problem of the manager, once the input conditions $\theta(i)$ have been realized, becomes:

$$\min_{\{a^v(i)\}} \sum_{i\in T}(a^v(i)-\theta(i))^2+\delta\sum_{i\in T}(a^v(i)-\bar{a})^2+\delta\sum_{j\notin T}(a^o(j)-\bar{a})^2,$$

where $\bar{a}=1/N\sum_0^N a(i)$, and T is the set of inputs produced in-house. We solve for the t optimal internal actions inverting a t-by-t matrix using the Sherman–Morrison formula:

$$a^{v*}(i)(\{\theta(i)\},\{\theta(j)\})=\hat{a}^v+\frac{1}{1+\delta}(\theta(i)-\hat{\theta}(i))+\frac{\delta}{1+\delta}\frac{1}{N+\delta(N-t)}\sum_{i\in T}(\theta(i)-\hat{\theta}(i))$$
$$+\delta\frac{1}{N+\delta(N-t)}\sum_{j\notin T}(\theta(j)-\hat{\theta}(j))$$

where

$$\hat{a}^v=\frac{1}{1+\delta}\hat{\theta}(i)+\frac{\delta}{1+\delta}\tilde{\hat{\theta}},$$

with $\tilde{\hat{\theta}}$ being a weighted average of the expected values of the input conditions, $\hat{\theta}(.)$, defined as

$$\tilde{\hat{\theta}}=\frac{1}{N+\delta(N-t)}\sum_{i\in T}\hat{\theta}(i)+\frac{1+\delta}{N+\delta(N-t)}\sum_{j\notin T}\hat{\theta}(j).$$

The actions are fully interdependent, since the optimal action for input i depends on all other actions, which are determined by the realizations of all input conditions. The realization of local input condition i gets a higher weight compared to all other internal input conditions, but the manager puts less weight on $\theta(i)$ to accommodate all other inputs, thus internalizing all externalities.

Exploiting the independence of the random variables, the expected costs are:

$$E[F]=fN+\left[\frac{N+\delta(N-t)-1}{N+\delta(N-t)}\frac{\delta}{1+\delta}t+\frac{N+\delta(N-t)-(1+\delta)}{N+\delta(N-t)}\delta(N-t)\right]\sigma^2+$$
$$+\frac{\delta}{1+\delta}\sum_{i\in T}(\hat{\theta}(i)-\tilde{\hat{\theta}})^2+\delta\sum_{j\notin T}(\hat{\theta}(j)-\tilde{\hat{\theta}})^2+M(t,N,K).$$

Further assuming that all input conditions have the same expected value, total expected

market access costs are

$$E[F] = fN + \left[\frac{N+\delta(N-t)-1}{N+\delta(N-t)}\frac{\delta}{1+\delta}t + \frac{N+\delta(N-t)-(1+\delta)}{N+\delta(N-t)}\delta(N-t)\right]\sigma^2 + \\ + M(t,N,K). \quad \text{(A.6)}$$

In this more general setting, the returns of integration are not constant, and depend on both t and N. It is possible to show that t and N are complementary, so that integration becomes more appealing in a very complex environment. At the same time, the returns to integration decrease in t; they are strong initially but tend to diminish when the number of internalized inputs becomes large, since the manager finds it increasingly difficult to coordinate all inputs.

To find the solution in the setting with a measure N, we can proceed in a similar way and find an analogous expression for optimal internal actions. However, in expectation, all the strategic terms have measure zero because they are of higher order. Alternatively, we can think of the limit of the discrete case or let the strategic effects between actions go to zero from the beginning, as if the manager disregarded the effects of changing the (infinitesimal) action $a(i)$ on $\bar{a}$. As expected, in this case the market access cost function takes the same form as in the baseline model

$$E[F] = fN + \left[\frac{\delta}{1+\delta}t + \delta(N-t)\right]\psi^2 + M(t,N,K),$$

with $\psi^2 = \sigma^2$ (there is no deterministic adaption when all input conditions have the same mean). When the number of inputs grows large, externalities across actions become small and the firm no longer needs to internalize them. Since the expected market access cost function is the same as in the model presented in the main text, all the results there apply.

A.5 No Fiat within the Firm

In this appendix we study a version of the model where the manager can communicate with, and monitor all employees, but she is no longer in a position to impose the optimal coordinating action on them. Instead, the manager has to propose a contract that incentivizes an employee accordingly—in other words, we add a standard principal-agent problem to the model.

We start by noting that an optimal contract strikes a balance between minimizing intermediate input costs and minimizing ex-post adaptation costs. Minimizing service input costs is straightforward: a fixed price contract $P(i) = f \equiv 0$ sets input costs to zero (and is the lowest compensation that respects the agent's participation constraint). Regarding adaptation, the expected costs for an individual input i are $\mathbb{E}[\delta(a(i)) - \hat{\theta}(i)^c)]$, which are minimized when the employee chooses $a(i) = \hat{\theta}(i)^c$. The only contract that

ensures this action is

$$P(i) = [a(i) - \theta(i)]^2 - \left[a(i) - \hat{\theta}(i)^c\right]^2.$$

The optimal contract offered by the firm must be a combination of these two extreme compensation schemes when it comes to performance pay $P(i)^p$, and still respect the employee's participation constraint. Formally, let $\omega^* \in [0, 1]$ be the weight on adaptation costs chosen optimally on the first stage. Then the employee faces

$$P(i)^p = \omega^* \left\{ [a(i) - \theta(i)]^2 - \left[a(i) - \hat{\theta}(i)^c\right]^2 \right\}$$

on the second stage.

The action taken on the second stage maximizes

$$\omega^* \left\{ [a(i) - \theta(i)]^2 - \left[a(i) - \hat{\theta}(i)^c\right]^2 \right\} - [a(i) - \theta(i)]^2$$
$$= (\omega^* - 1) [a(i) - \theta(i)]^2 - \omega^* \left[a(i) - \hat{\theta}(i)^c\right]^2.$$

The optimal choice is

$$a(i)^* = \omega^* \left[\hat{\theta}(i)^c - \theta(i)\right] + \theta(i).$$

If the firm puts all the weight on minimizing adaptation costs on the first stage ($\omega^* = 1$), the employee plays the coordinating action $a(i)^* = \hat{\theta}(i)^c$. By contrast, if the firm intends to minimize intermediate inputs costs, it implements $\omega^* = 0$ and the employee plays $a(i)^* = \theta(i)$.

To find the optimal contract on the first stage, the firm internalizes the employee's participation constraint (with equality due to monopsony power)

$$\mathbb{E}\left[P(a(i, \omega)) - (a(i, \omega) - \theta(i))^2\right] = 0 \iff \Delta(\omega) = \omega(1 - \omega)\left[\hat{\theta}(i)^c - \theta(i)\right]^2,$$

where $\Delta(\omega)$ is the fixed transfer the firm has to pay in order for the employee to accept the contract, i.e., $P(i, \omega) = \Delta(\omega) + P(i, \omega)^p$.

Finally, the firm has to pick the optimal incentive scheme ω by minimizing

$$P(i, \omega) + \delta \left[a(i, \omega)^* - \hat{\theta}^c\right]^2 =$$
$$\Delta(\omega) + \omega \left\{ [a(i, \omega)^* - \theta(i)]^2 - \left[a(i, \omega)^* - \hat{\theta}(i)^c\right]^2 \right\} + \delta \left[a(i, \omega)^* - \hat{\theta}^c\right]^2 =$$
$$\left[\hat{\theta}^c - \theta(i)\right]^2 \left[\omega^2 + \delta(1 - \omega)^2\right].$$

The solution is

$$\omega^* = \frac{\delta}{1+\delta} \in [0,1).$$

The weight on minimizing adaptation costs increases in δ as expected.

The optimal employment contract is less high-powered than the outsourcing contract, as the firm shares in the inconvenience costs of its employees.

The remaining derivations are analogous to the main text, where Conjecture 1 becomes

Conjecture 2 (Optimal Contracts Without Fiat)**.** *The prevailing contract with every*

- *external agent is*

$$P(a(i)) = P(i) = 0.$$

- *employee is*

$$P(a(i)) = \Delta(\omega^*) + \omega^* \left\{ [a(i) - \theta(i)]^2 - \left[a(i) - \hat{\theta}(i)^c \right]^2 \right\},$$

where

$$\omega^* = \frac{\delta}{1+\delta}.$$

A.6 Testable Predictions for Cost Shares

In this appendix, we derive the conditions under which our propositions not only hold for the outsourced share of tasks, $\mathcal{O}$, but also for the share of outsourced service expenditures in total costs, $\mathcal{O}^C$. To do so, we make the same assumptions about demand, technology, and export decisions as in the quantitative exercise in the main text. For the reader's convenience, we reproduce the relevant Assumption 3 here:

Assumption 2 (Demand, Technology and Market Structure)**.** *We further specify that*

- *downstream demand in every market i is derived from CES preferences/technology with elasticity of substitution $\sigma > 1$, total expenditure $R(i)$ and ideal price index $P(i)$*[2]

- *there are iceberg trade costs $\tau(i) \geq 1$*

- *exporters produce with heterogeneous constant marginal costs $1/\varphi > 0$, where $\varphi \sim$ Pareto with shape parameter $k > \sigma - 1$*

- *Firms compete under monopolistic competition and there is* no *free entry (Chaney, 2008)*

[2]Since we have no information on competitors' prices in the destination markets, $P(i)$ is an aggregator of French firms' prices and $R(i)$ is total expenditure on French goods in destination i.

- *The foreign market entry decision is taken before the service make-or-buy decision*

As in the quantitative exercise, we avoid a second source of heterogeneity in the model by assuming that managerial capability is equal to marginal productivity ($K = \varphi$), and posit that the number of destinations is chosen before the number of integrated tasks.

The firm's profit function is

$$E[\pi(N,t,K)] = \underbrace{\zeta \int_0^N R(i)P(i)^{\sigma-1}\tau(i)^{1-\sigma}K^{\sigma-1}}_{\text{operating profits, } \pi^{op}(.)} - \underbrace{fN - \left[\delta(N-t) + \frac{\delta}{1+\delta}t\right]\psi^2 - N^{\alpha}K^{\beta}t^{\gamma}}_{\text{market access costs, } F(.)}, \quad \text{(A.7)}$$

where

$$\zeta \equiv \frac{(\sigma-1)^{\sigma-1}}{\sigma^{\sigma}}.$$

In the next Section, we rederive Propositions 1 and 3 in terms of costs shares, taking the number of exports destinations as given. Then we derive additional predictions as to how the relationships in these propositions vary with average export market size/variable costs and the price elasticity of demand. Finally, we also compute the optimal number of destinations, N. To prove our additional propositions, we assume that destination markets are symmetric with respect to both total expenditure and the price index (but not trade costs). This saves on notation and is without loss, since it is immaterial whether country heterogeneity is only due to differences in trade costs or in full market potential. Defining $\rho = (\sigma-1)/\sigma$, and using the functional form for managerial costs the expected firm's profit function becomes

$$E[\pi(N,t,K)] = (1-\rho)R\left(\rho KP\right)^{\frac{\rho}{1-\rho}} \int_0^N \left(\frac{1}{\tau(i)}\right)^{\frac{\rho}{1-\rho}} di - fN - \delta\psi^2 N + \frac{2}{3}\frac{\delta^2}{1+\delta}\psi^2 t^*. \quad \text{(A.8)}$$

A.6.1 Propositions 1 and 3 for Cost Shares

The corresponding total expected costs of the profit function above are

$$\mathbb{E}\left[C^T\right] = \underbrace{\rho R\left(\rho KP\right)^{\frac{\rho}{1-\rho}} \int_0^N \left(\frac{1}{\tau(i)}\right)^{\frac{\rho}{1-\rho}} di}_{\equiv\, C^V} + \underbrace{fN + \delta\psi^2 N - \frac{2}{3}\frac{\delta^2}{1+\delta}\psi^2 t^*}_{\equiv\, F},$$

where C^V and F are expected total variable and total market access costs, respectively. We can denote the outsourcing share in total costs as

$$\mathcal{O}^C = \frac{(f+\delta\psi^2)(N-t^*)}{C^V+F} = \frac{F^O}{C^V+F} \equiv \frac{\widetilde{F}^O}{C^V/N+\widetilde{F}},$$

where $\widetilde{F}^O$ and $\widetilde{F}$ are, respectively, the outsourced part and the total expected market access cost per destination market.

Letting $\mathcal{E}_{y,x}$ denote the elasticity of y with respect to x, we can restate Propositions 1 and 3 in terms of total costs.

Proposition A.1 (Cost Share of Outsourcing and Market Access)**.** *The share of outsourced service expenditures in total costs rises in the number of export destination markets, but at a decreasing rate:*

$$\frac{\partial}{\partial N}\mathcal{O}^C > 0 \quad \textit{and} \quad \frac{\partial^2}{(\partial N)^2}\mathcal{O}^C < 0$$

Proof. We prove the first part of the statement by computing the elasticity of the share of outsourced service expenditures in total costs with respect to the number of export destination markets, $\mathcal{E}_{\mathcal{O}^C,N}$, which is the object that we estimate empirically. This elasticity can be defined as

$$\mathcal{E}_{\mathcal{O}^C,N} = \frac{\partial \mathcal{O}^C}{\partial N}\frac{N}{\mathcal{O}^C} = \mathcal{E}_{F^O,N} - \mathcal{E}_{C^V,N}\frac{C^V}{C^V+F} - \mathcal{E}_{F,N}\frac{F}{C^V+F},$$

where

$$\mathcal{E}_{F^O,N} = 1 + \mathcal{E}_{\widetilde{F}^O,N} = 1 + \mathcal{E}_{\mathcal{O},N} = 1 + \frac{1}{2}\frac{t^*}{N-t^*},$$

$$\mathcal{E}_{F,N} = 1 + \mathcal{E}_{\widetilde{F},N} = 1 + \frac{1}{\widetilde{F}}\frac{1}{3}\frac{\delta^2}{1+\delta}\psi^2\frac{t^*}{N},$$

$$\mathcal{E}_{C^V,N} = \frac{\left(\frac{1}{\tau(N)}\right)^{\frac{\rho}{1-\rho}} N}{\int_0^N \left(\frac{1}{\tau(i)}\right)^{\frac{\rho}{1-\rho}} di} = \frac{\tau(N)^{1-\sigma}N}{\int_0^N \tau(i)^{1-\sigma} di}.$$

Since countries are ranked with respect to variable trade costs ($\partial\tau(i)/\partial i \geq 0$), we have that $\mathcal{E}_{C^V,N} < 1$: the variable trade costs to reach the N^{th} country are higher than for the average country, because the firm enters countries with low variable trade costs first. It follows that $\mathcal{E}_{C^V,N} < \mathcal{E}_{F,N}$ and that $\mathcal{E}_{\mathcal{O}^C,N} > \mathcal{E}_{F^O,N} - \mathcal{E}_{F,N}$. We can further show that $\mathcal{E}_{F^O,N} - \mathcal{E}_{F,N} = \mathcal{E}_{\widetilde{F}^O,N} - \mathcal{E}_{\widetilde{F},N} > 0$ because

$$F > \frac{2}{3}\frac{\delta^2}{1+\delta}\psi^2(N-t^*) \iff fN + \delta\frac{3+\delta}{3(1+\delta)}\psi^2 N > 0.$$

Intuitively, when the number of destination markets increases, the outsourced part of

market access costs increases more rapidly than the total market access costs, precisely because the manager reacts to the higher complexity by outsourcing a higher share of tasks.

It follows that $\mathcal{E}_{\mathcal{O}^C,N} > 0$, which completes the first part of the proof.

To show that that the share of outsourcing in total costs is concave in the number of countries, we can compute

$$\frac{\partial^2 \mathcal{O}^C}{(\partial N)^2}\frac{N^2}{\mathcal{O}^C} = \frac{\partial^2 F^O}{(\partial N)^2}\frac{N^2}{F^O} - \frac{\partial^2 C^T}{(\partial N)^2}\frac{N^2}{C^T} - 2\mathcal{E}_{F^O,N}\mathcal{E}_{C^T,N} + 2\mathcal{E}^2_{C^T,N} =$$

$$\frac{F}{C^T}\left[\underbrace{-\frac{3}{2}\left(\mathcal{E}_{\widetilde{F}^O,N} + \mathcal{E}_{\widetilde{F},N}\right)}_{\text{I}}\underbrace{-2\mathcal{E}_{\widetilde{F},N}\left(\mathcal{E}_{\widetilde{F}^O,N} - \frac{F}{C^T}\mathcal{E}_{\widetilde{F},N}\right)}_{\text{II}}\underbrace{-2\frac{C^V}{C^T}\left(1+2\mathcal{E}_{\widetilde{F},N}\right)\left(1-\mathcal{E}_{C^V,N}\right)}_{\text{III}}\right] +$$

$$\frac{C^V}{C^T}\left[\underbrace{-\mathcal{E}_{\widetilde{F}^O,N}\left(2\mathcal{E}_{C^V,N} - \frac{1}{2}\right)}_{\text{IV}}\underbrace{-\frac{\rho}{1-\rho}\mathcal{E}_{C^V,N}\mathcal{E}_{\tau(N),N}}_{\text{V}}\underbrace{-2\frac{C^V}{C^T}\mathcal{E}_{C^V,N}\left(1-\mathcal{E}_{C^V,N}\right)}_{\text{VI}}\right], \quad \text{(A.9)}$$

where the second equality follows from

$$\frac{\partial^2 F^O}{(\partial N)^2}\frac{N^2}{F^O} = 2\mathcal{E}_{\widetilde{F}^O,N} + \frac{\partial^2 \widetilde{F}^O}{(\partial N)^2}\frac{N^2}{\widetilde{F}^O} = \frac{1}{2}\mathcal{E}_{\widetilde{F}^O,N}$$

and

$$\frac{\partial^2 C^T}{(\partial N)^2}\frac{N^2}{C^T} = \frac{\partial^2 C^V}{(\partial N)^2}\frac{N^2}{C^V}\frac{C^V}{C^T} + \left(2\mathcal{E}_{\widetilde{F},N} + \frac{\partial^2 \widetilde{F}}{(\partial N)^2}\frac{N^2}{\widetilde{F}}\right)\frac{F}{C^T} = \frac{\rho}{1-\rho}\mathcal{E}_{C^V,N}\mathcal{E}_{\tau(N),N}\frac{C^V}{C^T} + \frac{7}{2}\mathcal{E}_{\widetilde{F},N}\frac{F}{C^T},$$

which in turn use the following definitions:

$$\frac{\partial^2 \widetilde{F}^O}{(\partial N)^2}\frac{N^2}{\widetilde{F}^O} = -\frac{3}{4}\frac{t^*}{N-t^*} = -\frac{3}{2}\mathcal{E}_{\widetilde{F}^O,N},$$

$$\frac{\partial^2 \widetilde{F}}{(\partial N)^2}\frac{N^2}{\widetilde{F}} = \frac{1}{\widetilde{F}}\frac{1}{2}\frac{\delta^2}{1+\delta}\psi^2\frac{t^*}{N} = \frac{3}{2}\mathcal{E}_{\widetilde{F},N},$$

$$\frac{\partial^2 C^V}{(\partial N)^2}\frac{N^2}{C^V} = \frac{\rho}{1-\rho}\frac{\tau(N)^{1-\sigma}N}{\int_0^N \tau(i)^{1-\sigma}di}\frac{\partial \tau(N)}{\partial N}\frac{N}{\tau(N)} = \frac{\rho}{1-\rho}\mathcal{E}_{C^V,N}\mathcal{E}_{\tau(N),N}.$$

We can show that, under mild conditions, the expression in Equation (A.9) is negative. The terms in the second line (I, II, III) are scaled by total (expected) market access costs and are strictly negative because $\mathcal{E}_{\widetilde{F}^O,N} > \mathcal{E}_{\widetilde{F},N}$ and $\mathcal{E}_{C^V,N} < 1$, as shown above. The third line is scaled by total variable costs and the terms V and VI are strictly negative, because all elasticities are positive and $\mathcal{E}_{C^V,N} < 1$. The term IV is also negative if $\mathcal{E}_{C^V,N} > 1/4$,

i.e., if trade costs do not increase too fast. This sufficient condition is likely to be met. For instance Chen and Novy (2011) find that trade frictions increase only moderately with distance, with an elasticity significantly lower than one. Alternatively, it is sufficient that this term is lower in absolute value than the sum of the other five terms, or that the share of market access costs is large enough. □

In the next step we derive the outsourced cost share equivalent of Proposition 3. Previewing the analytical findings, the outsourced cost share falls in managerial capability as in the case of outsourced task shares. Its cross-derivative with respect to the number of destination countries and managerial capability is ambiguous due to counteracting forces. To derive empirically testable implications, however, we show that it falls in the share of variable costs and in the elasticity of demand. These predictions are tested in Online Appendix C below.

Proposition A.3 (Managerial Capability)**.** *The share of outsourced service expenditures in total costs* $\mathcal{O}^C$

a) falls in the managerial capability of a company (K*),*

$$\frac{\partial}{\partial K}\mathcal{O}^C < 0.$$

b) displays a cross partial derivative with respect to the number of export destination markets and managerial capability that decreases in the share of variable costs in total costs and in the elasticity of demand σ*:*

$$\frac{\partial^2}{\partial N \partial K}\mathcal{O}^C = f\left(\underbrace{\frac{C^V}{C^V+F}}_{-}, \underbrace{\sigma}_{-}\right).$$

Proof. To prove the first part of the statement, we compute the elasticity of the share of outsourced service expenditures in total costs with respect to managerial capability, $\mathcal{E}_{\mathcal{O}^C,K}$, which is defined as

$$\mathcal{E}_{\mathcal{O}^C,K} = \frac{\partial \mathcal{O}^C}{\partial K}\frac{K}{\mathcal{O}^C} = \mathcal{E}_{F^O,K} - \mathcal{E}_{C^V,K}\,\frac{C^V}{C^V+F} - \mathcal{E}_{F,K}\,\frac{F}{C^V+F},$$

where

$$\mathcal{E}_{F^O,K} = \mathcal{E}_{\widetilde{F}^O,K} = \mathcal{E}_{\mathcal{O},K} = -\frac{1}{2}\frac{t^*}{N-t^*},$$

$$\mathcal{E}_{F,K} = \mathcal{E}_{\widetilde{F},K} = -\frac{1}{\widetilde{F}}\frac{1}{3}\frac{\delta^2}{1+\delta}\psi^2\frac{t^*}{N},$$

$$\mathcal{E}_{C^V,K} = \frac{\rho}{1-\rho}.$$

Since $\mathcal{E}_{C^V,K} > 0$ and $\mathcal{E}_{F,K} < 0$, we have that $\mathcal{E}_{\mathcal{O}^C,K} < \mathcal{E}_{F^O,K} - \mathcal{E}_{F,K} = \mathcal{E}_{\widetilde{F},N} - \mathcal{E}_{\widetilde{F}^O,N}$. It follows that $\mathcal{E}_{\mathcal{O}^C,K} < 0$, because $\mathcal{E}_{\widetilde{F}^O,N} - \mathcal{E}_{\widetilde{F},N} > 0$, as we have shown in the proof of Proposition A.1 above. Note that this result does not rest on the assumption that marginal costs are a function of managerial ability: the proposition continues to hold even if marginal costs are a function of an exogenous productivity draw and independent of managerial capabilities (i.e., if $\mathcal{E}_{C^V,K} = 0$). This completes the proof of the first part.

To show how the share of outsourced service expenditures in total costs varies when both the number of countries and managerial ability change, we compute

$$\begin{aligned}\frac{\partial^2 \mathcal{O}^C}{\partial N \partial K}\frac{NK}{\mathcal{O}^C} = \frac{\partial^2 F^O}{\partial N \partial K}\frac{NK}{F^O} - \frac{\partial^2 C^T}{\partial N \partial K}\frac{NK}{C^T} - \mathcal{E}_{F^O,N}\mathcal{E}_{C^T,K} - \mathcal{E}_{F^O,K}\mathcal{E}_{C^T,N} + 2\mathcal{E}_{C^T,K}\mathcal{E}_{C^T,N} = \\ \frac{F}{C^T}\left[\left(\mathcal{E}_{\widetilde{F}^O,N} - \mathcal{E}_{\widetilde{F},N}\right)\left(\frac{1}{2} + 2\mathcal{E}_{\widetilde{F},N}\right)\right] + \\ \frac{F}{C^T}\frac{C^V}{C^T}\left[\left(\mathcal{E}_{\widetilde{F},N} + \mathcal{E}_{C^V,K}\right)\left(\mathcal{E}_{\widetilde{F},N} + 1 - \mathcal{E}_{C^V,N}\right)\right] + \\ \frac{C^V}{C^T}\Bigg[\underbrace{-\mathcal{E}_{\widetilde{F}^O,N}\left(\frac{1}{2} + \mathcal{E}_{C^V,K} - \mathcal{E}_{C^V,N}\right)}_{\text{I}}\underbrace{-\mathcal{E}_{C^V,K}\left(1 - \mathcal{E}_{C^V,N}\right)}_{\text{II}}\Bigg], \quad \text{(A.10)}\end{aligned}$$

where the second equality follows from

$$\frac{\partial^2 F^O}{\partial N \partial K}\frac{NK}{F^O} = \frac{\partial^2 F^O}{\partial N \partial K}\frac{K}{\widetilde{F}^O} = \mathcal{E}_{\widetilde{F}^O,K} + \frac{\partial^2 \widetilde{F}^O}{\partial N \partial K}\frac{NK}{\widetilde{F}^O} = -\frac{1}{2}\mathcal{E}_{\widetilde{F}^O,N}$$

and

$$\frac{\partial^2 C^T}{\partial N \partial K}\frac{NK}{C^T} = \frac{\partial^2 C^V}{\partial N \partial K}\frac{NK}{C^V}\frac{C^V}{C^T} + \left(\mathcal{E}_{\widetilde{F},K} + \frac{\partial^2 \widetilde{F}}{\partial N \partial K}\frac{NK}{\widetilde{F}}\right)\frac{F}{C^T} = \mathcal{E}_{C^V,K}\mathcal{E}_{C^V,N}\frac{C^V}{C^T} - \frac{1}{2}\mathcal{E}_{\widetilde{F},N}\frac{F}{C^T},$$

which in turn use the following definitions:

$$\frac{\partial^2 \widetilde{F}^O}{\partial N \partial K}\frac{NK}{\widetilde{F}^O} = \frac{1}{4}\frac{t^*}{N - t^*} = \frac{1}{2}\mathcal{E}_{\widetilde{F}^O,N},$$

$$\frac{\partial^2 \widetilde{F}}{\partial N \partial K}\frac{NK}{\widetilde{F}} = \frac{1}{\widetilde{F}}\frac{1}{6}\frac{\delta^2}{1+\delta}\psi^2\frac{t^*}{N} = \frac{1}{2}\mathcal{E}_{\widetilde{F},N},$$

$$\frac{\partial^2 C^V}{\partial N \partial K}\frac{NK}{C^V} = \frac{\rho}{1-\rho}\frac{\tau(N)^{1-\sigma}N}{\int_0^N \tau(i)^{1-\sigma}di} = \mathcal{E}_{C^V,K}\mathcal{E}_{C^V,N}.$$

We can show that the sign of the expression in Equation (A.10) is in general ambiguous and depends on the share of variable costs in total costs. The second line is scaled by total (expected) market access costs and is strictly positive due to $\mathcal{E}_{\widetilde{F}^O,N} > \mathcal{E}_{\widetilde{F},N}$, as shown in the proof of Proposition A.1. The third line is positive due to $\mathcal{E}_{C^V,N} < 1$, but it is a

mixed term of lower order compared to the other terms of the expression. The fourth line is scaled by total variable costs and the term II in square brackets is negative due to $\mathcal{E}_{C^V,N} < 1$. The term I is also negative as long as

$$\mathcal{E}_{C^V,K} > \frac{1}{2} \Longleftrightarrow \sigma > \frac{3}{2}.$$

Therefore, under the mild sufficient condition that the products are not too differentiated, the fourth line in Equation (A.10) is negative.

We conclude the proof by noting that, in the presence of market access costs only ($F \to C^T$), we are back to the result in Proposition 3 and the share of outsourced service in total costs rises even more in the number of export destination markets when managerial capability is high. This result is overturned, however, if the share of variable costs is high enough. In particular, the effect of the interaction of N and K on the share of outsourced service expenditures in total costs tends to decrease, and possibly becomes negative, if the share of variable costs in total costs (C^V/C^T) is high enough and if the elasticity of variable costs to managerial ability ($\mathcal{E}_{C^V,K}$) rises, i.e., in our setting, when the elasticity of demand rises. Indeed, one can show that the partial derivative of the expression in Equation (A.10) with respect to σ is negative. □

A.6.2 Additional Predictions

Our assumptions on demand and technology allow us to obtain additional insights on the response of the main elasticities to changes in the share of variable costs and the elasticity of demand, which we test empirically by using a proxy for the share of variable costs and a measure of product differentiation.

Proposition A.4 below states that the elasticity of outsourcing with respect to both the number of destination markets and to managerial ability is larger in absolute value when the share of variable costs is higher. Indeed, the outsourced component of market access costs (the numerator of the outsourced cost share) is more sensitive to changes in the number of destination countries or managerial ability than total costs (the denominator). The intuition is the following. As discussed in the main text, the manager reacts to the higher export complexity by outsourcing a higher share of tasks, or takes advantage of her higher ability by handling more tasks in-house, to decrease ex-post adaptation costs. The outsourced share of market access costs is larger with more export destinations, while it is smaller when a capable manager is in charge. At the same time, a given increase in the number of countries or managerial capability has a small effect on total costs when variable costs are high.

The effect of the price elasticity of demand works via its effects on variable costs, which are less sensitive to changes in complexity or managerial ability compared to the outsourced part of market access costs. A firm that faces more elastic demand lowers

prices, sells more, and has higher variable costs. Moreover, high managerial ability implies large variable costs in a similar vein, and this effect is particularly sizeable when demand is elastic. Finally, a higher elasticity makes variable trade costs even less sensitive to changes in complexity, because, due to high competition, the firm is not able to expand much in the marginal markets as these are characterized by high variable trade costs.

Proposition A.4 (Magnitude of Outsourcing Elasticities)**.** *The magnitude of the elasticities of the share of outsourced service expenditures in total costs with respect to the number of destination countries and managerial capability increases in the share of variable costs in total costs and in the elasticity of demand e:*

$$\frac{\partial \mathcal{E}_{\mathcal{O}^C,N}}{\partial C^V} > 0, \frac{\partial \mathcal{E}_{\mathcal{O}^C,N}}{\partial \sigma} > 0 \qquad \textit{and} \qquad \frac{\partial \mathcal{E}_{\mathcal{O}^C,K}}{\partial C^V} < 0, \frac{\partial \mathcal{E}_{\mathcal{O}^C,K}}{\partial \sigma} < 0$$

Proof. The proof follows from partially differentiating the elasticities obtained in Propositions A.1 and A.3 with respect to variable costs and the elasticity of demand. First,

$$\frac{\partial \mathcal{E}_{\mathcal{O}^C,N}}{\partial C^V} = \frac{F}{\left(C^V + F\right)^2} \left(\mathcal{E}_{F,N} - \mathcal{E}_{C^V,N}\right) > 0,$$

because $\mathcal{E}_{F,N} > \mathcal{E}_{C^V,N}$, as shown in the proof of Proposition A.1.

Moreover,

$$\frac{\partial \mathcal{E}_{\mathcal{O}^C,N}}{\partial \sigma} = -\frac{C^V}{C^V + F} \frac{\partial \mathcal{E}_{C^V,N}}{\partial \sigma} + \frac{\partial \mathcal{E}_{\mathcal{O}^C,N}}{\partial C^V} \frac{\partial C^V}{\partial \sigma} > 0,$$

where the result follows from partially differentiating the elasticity of variable costs with respect to N introduced in the proof of Proposition A.1,

$$\frac{\partial \mathcal{E}_{C^V,N}}{\partial \sigma} = \mathcal{E}_{C^V,N} \left[\frac{\int_0^N \tau(i)^{1-\sigma} \ln\left(\tau(i)\right) di}{\int_0^N \tau(i)^{1-\sigma} di} - \ln\left(\tau(N)\right) \right] < 0,$$

and from the fact that $\partial C^V / \partial \sigma > 0$, at least for sufficiently productive firms. The intuition for this last statement is that a relatively productive firm that faces a more elastic demand lowers its price and sells more. The formal derivation is most illustrative when we assume that there is no heterogeneity in variable trade costs:

$$\frac{\partial \ln C^V}{\partial \sigma} = \underbrace{\ln\left(1 - \frac{1}{\sigma}\right) + \frac{1}{\sigma - 1}}_{>0} \underbrace{+ \ln\left(\frac{KP}{\tau}\right)}_{>0 \iff KP > \tau}.$$

We can further show that

$$\frac{\partial \mathcal{E}_{\mathcal{O}^C,K}}{\partial C^V} = -\frac{F}{\left(C^V + F\right)^2} \left(\mathcal{E}_{C^V,K} - \mathcal{E}_{F,K}\right) < 0,$$

because $\mathcal{E}_{C^V,K} = \sigma - 1 > 0$ and $\mathcal{E}_{F,K} < 0$, as shown in the proof of Proposition A.3.

Finally, using previous results, we can show that

$$\frac{\partial \mathcal{E}_{\mathcal{O}^C,K}}{\partial \sigma} = -\frac{C^V}{C^V + F}\frac{\partial \mathcal{E}_{C^V,K}}{\partial \sigma} + \frac{\partial \mathcal{E}_{\mathcal{O}^C,K}}{\partial C^V}\frac{\partial C^V}{\partial \sigma} < 0,$$

which completes the proof. Note again that our assumption that marginal costs are a function of managerial ability is not fundamental in any of the results, which would hold even in a setting in which managerial ability has no impact on marginal costs ($\mathcal{E}_{C^V,K} = 0$). □

A.6.3 Endogenous N and the Role of Managerial Capabilities

The manager chooses the optimal number of destination markets by maximizing the total profits in Equation (A.8). The optimal number of destination countries N^* is implicitly defined by the first order condition:

$$\mathcal{F}(K, N^*) = (1-\rho)\, R \left(\frac{\rho K P}{\tau(N^*)}\right)^{\frac{\rho}{1-\rho}} - (f + \delta\psi^2) + \frac{\delta^3\psi^3}{[3(1+\delta)]^{\frac{3}{2}}} K^{\frac{1}{2}} (N^*)^{-\frac{1}{2}} = 0$$

This allows us to relate the number of destination countries to the ability of the manager. In particular, even in our setting with endogenous organizational choices, we find that better managed firms participate more and more strongly in international trade, in line with the empirical evidence presented in Bloom et al. (2021).

Proposition A.5 (Optimal N and Managerial Capability)**.** *A firm with a more capable manager exports to a higher number of destination markets.*

$$\mathcal{E}_{N^*,K} > 0$$

Proof. The proof follows immediately from total differentiating the implicit function $\mathcal{F}(K, N^*)$ above. The elasticity of the optimal country with respect to managerial ability is given by

$$\mathcal{E}_{N^*,K} = -\frac{\mathcal{F}_K K}{\mathcal{F}_{N^*} N^*},$$

where

$$\mathcal{F}_K K = \rho R \left(\frac{\rho K P}{\tau(N^*)}\right)^{\frac{\rho}{1-\rho}} + \frac{1}{2}\frac{\delta^3\psi^3}{[3(1+\delta)]^{\frac{3}{2}}}\left(\frac{K}{N^*}\right)^{\frac{1}{2}},$$

$$\mathcal{F}_{N^*} N^* = -\rho R \left(\frac{\rho K P}{\tau(N^*)}\right)^{\frac{\rho}{1-\rho}} \mathcal{E}_{\tau(N^*),N^*} - \frac{1}{2}\frac{\delta^3\psi^3}{[3(1+\delta)]^{\frac{3}{2}}}\left(\frac{K}{N^*}\right)^{\frac{1}{2}}.$$

□

B Further Empirical Results

B.1 Explorations regarding the main stylized fact

In this Appendix, we report further explorations to better understand the nature of the relationship between professional business service outsourcing and exporting. It complements Section 2 on the main stylized fact and the reader can refer to the end of that section for a summary and the logical starting point for this appendix. All findings are reported in Table E.8 and are based on slight variations of our baseline OLS model (1), i.e., interacting the number of destination countries with different measures. Since we rely on within-firm estimates (panel data set) and the interacted variables vary within units of the panel, we de-mean all variables by all fixed effects included in the regressions before computing the interaction terms (Giesselmann and Schmidt-Catran, 2022). As a by-product, all level effects can be interpreted directly at the mean of the interaction variable.

First, Figure 1 suggests a concave relationship between the number of destination countries and the outsourcing cost share. Accordingly, we estimate a specification where N enters in a quadratic way and the results in column (2) of Table E.8 strongly confirm this impression. In the discussion of Proposition 1—derived from the theoretical framework presented in Section 3—we argue that such a concave relationship is plausible even if cost shares did not mechanically imply concavity when it approaches its upper bound of one. Moreover, in unreported regressions, we re-estimate the baseline specification (1) with two restricted samples. We focus on firms that have exported to at least 50 or 80 foreign markets at least once in our sample. The two numbers are based on the 95th and 99th percentile in the distribution of the number of export destinations in the data. In both regressions, we find that the coefficient of interest is positive and statistically significant at least at the 5% level. Both estimates are also smaller than our baseline, which is consistent with concavity. Importantly, these results rule out that the relationship between the number of foreign markets served and the outsourced cost share is non-monotonic in any relevant sense.

Second, we take the opportunity to let our data speak to the seminal contribution of Arkolakis (2010) and thus relate our paper to it very directly. In column (3) of Table E.8, we regress the (log) outsourced expenditure on the (log) number of export destinations, its square, and two reweighted variants of these regressors. In particular, $N(Arkolakis)$ is the weighted count of the number of destinations of each firm, where the weights are equal to Arkolakis's (2010) formulation of market access costs:

$$w(i)^{.29} L(i)^{.43} \frac{1-(1-s_f(i))^{.085}}{.085}.$$

Here, $w(i)$ and $L(i)$ are GDP per capita and population in destination i and $s_f(i)$ is

the market share of French firm f in market i (proxied by the firm's share in total French exports to the destination). The country data come from the World Development Indicators and the exponents are the original calibrations in Table 2 of Arkolakis (2010).

We find direct evidence for the entry cost channel proposed by Arkolakis (2010). Over and above the fact that a larger number of destinations leads to higher expenditure in market access services, this effect is significantly stronger, when "Arkolakis" entry costs are high in a particular market; either because the market is large or because the firm tries to achieve a large market share.

These patterns are very different when we examine the boundary of the firm via our main outcome of interest, the outsourced cost *share*, see column (4) of Table E.8. Market size and market shares combined in the Arkolakis entry costs do not have any additional explanatory power and instead the extensive country margin is the main determinant. Overall, these findings suggest that the efficiency gain due to an optimal market access service make-or-buy decision is a distinct channel from the one proposed in Arkolakis (2010) and complements it.

Third, not every additional export destination presents a firm with the same challenges and requires the same organizational adjustments. The latter may depend on how 'difficult' it is to understand the workings in the destination, on how many products are to be offered there, and last but not least, on whether a firm has already gained experience in that market.

We start by investigating whether there are stronger effects on outsourcing when a new foreign market adds substantially more complexity. We reweight the number of countries using the Hausmann et al. (2011) measure of economic (country) complexity, which can be thought as a proxy for how 'difficult' market access is in one country compared to others. As shown in column (5), we find evidence that after controlling for the quadratic term in N there is a positive interaction effect at the same order of magnitude as the main effect of N. The large standard errors are not surprising: our empirical specification rests on within variation and involves multiple interaction terms, so that this exercise is quite demanding of the data. Nevertheless, we view these results as supportive of the hypothesis. The point estimate is indeed large and the P-value is .16.

Next, we investigate whether firms that simultaneously raise the number of exported products implement greater reorganizations when they access foreign markets. The multi-product literature in international trade typically assumes the presence of product-specific market access costs and notes that these are mainly made up by service inputs. For instance, Bernard et al. (2011) justify their presence by arguing that they capture the research, advertising and regulation costs to supply each product to a certain destination. Therefore, an increase in the number of products could also entail an increase in the number of service inputs needed, and consequently a rise in coordination complexity. At the same time, to the extent that companies follow a sequential entry strategy for products

and trial their most successful variety before adding others to their local portfolio, it is likely that the complexity generated by adding an additional product is lower compared to entering an entirely new market: One would expect only a marginal effect on complexity from the simultaneous increase of markets and products. Consistent with these hypotheses, we find a positive and significant increase in the share of service outsourcing when the number of exported products increases, but the magnitude is smaller compared to adding new countries. Moreover, once again controlling for the quadratic term, our prior is confirmed in that the interaction term between N and the total number of products, NP, is small and insignificant.

Fourth, we examine the dynamics behind firms' outsourcing decisions in connection with accessing a new market abroad. We do so in two different ways. In column (7) of Table E.8, we include the number of export destinations in the previous period, $L.N$, and the same variable for the next period, $F.N$. Alternatively, we interact N with an indicator variable at the firm-year level, which indicates whether the exporter (i) only reenters markets relative to the previous period and given its entire observable history (and does not also enter a new market); (ii) only enters markets it had not exported to (and does not also reenter a market); (iii) simultaneously reenters *and* enters markets for the first time. Note that exit events are immaterial in these definitions.

The estimates in column (7) imply that firms prepare to enter a new market at least one year in advance and start outsourcing crucial service inputs. This process extends well into the actual year of entry as seen by the sizeable coefficient on the contemporaneous variable N, which is also consistent with a substantial fixed cost component in market access services. Finally, the small and only marginally significant estimate on $L.N$ implies that the reorganization is completed shortly afterwards. Interpreting the estimates in column (8) along the same lines, we find that reentry does not affect the boundary of the firm, which is consistent with the view that some of the entry cost might be sunk in nature or that such companies never really abandoned the market and continued to pay fixed costs in the form of PBS inputs. Only entering new markets, by contrast, entails a significant increase in the cost share of outsourcing. Whenever a firm both enters and reenters markets, there is an additional positive effect on the outsourcing share, which is consistent with the fact that simultaneous entry and reentry typically involves larger swings in the number of destinations. Finally, while the main effect of N is driven by several sources of variation, in our French setting of international expansion it mostly reflects past entry, which shows that the export-related inputs we measure in our data are indeed components of fixed costs.

These findings have important implications for the patterns of how exporters grow and are therefore closely related to a recent line of research that stresses demand factors as important determinants of both firm heterogeneity and how firms grow in new markets (e.g., Hottman et al., 2016; Argente et al., 2021). Fitzgerald et al. (2023), for instance,

highlights customer base accumulation by means of advertising as a determinant of success in a destination. Our findings complement these insights: Since market access costs depend on the existing set of export destinations and their characteristics, the market access trajectory for companies is not only state-dependent within destination, but also across them. Moreover, Morales et al. (2019) shows that the probability of entering a given new market is higher when a firm's previous destinations share some similarities in terms of language, culture or location. The conceptual mechanism and empirical evidence presented in this paper provide an important narrative, or micro-foundation, for this "extended gravity": market access costs depend on other destinations in the portfolio due to the effect on managerial overload and subsequent reorganization. A French firm that expands from Germany to Austria is required to handle only few additional tasks (which may even closely overlap with those already performed), so that little adjustment of the firm boundary is necessary.

C Empirical Evidence for the Predictions in Appendix Section A.6

In this appendix, we provide empirical evidence regarding the additional predictions derived in Appendix A.6. In particular, we first study how the baseline effect of the number of destinations on outsourcing cost shares varies with the share of variable components in total costs of a firm and how it varies with the elasticity of downstream demand. Second, we want to investigate whether our modelling approach to organization-augmented market access costs captures patterns of the data related to managerial capability and market expansion. Following the exercise in Section 4, we study how the interaction between managerial capability and the number of export destinations varies with the same characteristics, the variable cost share and the downstream demand elasticity.

Since there is no information on variable cost shares in our firm-level data, we proxy it with the total export value divided by the number of export destinations, i.e., the average sales per market. This variable is expected to correlate positively with the actual variable cost share, especially for big exporters. To proxy the downstream demand elasticity faced by our firms, we use the Rauch (1999) classification of goods and the product-level trade flow information from our customs data. This allows us to compute the export-value-weighted share of differentiated products at the firm level.

To conduct our analyses, we restrict the sample to observations with above-median variable cost shares or differentiated export shares. Appendix Table E.9 shows that, in line with Proposition A.4, the baseline effect of N is indeed stronger for firms that access on average larger markets (columns (4)-(6)) and for firms that sell less differentiated products (columns (5)-(9)), compared to the full sample in the first three columns. The intuition is that fixed export costs—the outsourced part in particular—are very sensitive to the increase in export complexity, while variable costs increase by less because the firm sells smaller and smaller quantities in the marginal (typically more distant) foreign markets. Thus the outsourcing share reacts more strongly when the share of total costs accounted for by variable costs is large. A low degree of differentiation of a firm's products and therefore a high demand elasticity has a similar effect, since it increases the variable cost share, inter alia.

We then compare the interaction effects of our managerial capability proxies with the number of export markets across the full and the restricted samples. In the full sample (columns (1)-(3)), they are small and insignificant, which is consistent with the model's ambiguous prediction. As predicted by Proposition A.3, they fall when we rely on the sample with a high variable cost share and rise when goods are strongly differentiated, i.e., when the demand elasticity is low (with the exception of communication). The same pattern holds true for the level effects of the managerial capability variables, as predicted by Proposition A.4.

D Data Appendix

D.1 Data sets used

The French micro-data come from the following five main data sources:

1. The Enquête annuelle d'Entreprise (EAE) that collects balance sheet data on all French firms with more than 20 employees and a sample of smaller firms;
2. The Déclaration annuelle de données sociales (DADS) that collects employment data on all firms with paid employees; the data used are aggregated at the establishment level;
3. Transaction-level import-export data provided by the French Directorate-General of Customs and Indirect Taxes (DGDDI);
4. The Liaisons Financières entre sociétés (LiFi) database, which collects information on the financial links between enterprises incorporated in France as well as their foreign owners and affiliates;
5. Finally the service outsourcing data contained in the EAE are integrated with the Enquête Recours aux Services par l'Industrie (ERSI), a survey of firms with more than 20 employees and the census of firms with more than 250 employees that collects detailed information about service outsourcing policies for the year 2005. The total response rate of the survey is 85% and is well-balanced across industries and firm sizes.

We also make use of the following aggregate or otherwise publicly available data:

- Aggregate trade data from the World Integrated Trade Solution (WITS) database;
- Gravity variables are provided by Mayer and Zignago (2011);
- Information on foreign market complexity comes from Hausmann et al. (2011);
- Information on the degree of product differentiation comes from Rauch (1999);
- Task-related information comes from the 2007 O*NET v12.0 Database, combined with employment information from the 2007 Occupational Employment Statistics (OES) Survey of the Bureau of Labor Statistics.

D.2 Variable Definitions

D.2.1 The Enquête annuelle d'Entreprise and DADS

The main variables constructed using the EAE and DADS databases are defined as follows.

PBS outsourcing share: It is defined as the sum of purchases of studies (D321), purchases of IT services from an external supplier (D329), non-capital expenditures on software purchases (D511), and advertising (D360) over total costs. Purchases of studies correspond to item 604 of the French accounting rules (Plan Comptable Général - PCG),

which belongs to the set of contracted-out goods and services that integrate directly the production cycle of the firm. Advertising corresponds to item 623 of the PCG, which belongs to 'Other external services' (item 62). Non-capital expenditures on software purchases are also classified in other external services within the EAE and are distinct from software developed in-house (variable D510). Finally the description of the EAE variable D329 explicitly states that IT services are purchased from external suppliers.

Total costs: It is the sum of purchases of goods (R210), purchases of raw materials (R212), other purchases and charges (R214), total wages and salaries (R216), social contributions (R217), and other charges (R222).

Employment: Total number of full time equivalent employees (yearly average, E101).

Skill intensity: Ratio of skilled workers to unskilled workers (from DADS). The number of skilled workers is the sum over all establishments of non-secondary jobs at the end of the year for the following categories: chief executives (chefs d'entreprises salariés), managers and professional occupations (cadres et professions intellectuelles supérieures), intermediate professions and technicians (professions intermédiaires). Unskilled workers include the following categories: sales and administrative occupations (employés), qualified and unqualified operators and laborers (ouvriers). All of the previous categories include ordinary employment only and exclude for instance interns and apprentices.

Capital intensity: Ratio of the total capital stock to total employment, where the capital stock is measured as the total of tangible capital assets at end of year (I150) and total employment is the total number of full time equivalent employees (E101).

Num. Layers: It is the number of hierarchical layers, defined as in Caliendo et al. (2015). It counts the number of one-digit occupational categories (catégories socioprofessionnelles) with positive employment within the firm. It takes values between 1 and 5.

Top Managers share (CS2): It is the share of workers classified as top managers (chefs d'entreprises) in total employment, according to the occupation categories reported in DADS.

Professional share (CS3): It is the share of workers classified as middle managers and professional occupations (cadres et professions intellectuelles supérieures) in total employment. It comes from DADS and it is another proxy for internal production of PBS services, given that they are mainly produced by professionals.

Employment outsourcing sh: It is the share of expenditures on external labor (D350) over total costs. The expenditures on external personnel correspond to item 621 of the PCG, and cover temporary workers as well as seconded or borrowed employees. The variable has been recently used by Bilal and Lhuillier (2021).

Industrial (Capacity) outsourcing sh: It is the share of expenditures on industrial outsourcing over total costs, including the sub-component due to capacity constraints (D327). Industrial outsourcing corresponds to the 'contract manufacturing services' reported in

the U.S. Census of Manufacturers, in which buyer provides design and production criteria to a manufacturer who performs the physical transformation activities (Fort, 2017). Capacity industrial outsourcing is a situation in which the buyer has the capability and equipment inside the firm but decides to subcontract production to an external supplier either occasionally (due to peaks in demand or breakdowns) or more permanently (to avoid scaling up and yet maintaining the internal know-how).[3]

Serv. NonRoutineness: It is the non-routine task share for the upstream service input. It corresponds to the inverse of the average task routineness in the service sector constructed following Costinot et al. (2011). Task routineness for an occupation is measured as: $r(o) = 100 - i(o)$, where $i(o)$ is the importance of 'Making Decisions and Solving Problems' (on a scale 0 to 100) available in the 2007 O*NET v12.0 Database. Occupation measures are first transformed to 4-digit 2002 NAICS industries using employment weights from the 2007 Occupational Employment Statistics (OES) Survey of the Bureau of Labor Statistics, and then to NACE Rev 1.1 using a concordance table available upon request. The task routineness measure is then aggregated up at the service type level using employment weights from DADS.

Serv. Dispersion: It is the inverse Herfindahl–Hirschman index of firm-level labor cost shares in an upstream service sector. The firm-level labor costs are proxied with the total wage bill from DADS (S_BRUT), which does not include the firm's social security contributions. The service sectors are defined at the level of the ERSI service types (see Section D.2.3).

Serv. Inv Elasticity: It is the (inverse) elasticity of service demand estimated as in Gervais and Jensen (2019). It corresponds to the median value of the ratio between value added and operating profits for the firms operating in the industries that produce a certain service type (see Section D.2.3). Value added is defined as turnover and other products (R310 + R315) minus purchases of goods (R210), purchases of raw materials (R212), and other purchases and charges (R214). Operating profits are defined as value added minus labor costs (R216 + R217 + R222) and taxes (R215).

Monitoring: It captures the firm-level task share devoted to monitoring activities, a measure of managerial intensity within the firm. We first use of the 2007 O*NET database to obtain a measure of monitoring intensity for an occupation by averaging the importance of: i) 'Guiding, Directing, and Motivating Subordinates'; ii) 'Staffing Organizational Units'; iii) 'Monitoring and Controlling Resources'. We then concord the 6-digit O*NET occupations (classified according to the 2006 Standard Occupation Classification) to the 1-digit French occupational categories (catégories socioprofessionnelles) and use firms' employment shares in each occupation to obtain a firm-year level measure.

Coordination: It captures the firm-level task share devoted to coordination activities, a measure of managerial intensity within the firm. It is constructed similarly to *Moni-*

[3]For the definitions provided by the INSEE, see https://www.insee.fr/fr/metadonnees/definition/c1670.

toring, with the difference that the coordination intensity for an occupation is obtained by averaging the importance of: i) 'Scheduling Work and Activities'; ii) 'Organizing, Planning, and Prioritizing Work'; iii) 'Coordinating the Work and Activities of Others'.

Communication: It captures the firm-level task share devoted to communication activities within the firm, a measure of managerial intensity in line with the micro-foundation proposed in our conceptual model. It is constructed similarly to *Monitoring*, with the difference that the communication intensity for an occupation is obtained by averaging the importance of: i) 'Interpreting the Meaning of Information for Others'; ii) 'Communicating with Supervisors, Peers, or Subordinates'.

D.2.2 Customs data

The main variables constructed using the French customs data are defined as follows.

N: Number of export destinations of the firm.

Exp intensive margin: It is the average intensive margin across export destinations of the firm, obtained as the total value of exports divided by the number of export destinations.

N imp: Number of import origins of the firm.

Imp intensive margin: It is the average intensive margin across import origins of the firm, obtained as the total value of imports divided by the number of import origins.

Differentiation: It is a measure of firm export differentiation, obtained as the a weighted average of the differentiation of the firm's exported products, with weights equal to the shares of each product in the total firm export value. An exported product is considered as differentiated if it is neither sold on an organized exchange nor reference priced. We use the Rauch's (1999) 'Liberal' classification as in Nunn (2007) and Corcos et al. (2013).

N (Complexity): It is the number of export destinations of the firm weighted by the (rescaled) index of economic complexity proposed by Hausmann et al. (2011).

NP: Number of exported products. This information is not available for exporters that file simplified declarations. The full reporting threshold is 38k€ (250k French Francs) before 2001, 100k€ in the 2001-2006 period, 150k€ in 2007. See Bergounhon et al. (2018) for further details.

Entry: It is an indicator variable that takes value equal to one if the exporter *only* reenters markets relative to the previous period and its full history in the data; two if the exporter *only* enters markets it had not exported to in its full history in the data; three if the exporter simultaneously reenters *and* enters markets for the first time. The variable construction requires at least three years of trading history to be defined, so it is missing in the initial two years of exporting activity of new exporters and in year 1996 because we use trade data starting in 1995.

D.2.3 ERSI

The ERSI survey contains information about 34 types of services; in particular for each service type it provides a binary variable equal to one if the service is outsourced by the firm. Hence the OUT_{is} variable corresponds to the B* variables contained in the survey. We use the revised version of the variables, adjusted to remove internal inconsistencies. The service types are:

1. ICT Services
   - 1.1: IT consulting
   - 1.2: Software and IT third party maintenance
   - 1.3: Data processing and IT management
   - 1.4: Telecommunications
2. R&D and Professional Services
   - 2.1: Research and development
   - 2.2: Architecture, engineering and technical studies
3. Transportation Services and Logistics
   - 3.1: Railways, air, water and land transport
   - 3.2: Handling and warehousing
   - 3.3: Packaging
   - 3.4: Courier and post
   - 3.5: Chartering and international transport
4. Administrative Services
   - 4.1: Secretariat, translation and interpreting
   - 4.2: Vocational training
   - 4.3: Business and management consultancy
   - 4.4: Legal services
   - 4.5: Accounting, book-keeping and auditing
   - 4.6: Labor recruitment and provision of permanent personnel
   - 4.7: Temporary work
   - 4.8: Brokerage and fund management
   - 4.9: Insurance and other financial services
   - 4.10: Leasing
   - 4.11: Invoicing/billing and debt recovery
5. Commercial Services
   - 5.1: Advertising, marketing and communication
   - 5.2: After-sales services
6. Maintenance and General Services
   - 6.1: Car, equipment and machinery maintenance
   - 6.2: Buildings maintenance
   - 6.3: Cleaning

6.4: Investigation and security activities
6.5: Sewage and sanitation
6.6: Refuse collection, treatment and recycling
6.7: Real estate
6.8: Renting of machinery, car and transport equipment

7. Personnel Services
   7.1: Restaurants, canteens and catering
   7.2: Day care, nurseries and personal services

The correspondence between the service types and the 4-digit NAF (Nomenclature d'Activités Française) Revision 1 industries is available upon request.

D.2.4 Robustness Checks

The main variables used in the robustness exercises contained in the paper are defined as follows.

Contract intensity: The variable is constructed using the information about firms' imports. The firm-level contract intensity is therefore a weighted average of the contract intensity of the firm's imported products, where the measure of contract intensity is taken from Rauch (1999), and the weights are the shares of each product in the total firm imports. An imported good is considered as contract intense if it is neither sold on an organized exchange nor reference priced, we use the Rauch's (1999) 'Liberal' classification as in Nunn (2007) and Corcos et al. (2013).

HQ Share (Rev): the share of the firm revenues accounted for by branches of the firm that produce services (NACE codes from 50 to 93, often the headquarters). The EAE survey provides firm-level information at the level of branch of activity; i.e., revenues, employment and other firm-level information reported at the 4-digit NAF industry level. There is no one-to-one correspondence between branches and establishments, and a single branch can regroup the 4-digit industry-specific activities of multiple establishments or just represent part of the activity a single establishment.

HQ Share (Empl): the share of the firm workers employed in branches of the firm that produce services (NACE codes from 50 to 93, often the headquarters).

PBS Share (Rev): the share of the firm revenues accounted for by branches of the firm that produce business services (defined as ERSI categories 1, 2, and 5, see Section D.2.3).

PBS Share (Empl): the share of the firm workers employed in branches of the firm that produce business services (defined as ERSI categories 1, 2, and 5, see Section D.2.3).

HQ Est. (Salaries): the share of the firm total wage bill accounted for by establishments classified as headquarters by the firm itself (values 10, 27, 80, 87 of the variable FTNET, reporting the function of the establishment).

HQ Est. (Empl): the share of the firm workers employed in establishments classified

as headquarters by the firm itself (values 10, 27, 80, 87 of the variable FTNET, reporting the function of the establishment).

Total service (Out+Int) share: the share of total service expenditure in total costs. Total service expenditure is the sum of purchased services and the total labor cost of middle managers and professionals (CS3) employed by the firm, which is one of our proxies for internal production of PBS services.

TFP: It is computed using the methodology proposed by Wooldridge (2009). The coefficient of a Cobb-Douglas value-added production function are estimated at the 3 digit NACE industry level using intermediate inputs (R210 + R212 + R214) as the proxy for the productivity shock. Real value added is obtained by double-deflation as the difference between real output and real intermediate expenditures using deflators from the OECD STAN database. TFP at the firm level is then calculated as a residual between the actual and predicted value added using the estimated coefficient.

D.3 Data Cleaning

All variables from EAE before 2001 and salary from DADS before 2000 are transformed into euro. Unfortunately there are no missing values in the database and all variables are zeros even when they are clearly missing. So we set the relevant variables to missing in the following cases:

- If all balance sheet variables are zeros (E* R* D* I* S*);
- If all income statement variables are zeros (R1* R2* R3* R40* D* S001);
- If all cost variables are zeros (R2*);
- If all employment variables are zeros (E* S003 D350 D351 D352 - after having performed the adjustments described below);
- If employment is zero (E101) but total salaries are positive (R216);
- If all intangible investment variables are zeros;
- If capital stock is zero (I150);
- If purchases of studies (D321) and purchases of materials (D322) are zeros but the variable containing their sum (D314) is positive;
- If all outsourcing and external charges are zeros (D3* D5*);

The following adjustments are also performed.

Capital (I150): whenever possible, we obtain the end of the year capital stock from the stock at the beginning of the year by adding acquisitions and revaluations and subtracting decumulation and disposals.

Other purchases and charges (R214): whenever it is zero or too small we take the sum of its components, which, according to the French accounting rules (Plan Comptable Général), are: outsourcing of non-core activities (D323), payments for leasing (D330), salaries to external employees (D350), advertising (D360).

Employment (E101): employment is measured as the total number of full time equivalent employees (annual average). Whenever possible, we replace the zeros with the sum of the annual average employment over all branches (S003), or with employment at the end of the year (E200), or with with the sum of the annual average employment over all establishments (V001), or, finally, with the sum of non-secondary jobs at the end of the year over all establishments from DADS (EFF_3112_ET). We use employment at the end of the year from DADS instead of the annual average employment (EFF_MOY_ET) because the latter is not available before 2002; non-secondary jobs (postes non annexes) exclude secondary jobs that last or are paid too little (see INSEE, 2013).

HQ Share (Empl) and *PBS Share (Empl)*: they are set to missing in 2007 because very few firms report employment by branch in that year.

Outsourcing shares: they are set to missing if they exceed one.

Industrial (Capacity) outsourcing sh: we set the observations to missing whenever the variables providing the sub-components of the total (e.g. due capacity constraints) do not sum up to 100. Conversely, we consider zero values for capacity outsourcing as genuine whenever the total expenditures on industrial outsourcing is positive.

Purchases of goods (R210), *Purchases of raw materials* (R212): they are set to missing if negative (only few cases in 1996).

Purchases of Studies (D321): to impute missing values we take advantage of the variable overall outsourcing (D314), which contains the sum of purchases of studies (D321) and of purchases of (contracted-out) materials, equipment and works (D322, item 605 of the PCG). We compute the 2-digit industry-level average share of purchases of studies in the total, and use this average and the firm-level expenditure on overall outsourcing to impute missing values in the variable purchase of studies. We cannot impute missing values for the food and beverage industry (NACE 15) because no firm is reporting the subcategories.

Value Added: we set negative observations to missing.

Total wages and salaries (R216): when we take total employment from DADS we also replace the total wage bill with the sum of gross salaries over all establishments from DADS (S_BRUT). We do so only when total costs are non-missing, otherwise total costs would be heavily underestimated (would contain wages only).

Total costs: instead of purchases of goods (R210), purchases of raw materials (R212), and other purchases and charges (R214), we use their reported sum (total purchases and external charges, R771) whenever the value is larger.

Turnover (R310): if it is zero, it is set equal to the sum of turnover over all branches (S001) when this is positive. We also use turnover from branches if reported exports are larger than turnover but smaller than turnover from branches (only two cases in 2005).

Trade variables: for the robustness exercise with non-exporters, we typically set trade variables to zero if the corresponding value is not reported in the trade data. There are

two exceptions in which we set values to missing instead of zero: i) the non-exporter reports positive exports in the EAE survey; ii) for the number of products when the firm exports a positive amount but it files simplified declarations that do not report product information.

Finally we drop the observations in the following cases:

- Turnover comes entirely from branches classified in services;
- Turnover is lower than total exports. More precisely we allow for a 10% reporting error, hence we drop the observation if total exports are 10% larger than turnover.

E Online Appendix Figures and Tables

Figure E.1: Outsourcing Cost Shares and the Extensive Country Margin in Deviations

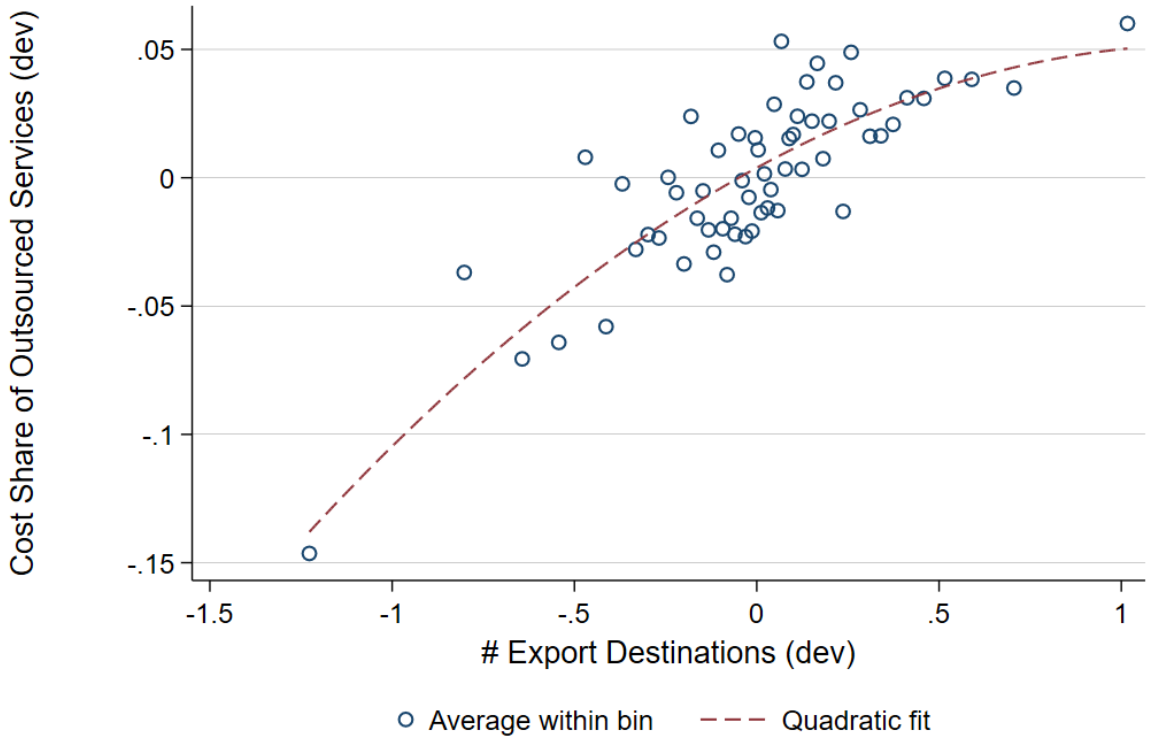


Figure shows average total external expenditures on market access services, like market research and advertising, as shares of total costs within 30 quantile bins for the number of export destinations. Variables de-meaned by the controls and fixed effects specified in equation (1). Full firm panel 1996-2007.

Figure E.2: Goodness of fit: Targeted Moments

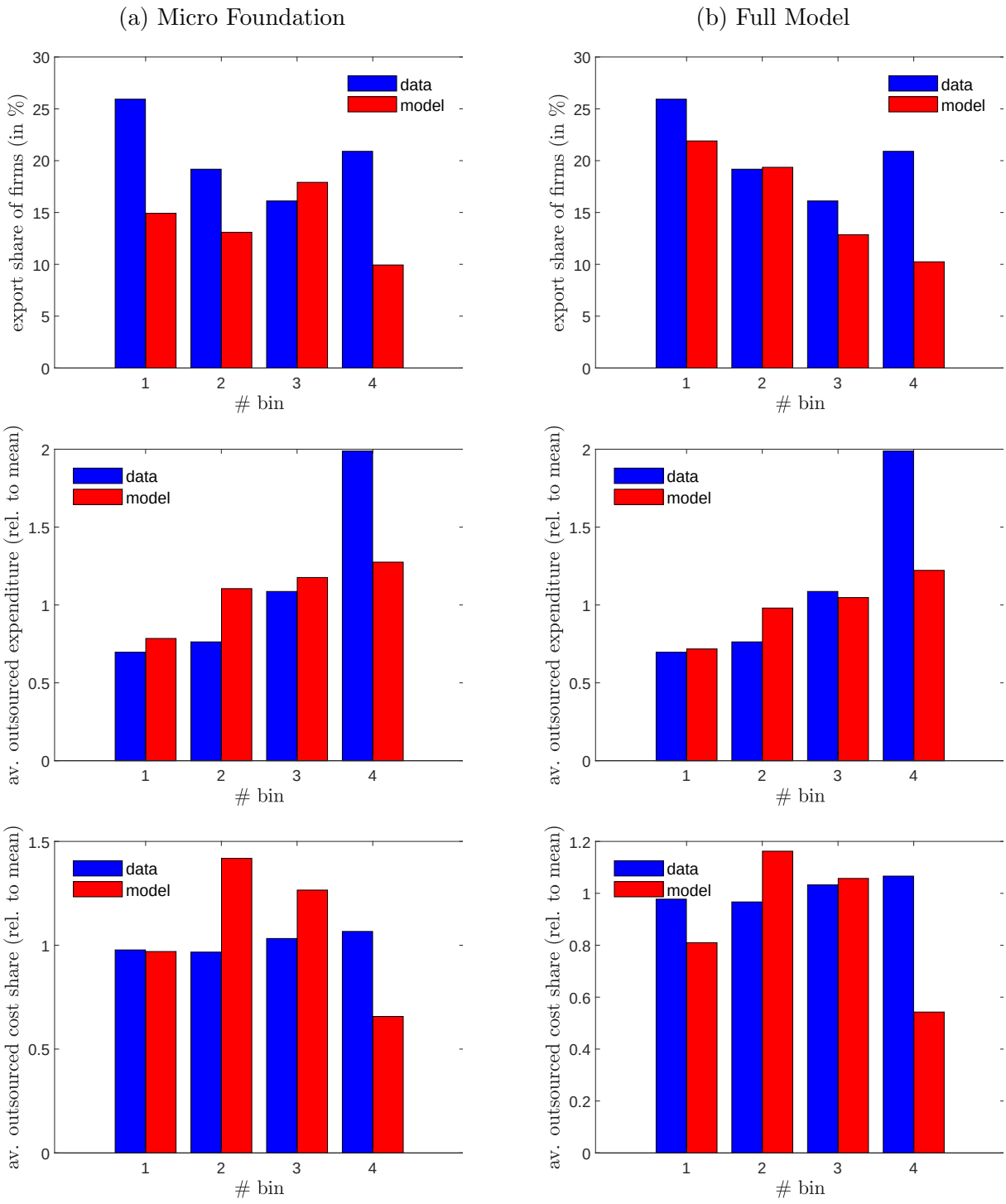


Figure shows targeted data moments in blue and simulated model moments (average over 100 simulations) in red. Panel a) shows moments for the calibration using the micro foundation. Panel b) shows moments for the full model where all parameters are calibrated.

Figure E.3: Counterfactuals: Micro Foundation

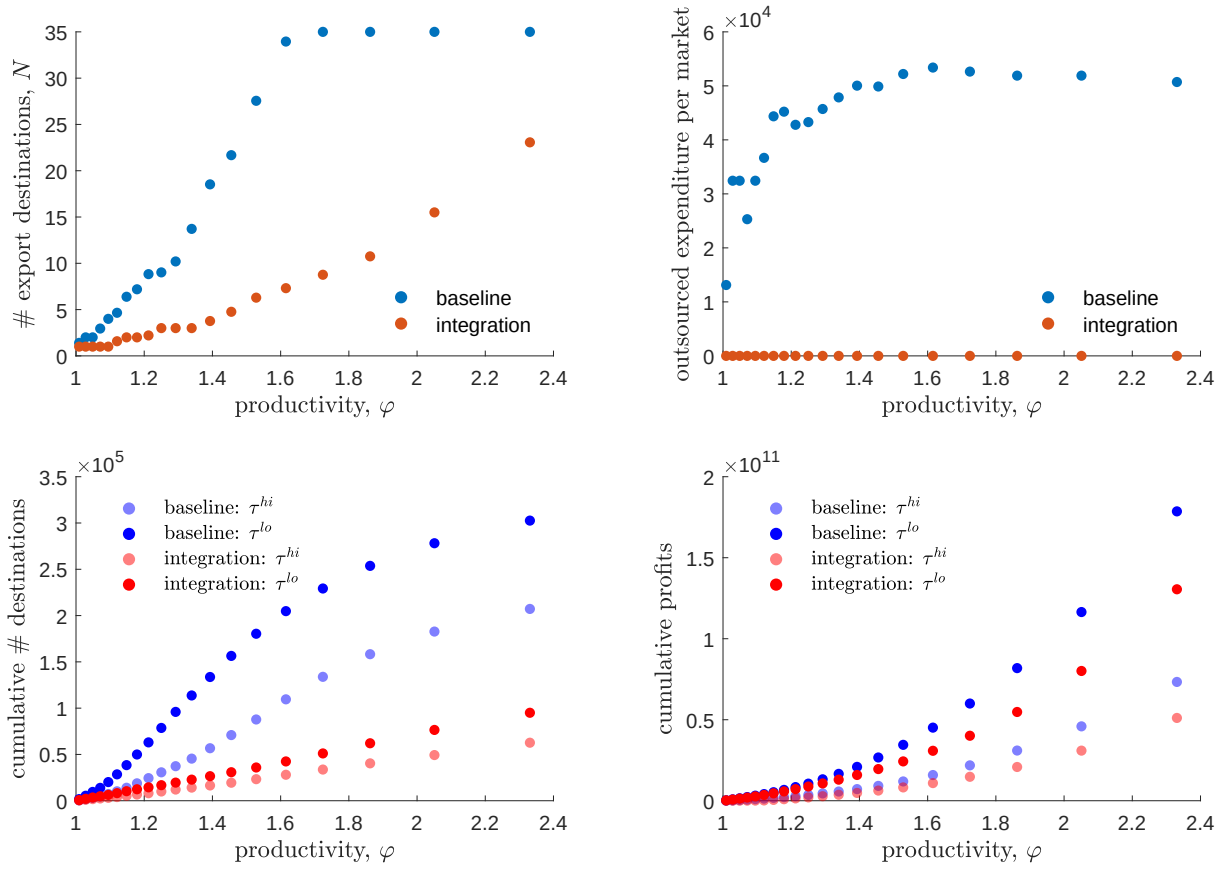


Figure illustrates average outcomes from 100 simulations of the quantified model using the micro foundation. 'baseline' refers to the estimated model with the organization-augmented fixed cost function, 'integration' to the counterfactual where firms are forced to employ service workers directly. All graphs are binscatter plots with 20 bins. τ^{hi} is the estimated true trade cost at the country level, τ^{lo} is τ^{hi} reduced by 25%. 'Cumulative' refers to the sum across firms along the x-axis/productivity distribution. Only firms with productivity below the 90th percentile shown for visibility.

Table E.1: Summary Statistics Baseline Sample (EAE)

	1996						2007					
	mean	sd	p25	p50	p75	obs	mean	sd	p25	p50	p75	obs
PBS outsourcing sh	0.045	0.072	0.0040	0.015	0.051	16,521	0.050	0.080	0.0037	0.016	0.063	14,102
PBS outsourcing (k€)	1615.2	14505.0	21.0	98.5	436.8	16,522	3285.7	47352.8	34	176	798	14,102
PBS outsourcing rel to wage bill	0.17	0.33	0.014	0.053	0.17	16,327	0.21	0.35	0.015	0.065	0.23	13,887
Firm average wage (k€)	22.7	8.19	18.0	21.3	25.5	17,993	30.1	10.8	24.2	28.1	33.5	15,579
# export destinations (N)	11.8	15.4	2	6	15	18,033	14.1	17.3	3	7	19	15,692
Export intensive margin (k€)	327.7	1381.6	19.9	67.0	217.8	18,033	620.8	4404.5	33.0	112.6	360.4	15,692
# import origins	5.33	5.42	1	4	8	18,033	7.14	6.88	2	6	10	15,692
Import intensive margin (k€)	488.5	2358.0	36.2	110.3	332.6	14,797	823.1	5371.4	71.5	203.6	574.7	13,347
# products (NP)	13.4	24.8	2	6	14	18,033	15.2	29.4	2	6	16	15,692
# exp. dest., complexity-weighted	15.7	17.8	3.46	9.00	21.5	18,033	18.2	20.1	3.69	10.7	25.6	15,692
Employment	153.6	786.5	30	47	109	18,026	158.7	862.3	31	49	119	15,670
Skill intensity	0.62	2.50	0.17	0.30	0.54	16,984	1.22	17.0	0.24	0.41	0.77	15,297
Capital intensity	81.9	2125.0	16.8	32.5	59.3	17,996	111.8	1874.0	23.0	47.7	93.4	15,582
# hierarchical layers	4.33	0.78	4	4	5	17,047	4.26	0.73	4	4	5	15,408
Professional share (CS3)	0.080	0.099	0.026	0.054	0.098	17,047	0.13	0.14	0.047	0.087	0.15	15,408
Employment outsourcing sh	0.018	0.027	0.0029	0.0090	0.023	11,189	0.025	0.030	0.0062	0.016	0.034	11,456
Industrial outsourcing sh	0.088	0.11	0.014	0.047	0.12	12,728	0.087	0.11	0.014	0.048	0.12	11,086
Total service (Out+Int) sh	0.082	0.084	0.027	0.057	0.11	17,398	0.099	0.097	0.033	0.068	0.13	15,140
Top Managers share (CS2)	0.021	0.042	0	0.0085	0.030	17,047	0.013	0.032	0	0	0.020	15,408
Monitoring capability	33.0	1.31	32.3	32.8	33.4	17,047	33.0	1.15	32.3	32.8	33.4	15,408
Coordination capability	56.4	0.95	56.0	56.4	56.8	17,047	56.6	0.92	56.1	56.6	57.0	15,408
Communication capability	68.2	1.11	67.9	68.5	68.9	17,047	68.6	1.01	68.2	68.8	69.2	15,408
Variable costs ratio	4.17	1.84	2.99	4.20	5.38	18,033	4.67	1.87	3.50	4.72	5.89	15,692
Differentiation of exp. products	0.76	0.39	0.62	1.00	1	18,033	0.74	0.40	0.47	1.00	1	15,692

The table shows summary statistics for the full sample of exporting manufacturing firms in the EAE in 1996 and 2007.

Table E.2: Summary Statistics Service Type Sample (ERSI)

	mean	sd	p25	p50	p75	obs
Panel A. Variables in ERSI (2005 only)						
Service out. indicator	0.51	0.16	0.41	0.52	0.62	4,033
MA Service out. indicator	0.55	0.20	0.40	0.53	0.67	4,033
# export destinations (N)	20.9	22.2	5	13	30	4,033
Employment	370.9	1757.1	56	138	329	4,029
Skill intensity	1.51	4.99	0.29	0.49	1	3,976
Capital intensity	173.9	3476.7	25.7	53.1	102.2	4,023
Panel B. Service Characteristics (2005 only)						
Service Routiness	32.1	6.18	28.3	33.0	35.0	32
Service HHI DADS	0.038	0.081	0.0040	0.013	0.037	32
Service Elasticity	3.13	4.05	1.75	2.19	2.88	28

The table shows summary statistics for the full sample of exporting manufacturing firms in the ERSI survey in 2005. *Service out. indicator* reports the summary statistics for the firm-level average probability of outsourcing across all service types. *MA Service out. indicator* reports the statistics restricted to 'market access' services only, i.e., characterized by an above median elasticity with respect to the (log) number of export destinations.

Table E.3: Miscellaneous Robustness Exercises

	(1) Clust Ind	(2) No Frac	(3) Serv supply	(4) Lag Ctrls	(5) Extra Ctrls	(6) Non-exp	(7) No < Thr	(8) > 20 Empl	(9) Long Diff
N	0.083	0.080	0.083	0.087	0.091		0.086	0.083	0.094
	(0.014)	(0.010)	(0.010)	(0.011)	(0.012)		(0.011)	(0.011)	(0.021)
NC (ihs)						0.086			
						(0.009)			
Observations	175,564	175,568	175,524	152,255	143,390	220,082	163,647	169,029	33,286
Number of firms	25,665	25,666	25,658	23,194	21,290	32,169	24,356	24,442	13,488
R-Square	0.746	0.830	0.749	0.761	0.751	0.746	0.749	0.744	0.783
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind#Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dep#Year FE			Yes						

The dependent variable is the (log) share of purchased services in total costs, apart from column (2) where it is the (log) *expenditure* on purchased services. The main regressor N is the (log) number of export destination countries at the firm-year level. Coefficient estimates for the baseline control variables employment, skill intensity, and capital intensity (all in logs) are not shown. The full baseline sample contains all French manufacturing exporters in the EAE during 1996-2007. In column (2), we control for total costs (in logs). In column (3), we control for department interacted year fixed effects. In column (4), we lag the baseline controls by one period. In column (5), we include the export intensive margin, the number of origins, the import intensive margin, the number of imported products, and a measure of contract intensity of as additional control variables (all in logs). In column (6), we add non-exporters to the baseline sample and use the inverse hyperbolic sine transformation. In column (7), we eliminate exporters who trade volumes below the full reporting threshold (for which we do not have product-level information). In column (8), we use only firms with more than 20 employees, where the EAE is a census. In column (9), we estimate a long difference specification with 1996 and 2007. Numbers of observations differ across columns due to sample restrictions and data availability. Standard errors in parentheses are clustered at the 3 digit industry level in column (1), and at the firm level in all other exercises.

Table E.4: Controlling for Internal Service Production

	(1) Out	(2) Out	(3) Out	(4) Out	(5) Out	(6) Out	(7) Out	(8) Out	(9) Out-TotServ	(10) TotServ
N	0.302	0.277	0.302	0.277	0.295	0.300	0.305	0.305	0.209	0.092
	(0.101)	(0.109)	(0.101)	(0.109)	(0.101)	(0.101)	(0.101)	(0.101)	(0.074)	(0.056)
Num. Layers	-0.002	-0.001	-0.002	-0.001	-0.002	-0.002	-0.002	-0.002		
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)		
HQ Share (Rev)	-0.084							-0.085		
	(0.048)							(0.048)		
HQ Share (Empl)		-0.028								
		(0.054)								
PBS Share (Rev)			-0.030							
			(0.423)							
PBS Share (Empl)				-0.229						
				(0.455)						
HQ Est. (Salaries)					0.031					
					(0.085)					
HQ Est. (Empl)						-0.017				
						(0.081)				
Professional Share (CS3)							0.076	0.086		
							(0.076)	(0.076)		
Observations	163,050	150,158	163,050	150,158	163,139	163,180	163,250	163,031	163,269	163,269
Number of firms	23,925	23,287	23,925	23,287	23,925	23,930	23,934	23,921	23,938	23,938
R-Square	0.744	0.748	0.744	0.748	0.744	0.744	0.744	0.744	0.674	0.787
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
KP-Stat	248.6	259.9	247.6	259.7	249.4	249.3	247.3	249.6	246.4	246.4
IV Type	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind#Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The dependent variable is the (log) share of purchased services in total costs in columns (1)-(8), the (log) share of purchased services in total service expenditure in column (9), and the (log) share of total service expenditure in total costs in column (10). The main regressor N is the (log) number of export destination countries at the firm-year level. Controls for internal service production are the number of hierarchical layers in a company (Num. Layers); the share of the firm revenues (*HQ Share (Rev)*) or employees (*HQ Share (Empl)*) generated by establishments classified in services (often the headquarters); the share of the firm revenues (*PBS Share (Rev)*) or employees (*PBS Share (Empl)*) generated by establishments classified in business service industries; the share of the firm wage bill (*HQ Est. (Salaries)*) or employment (*HQ Est. (Empl)*) accounted for by establishments classified as headquarters by the firm itself; the share of middle management and professionals in the total firm employment Professional Share (CS3). Coefficient estimates for the control variables employment, skill intensity, and capital intensity (all in logs) are not shown. The full baseline sample contains all French manufacturing exporters in the EAE during 1996-2007. Numbers of observations differ across columns due to data availability. Standard errors in parentheses are clustered by 3 digit industry.

Table E.5: IV Robustness

	(1) Excl EU15	(2) Brics Imp	(3) China Imp	(4) Balanced	(5) NoLev1 avw	(6) Base L5	(7) No Ctrls	(8) Max	(9) Base Pos	(10) Firm trends	(11) No PBS Group	(12) No For Group	(13) NoPivServ
N	0.265	0.305	0.294	0.383	0.380		0.301	0.293	0.328	0.299	0.251	0.316	0.313
	(0.088)	(0.115)	(0.106)	(0.114)	(0.188)		(0.092)	(0.085)	(0.084)	(0.108)	(0.141)	(0.119)	(0.102)
IV (N)						0.008							
						(0.014)							
Observations	163,726	134,784	159,997	88,349	169,137	61,883	163,269	165,388	169,137	163,269	94,691	131,913	159,437
Number of firms	23,949	21,516	23,665	9,143	24,490	12,778	23,938	24,102	24,490	23,938	16,930	21,106	23,090
R-Square	0.744	0.747	0.742	0.738	0.743	0.788	0.743	0.744	0.744	0.744	0.757	0.744	0.743
Controls	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
KP-Stat	205.0	178.7	93.4	165.7	127.5		264.0	222.5	237.2	213.4	129.7	177.0	244.0
IV Type	NewEU-Imp exEU15	Brics-Imp exFRA	China-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA		NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Ind#Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm trends										Yes			

The dependent variable is the (log) share of purchased services in total costs. The main regressor N is the (log) number of export destination countries at the firm-year-level. Coefficient estimates for the baseline control variables employment, skill intensity, and capital intensity (all in logs) are not shown. The full baseline sample contains all French manufacturing exporters in the EAE during 1996-2007. In column (1), we exclude all EU 15 countries in the computation of the shock variable. In column (2), we use the baseline instrument based on the BRICS economies. In column (3), we use the baseline instrument based on China. In column (4), we restrict to firms present throughout the sample period. In column (5), we replace the initial number of destination countries, NC_{ipt_0}, by 1 for all firms in the computation of the instrument. In column (6), we regress the 5-year lagged outsourcing share on the baseline instrumental variable. Column (7) reports the results without any control variables. In column (8), we use the most successful product as a measure of exposure in the instrument. In column (9), we rely on positive shocks only for estimation, i.e., $\Delta N'_{pt} = \Delta N_{pt}$ if $\Delta N_{pt} > 0$ and $\Delta N'_{pt} = 0$ otherwise. In column (10), we use firm-level time trends. In column (11), we exclude firms that belong to business groups that include: i) firms operating in the PBS industries that produce the services considered in our analysis (correspondence available upon request); ii) firms in the industry 'Management activities of holding companies' (741J in the NAF Rev. 1 classification), i.e., the headquarters that may provide these services. In column (12), we exclude firms that belong to foreign business groups. In column (13), we exclude firms that switch to the service sector. Numbers of observations differ across columns due to data availability. Standard errors in parentheses are clustered by 3 digit industry.

Table E.6: First Stages for IV Robustness

	(1) Excl EU15	(2) Brics Imp	(3) China Imp	(4) Balanced	(5) NoLev1 avw	(7) No Ctrls	(8) Max	(9) Base Pos	(10) Firm trends	(11) No PBS Group	(12) No For Group	(13) NoPivServ
IV	0.082	0.044	0.065	0.090	0.035	0.093	0.101	0.115	0.084	0.068	0.075	0.082
	(0.006)	(0.003)	(0.007)	(0.007)	(0.003)	(0.006)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.005)
Observations	163,726	134,784	159,997	88,349	169,137	163,269	165,388	169,137	163,269	94,691	131,913	159,437
Number of firms	23,949	21,516	23,665	9,143	24,490	23,938	24,102	24,490	23,938	16,930	21,106	23,090
R-Square	0.917	0.923	0.917	0.917	0.916	0.913	0.917	0.917	0.917	0.918	0.915	0.917
Controls	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
KP-Stat	205.0	178.7	93.4	165.7	127.5	264.0	222.5	237.2	213.4	129.7	177.0	244.0
IV Type	NewEU-Imp exEU15	Brics-Imp exFRA	China-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA	NewEU-Imp exFRA
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Ind#Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm trends									Yes			

This table shows the first stage regressions for the 2SLS results in Online Appendix Table E.5 and columns are numbered in the same way, see notes therein.

Table E.7: Results for Individual Services

Service Type		Outsourcing			TFP	
Num.	Description	N	Exp. Int.	Obs.	Out	Obs.
5.1	Advertising	0.067[a]	-0.015	3882	0.034	3817
1.1	IT Consulting	0.032[a]	-0.002	3882	-0.027	3817
4.1	Translation	0.030[a]	0.015[a]	3882	0.056[b]	3817
4.9	Insurance	0.030[b]	-0.01	3882	0.04	3817
1.2	IT Maintenance	0.029[c]	0.003	3882	-0.012	3817
3.1	Transportation	0.027[a]	-0.004	3882	-0.011	3817
2.1	R&D	0.026[c]	0.005	3882	0.007	3817
4.4	Legal Services	0.024[b]	-0.011	3882	-0.006	3817
2.2	Technical studies	0.022[c]	0.002	3882	0.032	3817
3.3	Packaging	0.021[a]	0.006	3882	0.02	3817
3.5	Chartering	0.020[c]	0.014[b]	3882	0.051[c]	3817
6.6	Refuse collection	0.021	0.003	3882	-0.021	3817
4.7	Temporary work	0.019	0	3882	0.093[a]	3817
4.2	Training	0.015	-0.004	3882	0.01	3817
4.6	Recruitment	0.015	0.002	3882	0.034	3817
6.3	Cleaning	0.012	0.003	3882	0.095[a]	3817
6.8	Machinery Renting	0.011	-0.007	3882	0.006	3817
4.11	Debt recovery	0.01	-0.013	3882	-0.135[a]	3817
6.4	Security	0.009	0.005	3882	0.058[b]	3817
6.2	Buildings Maint.	0.007	0.013	3882	0.073[a]	3817
3.2	Warehousing	0.006	0.026[a]	3882	0.049	3817
4.8	Brokerage	0.006	0.005	3882	0.026	3817
6.5	Sewage	0.006	0.007	3882	0.006	3817
4.10	Leasing	0.002	-0.017[b]	3882	-0.034[c]	3817
4.5	Accounting	0.002	0.002	3882	0.007	3817
4.3	Business Consulting	0.001	-0.002	3882	-0.037	3817
5.2	After-sales Services	0	-0.006	3882	-0.003	3817
1.3	Data processing	-0.002	0.001	3882	0.013	3817
6.7	Real estate	-0.002	-0.004	3882	0.022	3817
6.1	Machinery Maint.	-0.005	-0.004	3882	0.033	3817
7.1	Catering	-0.018	0.006	3882	0.04	3817

Every row reports estimates from a separate OLS regression where the dependent variable is an indicator equal one if a firm outsources the named service in 2005, and zero if not. The regressors N and Exp. Int. are the (log) number of export destination countries and the (log) export intensive margin at the firm-year level. The last two columns report the results of separate OLS regressions where the firm's TFP is regressed on the outsourcing indicator variable for each service type. Coefficient estimates for the the control variables employment, skill intensity, and capital intensity (all in logs) are not shown. The full sample contains all exporters in the ERSI survey, a cross-section of manufacturing firms in 2005. Common sample imposed. For the regressions of outsourcing, standard errors are clustered at the downstream sampling strata by upstream service type level; for the regressions of TFP, standard errors are clustered at the 3-digit industry level. Standard errors are not shown and significance levels are displayed as: [a] $p < 0.01$, [b] $p < 0.05$, [c] $p < 0.1$.

Table E.8: Further Explorations

	(1) Out Share	(2) Out Share	(3) Out Costs	(4) Out Share	(5) Out Share	(6) Out Share	(7) Out Share	(8) Out Share
N	0.101	0.091	0.125	0.095	0.093	0.074	0.065	0.092
	(0.013)	(0.013)	(0.015)	(0.014)	(0.032)	(0.014)	(0.013)	(0.017)
N × N		-0.047	-0.071	-0.058	-0.118	-0.050		
		(0.014)	(0.020)	(0.019)	(0.053)	(0.019)		
N (Arkolakis)			0.078	-0.006				
			(0.012)	(0.012)				
N × N (Arkolakis)			0.015	0.007				
			(0.009)	(0.008)				
N (Complexity)					-0.001			
					(0.029)			
N × N (Complexity)					0.072			
					(0.052)			
NP						0.029		
						(0.011)		
N × NP						0.005		
						(0.019)		
L.N							0.025	
							(0.013)	
F.N							0.066	
							(0.014)	
Reentry × N								0.004
								(0.015)
New entry × N								0.028
								(0.014)
New & reentry × N								0.038
								(0.017)
Observations	175,544	175,544	174,786	174,786	175,544	175,544	120,495	147,444
Number of firms	25,663	25,663	25,581	25,581	25,663	25,663	19,101	22,283
R-Square	0.746	0.746	0.824	0.747	0.747	0.747	0.777	0.764
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind#Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The dependent variable is the (log) share of purchased services in total costs, apart from column (4) where it is the costs of purchased services. The main regressor N is the (log) number of export destination countries at the firm-year level. N (Arkolakis) is the (log) number of export destination countries weighted by Arkolakis's (2010) formulation of market access costs, i.e. $w(i)^{\cdot 29}L(i)^{\cdot 43}\left(1-(1-s_f(i))^{\cdot 085}\right)/.085$, where $w(i)$ is the wage at destination (proxied by GDP per capita), $L(i)$ is the population, and $s_f(i)$ is firm f's market share in total French exports to destination i. N (Complexity) is the (log) complexity-weighted number of export destination countries. NP is a firm-year's (log) number of exported products. L and F signify time lags and leads, respectively. reentry/New Entry/New&reentry is an indicator variable at the firm-year level, which indicates whether the exporter reenters markets relative to the previous period and its full history in the data/ enters markets it had not exported to in its full history in the data/ simultaneously reenters *and* enters markets for the first time (mutually exclusive categories; all irrespective of concurrent exit). Coefficient estimates for the control variables employment, skill intensity, and capital intensity (all in logs), as well as the levels of the entry indicators are not shown. Variables are standardized to compare levels more easily across different variables. All interacted variables are first de-meaned at the level of the fixed effects and then multiplied. The full baseline sample contains all French manufacturing exporters in the EAE during 1996-2007. Column (1) replicates our baseline result for this sample and for the standardized value of (log) N. reentry requires at least three years of data to be defined, so the number of observations in column (8) is lower due to dropping the initial two years for every firm and year 1996 all together (trade data available only from 1995). Standard errors in parentheses are clustered at the firm level.

Table E.9: Managerial Capability and Service Outsourcing - Interactions

	(1) Full	(2) Full	(3) Full	(4) VarCosts	(5) VarCosts	(6) VarCosts	(7) Diff	(8) Diff	(9) Diff
N	0.083	0.082	0.083	0.107	0.107	0.106	0.071	0.071	0.071
	(0.010)	(0.010)	(0.010)	(0.020)	(0.020)	(0.020)	(0.013)	(0.013)	(0.013)
Monitoring	-0.013			-0.028			-0.011		
	(0.007)			(0.013)			(0.011)		
Coordination		-0.024			-0.045			-0.006	
		(0.009)			(0.015)			(0.013)	
Communication			-0.019			-0.031			-0.000
			(0.007)			(0.012)			(0.009)
N × Monitoring	-0.016			-0.028			0.003		
	(0.017)			(0.037)			(0.026)		
N × Coordination		-0.005			-0.008			0.006	
		(0.020)			(0.045)			(0.029)	
N × Communication			0.008			0.004			-0.005
			(0.019)			(0.042)			(0.026)
Observations	175,544	175,544	175,544	85,320	85,320	85,320	85,583	85,583	85,583
Number of firms	25,661	25,661	25,661	13,662	13,662	13,662	15,868	15,868	15,868
R-Square	0.746	0.747	0.747	0.780	0.780	0.780	0.734	0.734	0.734
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind#Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The dependent variable is the (log) share of purchased services in total costs. The main regressor N is the (log) number of export destination countries at the firm-year level. Monitoring/ Coordination/ Communication is a firm-year's employment-weighted monitoring/ coordination/ communication task share based on O*NET. Coefficient estimates for the control variables employment, skill intensity, and capital intensity (all in logs) are not shown. All interacted variables are first de-meaned at the level of the fixed effects and then multiplied. The full baseline sample contains all French manufacturing exporters in the EAE during 1996-2007. Common samples imposed across columns (1)-(3), (4)-(6), and (7)-(9). The samples in columns (4)-(6) and (7)-(9) cover the firm-year observations where total export value divided by the number of export destinations is above the sample median, and if the value share of Rauch (1999)-differentiated products in a firm's export mix is above the sample median. Standard errors in parentheses are clustered at the firm level.

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