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ABSTRACT

International Trade in Services: A Portrait of Importers and Exporters*

We provide a novel set of stylized facts on firms engaging in international trade in services, using unique data on firm-level exports and imports from the world's second largest services exporter, the United Kingdom (UK). We show that only a fraction of UK firms engage in international trade in services, that trade participation varies widely across industries and that services traders are different from non-traders in terms of size, productivity and other firm characteristics. We also provide detailed evidence on the trading patterns of services exporters and importers, such as the number of markets served, the value of exports and imports per market and the share of individual markets in overall sales. We interpret these facts in the light of existing theories of international trade in services and goods. Our results demonstrate that firm-level heterogeneity is a key feature of services trade. Also, we find many similarities between services and goods trade at the firm level and conclude that existing heterogeneous firm models for goods trade will be a good starting point for explaining trade in services as well.

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1 Introduction

Trade in services has been the fastest growing component of international trade since the early 1990s, with average annual growth rates of close to 10% and total export volume of $US2,800 bn in 2006 (World Trade Organization, 2008). Over the same period, the composition of services trade has shifted dramatically in favor of high-skill intensive categories such as business services, which has provoked heated debate about the consequences of services offshoring. Given these trends and the importance to the developed economies of the service sector more generally, it is not surprising that liberalization of services trade is a key issue in past and ongoing trade negotiations.

Nevertheless, we know very little about the firms that engage in trade in services. This is in stark contrast to the research on goods trade which has produced a large set of stylized facts on exporting and, more recently, importing firms. These firms have been shown to be larger and more productive, to use more capital intensive production processes and to employ more highly skilled workforces (see Bernard and Jensen, 1995, 1999; Bernard et al., 2007, Wagner, 2007; Greenaway and Kneller, 2007). This literature also shows that the fraction of firms exporting goods tends to be low and that even among exporters, most firms only serve a few foreign markets and make the majority of their sales on the domestic market (Bernard and Jensen, 1999; Eaton, Kortum and Kramarz, 2004; Bernard, Jensen and Schott, 2007). These findings have inspired a large theoretical literature in which various attempts have been made to incorporate these stylized facts into different theoretical frameworks (e.g. Melitz, 2003; Bernard et al., 2003; Eaton, Kortum and Kramarz, 2008; Bernard, Redding and Schott, 2009).

We present, for the first time, a comparable set of stylized facts for firms engaging in trade in services, based on two unique firm-level datasets on services exports and imports in the UK from 2000 to 2005. The first of these datasets, the Annual Respondents Database (ARD), contains information on the value of firm-level services exports and imports and a range of additional variables, for a large sample representative of the population of private businesses in the UK. This allows us to distinguish between exporters and importers of services and firms not engaged in services trade, and to analyze the differences between these groups. We also combine the ARD with data from the International Trade in Services Inquiry (ITIS), which provides more detailed information on firms engaged in services trade, such as the countries with which they trade and the types of services they export or import.

We use these two sets of data and some additional sources, to paint a detailed picture of the characteristics and trade patterns of services exporters and importers in the UK. Our first objective is to advance the existing theoretical literature on services trade.[1] This literature, which is discussed below in more detail, so far has relied exclusively on frameworks based on either perfect competition or monopolistic competition and representative firms. We show that this abstraction overlooks a striking level of firm heterogeneity and makes it difficult to understand some important aspects of international trade in services. A first contribution of the

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[1] As discussed in more detail in section 3, our data mainly hold information on producer services, i.e., services used as inputs in the production of other goods and services. This is in line with most of the theoretical literature on services trade, as well as contributions to the offshoring debate, both of which focus on producer services (rather than the other two major components of services trade, travel and transportation).

present paper is to analyze this heterogeneity in more detail and to provide a set of empirical regularities which future heterogeneous firm models for services trade should be able to replicate. We do so in two main steps, loosely following the chronological development in the empirical literature on firm-level trade in goods discussed above.

The first step is to use the ARD to identify exporters and importers of services in the population of UK firms and to compare the characteristics of these services traders with those of firms not engaged in services trade. Our results are thus comparable to the results of early firm-level studies on goods trade (e.g., Bernard and Jensen, 1995, 1999). For example, we show that only a fraction of firms engage in international trade in services, and that trade participation varies widely across industries. We show also that services traders are very different from non-traders in terms of several features such as size, productivity and capital intensity. We see these facts as the starting point for the development of heterogeneous firm models for services trade, just as the findings of authors such as Bernard and Jensen inspired the development of the first generation of heterogeneous firm models for goods trade (e.g., Melitz, 2003; Bernard et al., 2003).

The second step in our analysis involves combining the ARD and ITIS data in order to move beyond export and import status and provide more detail on the trade patterns of firms engaged in services trade. We present a set of stylized facts that mirrors some recent empirical findings from firm-level studies in the goods trade literature (e.g., Eaton, Kortum and Kramarz, 2004, 2008; Bernard, Jensen and Schott, 2009). For example, we document the substantial differences across services traders in terms of the number of foreign markets served, the value of exports and imports per market, and the share of individual markets in overall sales. We show also how country-level services trade can be decomposed into extensive and intensive margins (number of traders and service types per country, and average trade per firm and service type) and how these margins correlate with traditional gravity variables such as bilateral distance. We see the evidence arising from this part of the analysis as an important input for models designed to explain the micro patterns of services trade, similar to recent theoretical contributions in the goods trade literature (e.g. Eaton, Kortum and Kramarz, 2008; Bernard, Redding and Schott, 2009).

Of course, following the pattern of the empirical literature on firm-level goods trade raises questions about how our results compare to this literature, and how useful existing heterogeneous firm models for goods trade are for explaining services trade. This is the second major contribution of this paper. As we discuss in the next section, the applicability of goods trade models to services trade is a central question in the existing theoretical literature on trade in services. There are theoretical arguments both for and against the value of these models. Empirically, we find some striking resemblances between our findings and many of the stylized facts in the goods trade literature, which suggests that existing goods trade models might be suitable for explaining firm-level services trade.

In addition to providing input for future theoretical work, we are interested in the policy implications of our findings. For example, our results contribute to our understanding of the consequences of past and future liberalization initiatives for services trade. Similar to the liberalization of goods trade, services trade liberalization is likely to lead to shifts in the market

shares of purely domestic firms and those engaged in international trade. Our finding that exporters and importers are very different from domestic firms along a large number of firm characteristics (productivity, wages, skill intensity, etc.) suggests that increases in services trade following liberalization will have important implications for aggregate productivity and demand for skills.

The rest of the paper is structured as follows. Section 2 summarizes the existing theoretical and empirical literature on services trade, discusses conceptual differences between trade in goods and services, and highlights some implications for the subsequent analysis. Section 3 describes the data sources in more detail. Section 4.1 looks at the frequency and sectoral distribution of services trade and compares the characteristics of service traders and non-traders. Section 4.2 provides an analysis of firm-level export and import patterns, concentration of trade across and within firms, and the relative importance of the extensive and intensive margins in explaining firm-level and aggregate trade. Section 5 concludes.

2   Literature Review

The dominant theme in the theoretical literature on services trade is the extent to which trade in services differs from trade in goods, and how this affects previous theoretical results for goods trade. Authors such as Hill (1977) argue that a key characteristic of most services is the joint production requirement that consumption and production must be simultaneous. As services cannot be stored, both producer and consumer need to be present, at the same time and possibly in the same location, for a service transaction to take place. Deardorff (1985) and Melvin (1989) argue that this feature invalidates, or at least requires reinterpretation of, the law of comparative advantage for trade in services.[2] Mirza and Nicoletti (2004) point out that, as a result of joint production, inputs from the exporting and the importing country are usually required to trade a service.[3]

Other authors stress the similarities between goods and services trade. For example, Hindley and Smith (1984) argue that none of the differences between services and goods trade change the *normative* implications of existing theoretical approaches. Similarly, Bhagwati, Panagariya and Srinivasan (2004) propose that the gains from trade in producer services can be understood using the same theoretical frameworks as those used for goods trade. Markusen (1989) and van Marrewijk et al. (1997) point out that most producer services are both differentiated and characterized by important scale economies, assumptions familiar from a large class of trade in

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[2] This follows from the modelling of (producer) services as inputs into the production of final goods or services in another country. E.g., Melvin (1989) discusses a Heckscher-Ohlin type setting in which the two factors of production (labor and producer services) are internationally immobile, but producer services can be provided at a distance. The final good intensive in producer services is tradable but the labor intensive final good is not. In this setting, the country abundant in producer services will export them (i.e., provide factor services at a distance) and will import the good intensive in these services in return. Comparative advantage thus needs to be defined in terms of relative autarky prices for commodities and factors. If the focus is on autarky commodity prices only, the fact that the country abundant in producer services imports the producer service intensive good is in contradiction to this narrower interpretation of the principle of comparative advantage.

[3] Mirza and Nicoletti (2004) also present empirical evidence that, consistent with their predictions, the labor costs and infrastructure supply in both the exporting and importing countries, affect bilateral trade in services. Later empirical work by Lennon, Mirza and Nicoletti (2009) shows that some - but not all - of these variables also influence goods trade in a similar way.

goods models. Indeed, Markusen uses the same monopolistic-competition type model to analyze trade in both producer services and manufactured intermediate goods. Markusen and Strand (2009) show that a theory of trade and foreign direct investment in services require only minor modifications to Markusen's (2002) knowledge-capital model.

In the last ten years empirical work on services trade, mostly based on the gravity equation framework, has also increased. These papers lack the detailed micro-level data available to the trade-in-goods literature and instead analyze country or aggregate industry-level data on services trade (e.g. Freund and Weinhold, 2002; Kimura and Lee, 2006; Head, Mayer and Ries, 2009). The results of many of these studies are similar to the contributions on goods trade. For example, Head, Mayer and Ries (2009) and Kimura and Lee (2006) estimate comparable specifications for goods and services trade and find similar elasticities of both types of trade. Head, Mayer and Ries also show that other variables typically found in gravity regressions for goods trade, such as common language or a shared colonial origin, increase both goods and services trade.[4]

This review of the literature has two broad implications for the present research. First, as already pointed out, all the existing theoretical contributions work either with perfectly competitive frameworks or representative firm models. This raises the question of whether this abstraction from firm heterogeneity is defensible. If it is not, then what are the stylized facts that heterogeneous firm models for services trade should be able to explain?

Second, there is extensive discussion in the literature of the similarities and differences in services and goods trade, but conclusions are mixed. Empirically, the more recent gravity literature on services trade shows there are some remarkable similarities between the two types of trade. In view of these results, it seems natural to extend the comparison of goods and services trade to the firm level and ask whether the existing heterogeneous firm models for trade in goods are applicable also to services trade.

In addition to these two core questions, the stylized facts proposed in this paper provide insights into several other aspects of the literature. For example, our results about the importance of intensive and extensive margin adjustment in firm- and country-level services trade (section 4.2), provide indirect evidence of differences in the nature of the barriers to trade in goods and services, which have been stressed in the policy literature on trade in services (e.g., Hoekman, 2006). Likewise, our decomposition of country-level services trade in intensive and extensive margins sheds new light on the firm-level channels through which aggregate variables, such as distance, influence international trade in services. Finally, our analysis of the characteristics of services traders (section 4.1) provides useful evidence supporting the assumptions made in some existing models, such as the high degree of skill intensity in producer services postulated by Markusen (1989).

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[4]There is also a much larger literature on the effects of offshoring of services on employment, productivity and wages, rather than observed trade patterns (e.g., Amiti and Wei, 2005). It includes three studies that use UK firm-level data similar to ours (Criscuolo and Leaver, 2005; Hijzen et al., 2006, 2007). As part of their analyses, these studies provide descriptives statistics on the characteristics of UK service traders but relying on more selective samples and small numbers of variables.

3   Definitions and Data Description

In this section we describe the firm-level data on services imports and exports and the additional variables used. We begin with a definition of what is meant by international trade in services in this paper, and then describe our main data sources and how they are combined for the purpose of our analysis. Appendix A contains additional details on the data.

3.1   What is International Trade in Services?

In this paper trade in services is defined in accordance with the residential definition in the International Monetary Fund's (IMF) Balance of Payments Manual (5th ed.), on which basis the balance of payments statistics for the UK are compiled (see IMF, 1993). Thus, international trade in services is defined as service transactions between the residents and non-residents of an economy.[5]

For example, the provision of call-centre services from India to customers in the UK is one such transaction, where the service provider is non-resident in the UK, and the consumer is resident. The same is true for the attendance of a software programmer based in France at a training course in London (UK), or a UK-based engineer working on an oil drilling project in Saudi Arabia. Although these last two examples involve no cross-border transactions, the producers and consumers remain residents of their respective countries and, thus, their inter-actions amount to services trade according to our definition. In contrast, a subsidiary of a US multinational enterprise (MNE) in the UK is foreign-owned but ordinarily resident in the UK, so its transactions with other UK firms or local consumers do not count as services trade. We note that this is different from the definition used in the General Agreement on Trade in Services (GATS) which includes local affiliate sales as part of services trade.[6]

Our main data sources, the ARD and ITIS, do not cover the entirety of the UK's international services transactions. They focus primarily on producer services, that is, services used as intermediate inputs in the production of other goods and services. Thus, our data exclude consumer services, such as travel, passenger transport and higher education. They also exclude services provided by film and television companies, and the banking sector, although they do contain information on financial services provided by non-bank institutions, such as the finance divisions of firms, or other non-bank financial institutions such as fund management companies. Overall, in 2005, the sectors and types of service covered by our data accounted for 46% of total UK service exports and 31% of imports, as reported in the UK balance of payments (Office for

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[5]There are several definitions of a 'service transaction'. In its most restrictive definition, the Manual on Statistics of International Trade in Services (European Statistical Agency (ESA), 2002, p. 7) defines the term 'services' as follows: 'Services are not separate entities over which ownership rights can be established. They cannot be traded separately from their production. Services are heterogeneous outputs produced to order and typically consist of changes in the condition of the consuming units realised by the activities of the producers at the demand of the customers. By the time their production is completed they must have been provided to the consumers'. In this paper, we follow the definition of the provider of our data, the Office for National Statistics (ONS). This definition is somewhat less restrictive and includes activities whose output can be stored on physical objects such as disks, paper, DVDs in the form of computer programs, consultancy reports, etc. (see ONS, 2007, and Appendix A.2 for a list of services types in our data.)

[6]See Appendix A.1 for details of the GATS definition of services trade and for how the residential definition used in this paper relates to the GATS definition.

National Statistics (ONS), 2007, table 3.1). However, we have information on 70% of exports and 85% of imports of the balance of payments categories that contain predominantly producer services.[7] We do not think that this focus on producer services constitutes a major limitation of our analysis. Producer services have been by far the fastest growing component of international trade in services and now account for approximately 50% of all services trade (Lipsey, 2006; World Trade Organization, 2008). They are also at the centre of the current debate on offshoring and have been the subject of most existing theoretical and empirical work on services trade, making comparison with earlier studies easier.

3.2 Data Sources

The Annual Respondents Database. Our first main data source is the Annual Respondents Database (ARD), which is based on a mandatory annual survey of UK businesses carried out by the ONS, and is the UK equivalent of the US Longitudinal Respondents Database. The ARD is based on a stratified sample of over 40,000 UK private sector companies per year, a random sample of smaller businesses and the full population of larger businesses (those with more than 100 or 250 employees depending on the year). Among other variables, the ARD contains information on employment, investment, intermediate inputs, value added, gross outputs, industry affiliation, location and foreign ownership.[8] We also include information from the Annual Foreign Direct Investment Register, on MNE status (see Criscuolo and Martin, 2009).

Our analysis is based mainly on the responses to two questions on exports and imports of services, included in the ARD since 2000. Specifically, firms are asked whether or not they export or import commercial services and, if so, what is the value of the corresponding transactions.[9] The ARD data thus allows us to identify exporters and importers of services and to compare their firm-level characteristics with those of non-traders.

The International Trade in Services Inquiry. The second main source of information is the International Trade in Services Inquiry (ITIS), also carried out by the ONS. It collects data on international transactions in services by private sector companies resident in the UK, and is the main input into the trade in services account in the UK balance of payments (ONS, 2007). The ITIS covers firms with ten or more employees. The inquiry is statutory and is conducted on a quarterly and annual basis. We combine both inquiries, which, since 2001, have sampled more than 20,000 firms per year (before 2001 this was 10,000).

In contrast to the ARD, the ITIS asks about the types of services exported or imported, and the countries of destination or origin of exports and imports. The ITIS distinguishes between 38 types of services (grouped into 10 aggregate categories) and records trade with around 220 foreign countries and territories. It thus enables more detailed analysis of the trading patterns

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[7]See tables 3.4 to 3.9 in the UK balance of payments in ONS (2007). Appendix A.2 contains a complete list of the services included in our data.

[8]A more extensive description of the ARD is provided in Criscuolo, Haskel and Martin (2003).

[9]According to the survey notes, in these and the ITIS data (described below), the values reported should include: 'all transactions with individuals, enterprises and other organizations domiciled in a country other than the UK'. This definition includes subsidiaries and parents operating abroad. This means that the reported values of imported and exported services include both inter- and intra-firm trade.

of exporters and importers of services. Appendix A.2 provides a list of the types of services, and Appendix A.3 lists the countries included in the ITIS.[10]

We note that the classification of service types is different from the classification used to assign firms to industries. That is, all firms in the ITIS and the ARD are classified into sectors in the UK's 1992 Standard Industrial Classification (UK-SIC), according to their principal activity which they report in the ARD. In the ITIS, firms are asked in addition to report the value of their exports and imports for 38 separate types of services, based on a classification derived from the Extended Balance of Payments Services Classification (EBOPS).[11] Thus, a firm classified as a manufacturer of machine tools (UK-SIC code 2940) might report exports of engineering services in the ITIS (EBOPS code 280), for example. Note that since the ITIS does not provide information about domestic sales, we cannot disaggregate them by service type.

The third Community Innovation Survey. We also draw data from the third Community Innovation Survey (CIS3), which covers the period 1998-2000, to get information on firms' exports of goods, and skill intensity, measured as the proportion of graduates in the workforce. This is the only available ONS dataset that contains direct information on these variables.[12] Similar to the ARD for services trade, CIS3 provides information on the export status of a firm and the total value of goods exported, but not the specific product exported or the export destinations. CIS3 is based on a stratified random sample of around 20,000 UK businesses in the manufacturing and services sector. The survey contains information on goods exports in 1998 and 2000, and on skills for the year 2000.

3.3 Sample Combinations and Descriptive Statistics

In the remainder of this paper we use different combinations of these three surveys. All three datasets contain common firm identifiers and thus are easily merged. We work first with ARD data to examine the characteristics of service traders on their own and compared to non-traders (Section 4.1). The results in Section 4.1 on the skill intensity of traders and comparison of services and goods exporters is based on merged data from the ARD and the CIS3 for 2000. By merging the ARD and CIS3 data for that year, we obtain a sample containing information on services exports (from the ARD), goods exports and the skill intensity of firms (from the CIS3), and other firm-level variables such as employment and productivity (from the ARD).

Analysis of the import and export patterns of active UK service traders (Section 4.2) relies on a match between the ARD and the ITIS for 2000-2005, for firms that report positive exports

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[10] The coverage of service types is identical in the ARD and the ITIS. Both contain primarily producer services and exclude the categories listed earlier (transport, travel etc.). Indeed, the inclusion of filter questions about services trade in the ARD was undertaken with the single goal of improving the sample coverage of the ITIS (see Appendix A.4 for more details). While the ITIS excludes firms with less than 10 employees, which are included in the ARD, the total value of service trade in both surveys is very similar, with a difference of less than 10% between 2000 and 2005.

[11] EBOPS is an international trade in services classification developed by the OECD and Eurostat for use by their respective member states (see ESA, 2002, p. 29ff., for additional information). The ONS uses a slightly modified classification for the ITIS, which merges some of the EBOPS' subcategories and provides more detailed information on others (see Appendix A.2).

[12] HM Revenue and Customs holds detailed data on the export and import transactions of UK firms comparable, for example, to Bernard, Jensen and Schott (2009) for the US. Unfortunately, these data are not available to researchers.

or imports of services in the ITIS. By merging these two sources, we obtain a sample containing information on firm-level exports and imports of services by service type and country of destination or origin (from the ITIS), and additional firm-level variables such as employment, turnover or productivity (from the ARD).

Table 1 presents descriptive statistics for these three samples. It shows that the samples vary substantially in size and average characteristics of firms. The ARD is by far the largest sample with some 240,000 firm-year observations. The other two samples are smaller and biased towards larger firms. These differences are due in part to the different sampling schemes used, and in part to differences in the population of interest. For example, the ARD-ITIS sample contains only active services traders whereas the ARD and ARD-CIS3 include both traders and non-traders. In order to make the samples representative of the underlying populations, we use weights based on inverse sampling probabilities for all the remaining results reported in this paper. Appendix A.4 describes the construction of these weights. The results based on unweighted data are qualitatively identical to the results presented here and are available from the authors upon request. Thus, none of the conclusions we draw below depends on the use of weights.

Table 2 provides additional details on services exports and imports using the ARD-ITIS sample.[13] For each of the ten aggregate categories of services recorded in the ITIS, we show the number of exporters and importers, the value of exports and imports, and the shares in total trade accounted for. 'Business Services' is the most important category in both exports and imports, followed by 'Royalties and Licences' and 'Telecommunication Services'.

As discussed, in the ARD-ITIS, firms are characterized by their main sectors of activity as well as by the types of services they export and import. To illustrate this, we report the two-digit sector that accounts for the majority of the exports and imports by value for each aggregate service category. 'Other Business Activities' (UK-SIC 74) is the major export and import sector for a number of aggregate services. This sector includes, for example, management consultancies, and legal, accounting and architectural firms. Other prominent sectors include 'Post and Telecommunications' (UK-SIC 64), 'Wholesale Trade' (UK-SIC 51), and 'Manufacture of Chemical Products' (UK-SIC 24), which account for the majority of exports and imports of telecommunication services, trade-related services, and research and development, respectively. Note, also, the high level of intra-industry trade in table 2. For all ten aggregate service types, the same two-digit industry accounts for the majority of both exports and imports. This is consistent with, for example, the assumption in Markusen (1989) that producer services are characterized by a significant degree of product differentiation.[14]

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[13] The total value of trade reported in the ARD-ITIS, weighted by inverse sampling probabilities, is within 5% of the exports and imports values reported in the UK balance of payments categories for which our data contain information. Therefore, the ARD-ITIS is representative of trade in these categories which, as discussed, represent around 70% of UK exports and 85% of UK imports in producer services, respectively, and around 40% of overall UK services exports and imports.

[14] In unreported results, we use the ARD-ITIS sample to identify the export and import destinations of UK services trade (applying sample weights to aggregate figures). Overall, the ranking of trading partners is fairly similar to what is observed for the UK's trade in goods, although the dominance of the USA is much more pronounced, with US exports and imports accounting for over 25% of the total service trade reported in the ARD-ITIS (compared to around 15% for goods trade). Germany, the Netherlands, Switzerland, Ireland and France follow with 5-10% of total trade each.

4   Stylized Facts on Services Traders

We next present our stylized facts on exporters and importers of services. We focus first on a comparison of services traders and non-traders (Section 4.1). We then describe the trade patterns of active services traders and the importance of the intensive and extensive margins for explaining variations in firm-level and aggregate services trade (Section 4.2). Sections 4.1 and 4.2 summarize the main issues we try to address. We then present the corresponding sets of stylized facts and conclude with a discussion of the implications for research in services and goods trade, and for economic policy.

4.1   Stylized Facts, Part I: Characteristics of Services Traders

Our first set of stylized facts focuses on some of the basic characteristics of services exporters and importers, as compared to firms not engaged in international trade in services. These facts are comparable to those provided in early studies on the differences between goods exporters and non-exporters (e.g., Bernard and Jensen, 1995, 1999), and the more recent papers that also examine import status (e.g., Bernard et al., 2007; Muûls and Pisu, 2009).

Our objective is first to show that only a few firms are engaged in services trade and that services traders and non-traders coexist within all major sectors of the UK economy. Secondly, we show that export and import status are associated with important differences in other firm-level variables such as size or productivity. As we discuss, this interaction between trade status and firm characteristics is likely to have important implications for the effects of trade on aggregate economic outcomes, and provides a strong case for integrating firm heterogeneity into models of services trade. Our stylized facts suggest also that existing heterogeneous firm models for goods trade provide a good starting point for doing so.

Frequency, Sectoral Composition and Trade Intensity.   Table 3 provides basic information on exporters and importers of services in the UK in 2005, the most recent year available in our ARD sample.[15] We present aggregate figures as well as disaggregated information for eight groups of sectors in the UK's 1992 SIC (see Appendix Table A.1 for a list of the 2-digit sectors in each group). Again, note that this classification is based on the principal activity of firms and is distinct from the classification of service types – in the ARD we observe the sector of activity of a firm and whether it imports or exports services, but not which type of service.

Table 3 shows first is that services trade is a rare activity – only 8.1% of firms engage in either exports or imports of services (panel 1). Following Muûls and Pisu (2009), we further distinguish between three subgroups of traders: firms that only export; firms that only import; and firms that import and export. Exporting services is more common than importing – 6.2% of firms export, but only 3.9% import. Only 2% of firms are involved in both activities, but this group accounts for 80% of exports and 86% of imports of services (panel 2 in Table 3). That

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[15] Strictly speaking, our unit of observation is a so-called 'reporting unit', which is the unit for which businesses report their survey data to ONS. In the vast majority of cases, a reporting unit is the same as a firm or enterprise, although an enterprise could be part of a larger enterprise group (e.g. Vauxhall Motors UK is part of General Motors Corporation). See Criscuolo, Haskel and Martin (2003) for details.

is, around 2% of UK firms account for the vast majority of UK trade in services.[16]

Second, even for the few firms that engage in international trade in services, Table 3 shows that the value of their exports and imports is small compared to their average turnover. Average 'export intensity', that is, the ratio of exports to turnover, is around 31% and 27% for only-exporters and exporters-importers, respectively (Table 3, panel 3). For imports, these ratios are even lower at 9% for only-importers and 12.5% for exporters-importers.

Third, across industries, we see that all eight groups of sectors include exporters and importers of services.[17] However, the share of traders in the total number of firms varies widely, ranging from around 2% for construction and utilities to around 20% for Mining and High-Tech Manufacturing. Note that these figures do not necessarily reflect the importance of a sector group in overall exports and imports, since groups vary substantially in size. For example, the sector group Other Services makes up around a third of imports and exports by total value although only a small fraction of these firms is engaged in trade (Table 3, panels 1 and 4). Finally, export intensity also varies widely by sector group and trading status, ranging from less than 5% to over 60% (only-exporters in mining). Import intensity also shows some variation, but is mostly below 10% and never reaches more than the 20% observed for exporters-importers in wholesale and retail.

Fact 1. Only 8.1% of UK firms export or import services. At the same time, services exporters and importers coexist with non-traders in all major sectors of the UK economy.

Finally, although services traders are only a small fraction of all firms, they account for a large share of economic activity. On aggregate, exporters and importers account for 22% of employment and 30% of overall value added (Table 3 panels 5 and 6). And again, there is wide variation across sector groups, although services traders employ more people and produce more value added per firm than non-traders in all of the major sectors analyzed here. These figures are a first indication of the substantial differences that exist between services traders and non-traders. We now turn to more detailed analysis of these so-called 'trade premia', following similar studies in the goods trade literature (e.g., Bernard et al., 2007; Muûls and Pisu, 2009).

Comparison of Service Traders and Non-Traders. We analyze differences between services traders and non-traders on the basis of descriptive regressions that distinguish among the four groups of firms: only-exporters, only-importers, importers and exporters of services, and non-traders. We regress firm characteristics against dummy variables for these four categories, using non-traders as the excluded category.[18] We first present results with year fixed effects

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[16] In unreported results we show that services trade is even more concentrated. Sorting firms by the value of their exports and imports of services, we find the top 1% of exporters (i.e., 0.06% of all firms) accounts for 74% of exports. Similarly, the top 1% of importers (0.04% of all firms) accounts for 80% of overall imports. Details available from the authors on request.

[17] Note that this is not due to the relatively high degree of aggregation of our industry classification. Exporters and importers coexist with non-traders at much higher levels of disaggregation as well (results available from the authors on request).

[18] A number of studies focus on the broader comparison between exporter, importers and non-traders (e.g., Bernard et al., 2007; Bernard, Jensen and Schott, 2009), i.e., they do not distinguish between only exporters and only importers. In this sense, our results are more comparable to Muûls and Pisu (2009) who use the same classification as employed in this paper.

only, and then with year and four-digit industry fixed effects, to isolate within-sector variation in the data. Both sets of results are qualitatively similar and we focus on the specification with industry fixed effects, discussing differences from the year fixed effects-only specification where relevant.

Table 4 shows that exporters and importers of services are larger in terms of employment, turnover and gross value added, pay higher wages, and are more capital intensive and more productive in terms of both labor productivity and total factor productivity (TFP). Service traders are also more likely to be foreign owned or to be part of a UK MNE.[19] These trade premia are particularly pronounced for firms that both export and import services. Comparing only-importers and only-exporters, the former tend to be larger in terms of employment, turnover and value added, and are more likely to be foreign owned or to be part of a UK MNE. They are also more capital intensive once we control for industry fixed effects. However, only-exporters have higher labor productivity and TFP and pay slightly higher wages.

Using the smaller ARD-CIS3 sample for the year 2000, we have information on the skill level of the workforce from CIS3 as described in section 3.2 (skills are measured as the share of university graduates in all employees). Column 10 in table 4 shows that exporters-importers and only-exporters of services employ more high skilled workers – around 10 percentage points more than non-traders. There is no statistically significant difference between services importers and non-traders in terms of skill levels.

Fact 2. Service exporters and importers are larger than non-traders in terms of employment, turnover and value added. They are also more productive, more capital intensive, pay higher wages, and are more likely to be foreign owned or to be part of a MNE.

Fact 3. Firms that export, but do not import services, are smaller, but more productive and skill-intensive than firms engaged in services imports, but not exports.

The ARD-CIS3 subsample also contains information on goods exports for the year 2000. This allows us to compare exporters of services and goods for the same set of firms. Since we have no information on imports of goods, we use a different category split – firms that export only goods, firms that export only services, firms that export both goods and services, and firms that do not export at all (the excluded category). We use descriptive regressions and present the results for with and without sectoral fixed effects in table 5. Again, both sets of results are qualitatively similar and, in the discussion below, we focus on the specification with industry fixed effects.

Not unsurprisingly, given our previous results and those in the literature on goods trade, we find that all three groups of exporters are larger than non-exporters in terms of employment, turnover and value added (columns 1-3 in table 5). They are also more capital intensive, more productive, pay higher wages, and are more likely to be part of a UK MNE or to be foreign

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[19]Unless otherwise indicated, all differences discussed in this section are statistically significant at at least the 10% level. UK MNE status, capital-labor ratios and TFP are for 2000-2004 only since we do not have sufficient data for 2005. TFP is calculated as the residual of value added production functions, estimated in deviations from 3-digit sectoral medians via ordinary least squares (OLS). We use sectoral deflators from the EU KLEMS Project.

owned (Table 4, columns 4-9).[20] We find also that size differences relative to non-exporters are particularly pronounced for firms exporting both goods and services as well as for firms exporting goods only. Firms exporting services only are larger than non-exporters but smaller than the other groups of exporters. On the other hand, differences in labor productivity and TFP among the three groups are less pronounced, and services-only exporters if anything are more productive than goods-only exporters (although not statistically significantly so). For skill intensity (Table 4, column 10) the difference is more pronounced and is statistically significant, with services-only exporters being 15-20% more skill-intensive than goods-only exporters. When we control for industry fixed effects, services-only exporters are also around 5% more skill-intensive than exporters of both goods and services.

Fact 4. Firms that export services, but not goods are smaller than only-goods exporters, but are slightly more productive and are much more skill-intensive.

Discussion. A number of insights emerge from this first set of facts. First, exporters and importers coexist with non-traders in each of the broad industries analyzed here (fact 1). This is at odds with existing services trade theories that rely on frameworks with perfect competition or representative firms. It could be argued that this is an unimportant abstraction and that existing models still provide a good explanation for aggregate or sectoral trade patterns. Heterogeneity in trade status does become important, however, once we take into account the systematic differences between traders and non-traders in terms of other firm characteristics (fact 2). For example, liberalization of services trade is likely to shift market share from purely domestic firms to those engaged in international trade, even within the same sector. Our results suggest that this could lead to aggregate productivity gains and higher demand for skills, even if differences between traders and non-traders are based purely on self-selection into export or import status. Models with homogenous firms will miss out on these intrasectoral reallocation effects. This is of course the same reasoning which has led to the development of heterogeneous firm models in the goods trade literature (see Bernard et al., 2007).[21]

Second, the co-existence of exporters, importers and non-traders within industries and the presence of size and productivity premia (facts 1 and 2) seem to be first-order features of the data, which every heterogeneous-firm model for services trade should be able to replicate. Of course, similar stylized facts have emerged for trade in goods for a large number of countries, ranging from large and relatively closed economies such as the USA (e.g., Bernard et al., 2003), to small open economies such as Belgium (Muûls and Pisu, 2009). Focusing on exports, the pioneering contributions to the heterogeneous firm literature in goods trade explain these facts through exogenous differences in productivity across firms, combined with either monopolistic competition and fixed costs of exporting (Melitz, 2003), or settings in which products are

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[20] Some of the differences between traders and non-traders are positive, but insignificant for TFP, foreign ownership and MNE status. This seems to be a consequence of the loss of efficiency resulting from applying weighted least squares, a problem often associated with the use of sample weights (see Deaton, 1997). Indeed, in an earlier version of this paper we used OLS and obtained similar point estimates, but significantly lower standard errors (results available on request).

[21] Note, that, contrary to trade in goods, possible intrasectoral reallocation effects of services trade liberalization have not been systematically analyzed. This is an important area for further research, particularly in view of the increasing number of regional trade agreements that include clauses on services trade liberalization.

provided by the supplier at the lowest cost in a given market (Bernard et al., 2003). These models would seem, therefore, to provide a good starting point for explaining the basic characteristics of services exporters.[22] Less work has been done on import behavior, but at first sight it would seem that a combination of productivity differences between firms and fixed costs of importing might also explain the differences between importers and non-traders.

Finally, while the key qualitative facts are the same, we noted a few differences between exporters of goods and services, and exporters and importers of services (facts 3 and 4). The picture that emerges is of service exporters that are relatively small (compared to other internationally engaged firms), but very productive and human-capital intensive. One explanation for this finding might be the nature of service exporting. Many firms that export services are essentially exporting the knowledge embodied in their workforce, tailored to the customer.

In our view, these differences are not sufficiently substantial to require major modifications to goods trade models. However, they do suggest that there might be important differences in specific model parameters. From a policy perspective, they also raise the possibility that intrasectoral reallocation effects from services trade liberalization might be different from those induced by goods trade liberalization, for example, with regard to changes in the demand for skilled workers.

4.2 Stylized Facts, Part II: Trade Patterns of Active Services Traders

We next analyze the trade patterns of active services traders, that is, those firms that either export or import services (or do both). We use the matched ARD-ITIS data for this second part of our analysis, retaining only firms that report either positive exports or imports in the ITIS. For these firms we have information on country-specific trade flows and types of services traded. The objective in this section is to describe and analyze firm-level trade patterns in services trade, along the lines of the contributions to the goods trade literature such as Eaton, Kortum and Kramarz (2004, 2008) and Bernard, Jensen and Schott (2009).

We show first that there are substantial differences among traders in terms of number of foreign markets served, number of service types shipped, and the value of exports and imports per market and types of service. Second, we show that trade is highly concentrated in a small number of exporters and importers. Trade is also concentrated within firms in the sense that the top destination or source country and the top service type account for over 70% of the overall trade of the average internationally active firm. Third, we decompose firm-level and aggregate trade into the extensive and intensive margins, and correlate these margins with firm-level characteristics and standard gravity equation variables such as bilateral distance.

The evidence from this analysis provides further support for the strong firm-level heterogeneity characterizing services trade, this time within the group of active services traders. It also provides an additional set of empirical regularities that any theoretical model aimed at explaining import and export patterns of services traders should be able to replicate. As discussed

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[22]One caveat is that our facts do not say anything about the origin of trade premia, i.e., whether services trade makes firms more productive or whether more productive firms self-select into export and/or import status. Based on the empirical evidence available at the time, Melitz (2003) and Bernard et al. (2003) assumed that self-selection was the key mechanism. Providing evidence that self-selection is similarly important for services trade is another important topic for future research.

in detail below, it seems that more recent heterogenous firm-models for goods trade, such as Eaton, Kortum and Kramarz (2008) or Bernard, Redding and Schott (2009), again constitute a good starting point for explaining these facts. Finally, the results for the role of the extensive and intensive margins in aggregate trade provide important insights for the firm-level processes underlying the findings from the country- and sectoral-level gravity regressions for services trade discussed in section 2.

Variation in Export Values, Number of Destinations and Service Types. We note first the strong heterogeneity in trade patterns across active services traders. Table 6a shows that the average firm exports to 5.9 out of 218 markets (column 1) and sells 1.2 types of service out of a total of 38 (Table 6a, column 2).[23] On the import side, the average number of source countries is 4.9 and the average number of types of service imported is 1.8 (table 6b).

These averages hide strong variance and skewness in the underlying distributions. This is most obvious for the values of exports and imports, both per firm and per firm-service type and firm-country (Table 6a and 6b, columns 3-5). For example, the mean of total firm exports and imports is over 20 times larger than the median, and the 99th percentile is 60,000 times larger than the 1st percentile. But high variance and skewness are also important features of the distribution of number of countries and services types across firms (Table 6b, columns 1 and 2). In fact, the median number of foreign markets is just two on both the import and export sides, while the median number of services exported and imported is one: 36% of firms only export to a single market, 51% to at most two markets and less than 0.1% serve more than 100 markets. Similarly, 42% of importers only source from a single market, 59% from at most two markets and only 0.05% of firms record more than 100 source countries. The pattern is similar for number of services exported and imported: 87% of firms export a single type of service and 63% import a single type of service, 97% export and 81% import at most two types, and only 0.1% of firms export and 0.7% of firms import more than 10 different service types.

Fact 5. There are substantial differences across active services traders in total value of exports and imports, number of countries traded with, number of services traded, and mean exports and imports per country and type of service.

Qualitatively similar results have also been reported in the goods trade literature for a number of countries (see, e.g., Eaton, Kortum and Kramarz, 2004, for France; Bernard, Jensen and Schott, 2009, for the US; Muûls and Pisu, 2009, for Belgium; Manova and Zhang, 2009, for China). These studies all find strongly right-skewed distributions for number of foreign destinations, number of products traded, and firm-level exports and imports.

Figures 1a and 1b depict these results in terms of the relationship between number of firms and number of markets they export to and import from, and number of services sold and bought. For disclosure reasons, we cannot report the number of firms exporting or importing, to or from more than 40 countries, or more than 9 types of service.

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[23] Table 6a and succeeding tables and graphs are based on firm-year observations, i.e., a firm can appear several times. For simplicity, we refer to these firm-year observations as 'firms'. Again, firm-year observations are weighted by inverse sampling probabilities (see Appendix A.4).

The relationship between number of firms and foreign markets is negative for exports and imports, and shows a tight log-linear fit in both cases, with an R^2 of over 90% in the corresponding log-log regressions. The picture is similar for number of services exported and imported. The relationship between number of services traded and number of firms is also log-linear, with an even tighter fit (a regression of log number of services on log number of firms has an R^2 of 99% for both exports and imports). Again, similar log-linear patterns have been reported in the goods trade literature, for example, by Eaton, Kortum and Kramarz (2004).

Concentration of Trading Activity Across and Within Firms. The strong heterogeneity across firms shown in tables 6a and 6b (column 3, in particular) suggests that services trade is highly concentrated among a few firms. We now examine these patterns more closely.

Tables 7 and 8 group firms according to number of countries traded with and number of service types exported or imported. Clearly, activity is concentrated in a few top traders. Firms that export services to more than 50 destinations make up less than 1% of firms in the weighted ARD-ITIS sample, but account for 9% of overall exports (table 7a). Firms importing services from more than 50 countries account for 1.4% of firms, but 19% of imports (table 7b).

A similar pattern emerges for number of service types exported and imported (tables 8a and 8b). Firms exporting 10 or more service types represent 0.1% of exporters but 2.3% of exports. Firms importing 10 or more different types of service are more numerous (0.9% of all firms) and account for 6% of imports.

Finally, tables 7a-8b show that firms that trade with many countries and in many products account also for disproportionate shares of employment and (even more so) value added. This is preliminary evidence that firm-level variables, such as size and productivity, show a strong association not only with import or export status, but also with firm-level trade patterns. We return to this point in the analysis of trade margins.

Fact 6. Services exports and imports are highly concentrated among the few firms that trade with many countries and in many services types.

Trading activities are also concentrated within firms in the sense that for most firms a large fraction of total trade is with their most important market and/or in their most important product. Tables 9a-10b provide the relevant evidence. The first column in Tables 9a(b) report the average share of exports (imports) across all firms, derived from the first most important export (import) market, the second most important export (import) market and so on. In the next to last row we report a Herfindahl index as a standard measure of concentration. The first column in tables 10a(b) displays the same statistics for the categorical variable number of services.

The average firm's exports and imports are clearly highly concentrated in its top market and top product. On average, the largest export market accounts for 72% of total exports and imports and the top source country accounts of 78% of total exports and imports. Similarly, the top export and import service types account for 97% of overall exports and 89% of overall imports, respectively.

These results are skewed by the fact that most firms export to and import from one market only, and are active in only one type of service. By construction, for these firms, the top market or type of service makes up 100% of total trade. The remaining columns in tables 9a and 9b present average export/import shares for the ten most important markets for firms exporting to or importing from exactly 1, 2, 5, 10, 25 and 40 markets (1, 2, 3, 5, 9 service types in tables 10a and 10b). Of course, the importance of the top market and type of service declines as we move towards the right hand side of these tables. However, the top export or import market is always at least twice as large as the second most important market, and accounts for at least 25% of total firm exports or imports. The second-largest market in turn is 50-100% larger than the third most important market. This pattern is even more established for types of services. The top service type accounts for at least 50% of a firm's total trade value, which is two to three times larger than the second most important type (which in turn is roughly twice as important as the third most important service). Clearly, a firm's primary market and service product is of particular importance, even for firms that are diversified geographically and in terms of product scope.

Fact 7. Services trade is concentrated within firms. The top destination or source country and the top service type account for at least 70% of the average firm's overall trade.

A substantial between-firm concentration of trade and, to a lesser extent, of employment and value added, also applies to goods trade (see, e.g., Bernard et al., 2009; Muûls and Pisu, 2009; Manova and Zhang, 2009). Within-firm concentration patterns have received less attention, but Bernard, Redding and Schott (2009) report that the top destination and top product also account for disproportionate shares of overall firm exports of goods.

Extensive and Intensive Margins of Firm-Level Trade. Our final analysis focuses on the importance of the extensive and intensive margins for explaining the variation in firm-level and aggregate trade in services, starting with firm-level trade.

First, we consider two extensive margins of firm-level trade – number of trading partners (destination and source countries) and number of services traded – and the intensive margin (trade per service, per trading partner). By definition, total firm exports and imports are the product of these three margins. Thus, we can write:

$$\log X_{it} \equiv \log N_{it} + \log S_{it} + \log \bar{x}_{it} \tag{1}$$

where X_{it} denotes total exports or imports of firm i in year t. N_{it} is the number of trading partners, S_{it} the number of different service types traded, and $\bar{x}_{it} \equiv X_{it}/(N_{it}S_{it})$ is the average value of trade per service, per trading partner.

We perform a regression decomposition of total firm trade based on (1). We regress each of the three margins of trade on total firm exports or imports (X_{it}). Since we express our dependent variables in logs, the reported OLS coefficient estimates of the margins add up to unity.

Panel A in table 11 shows that the intensive margin is the most important source of inter-firm variation for both exports and imports.[24] It accounts for over two-thirds of the total variation, with the country margin accounting for 22%-25% and the service type margin for just 3%-8%. Part of the explanation for this dominance of the intensive margin is the large fraction of firms which trade with only one foreign country and in only one service type (see tables 6a and 6b). For these firms, by definition, the contribution of the intensive margin in the between-firm variation in exports and imports is 100%.

Fact 8. Differences in exports and imports across firms are explained mainly by variations in the intensive margin, i.e., trade per country and services type.

Interestingly, the results for the exports of goods by US firms suggest a more important role of the extensive margin for explaining cross-sectional variation in firm-level exports (Bernard et al., 2009, table 4).[25]

Panel B in table 11 shows that the three margins are also correlated with firm-level attributes. We report the regressions for total firm trade as well as its three margins on firm size (proxied by employment) and productivity (proxied by value added per worker). Again, the reported OLS coefficient estimates of the margins add up to the coefficient on total trade. It can be seen that higher employment and labor productivity are associated with a higher value of firm-level exports and imports (Table 11, columns 1 and 5), exporting to and importing from more countries (columns 2 and 6), exporting and importing more types of service (columns 3 and 7), and with higher export and import values per market and service (columns 4 and 8). The largest coefficient is again the coefficient of the intensive margin, followed by the coefficient of number of trading partners; the coefficient of number of services traded is considerably smaller.

Fact 9. More productive and larger firms trade with more countries and in more types of services, and export and import more per country and service type. The intensive margin (trade per country and service type) explains most of the correlation between firm productivity and size, on the one hand, and firm-level trade flows, on the other hand.

Extensive and Intensive Margins of Country-Level Trade. We also construct total UK service exports and imports per country from the ARD-ITIS data and decompose these country-level trade flows into extensive and intensive margins. Again, we consider two extensive margins – number of firms and number of service types per country – and the intensive margin (trade per service type, per firm). Thus,

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[24]We report results with year and industry fixed effects. Results with year fixed effects only, are qualitatively similar; they are available from the authors on request.

[25]In a regression similar to (1), these authors estimate coefficients of 0.384 and 0.347 respectively, for the product and country margins. Note, however, that their product classification is much more disaggregated than ours (8,000 different products as opposed to 38 service types in our data). This will tend to understate the importance of the product extensive margin in our analysis. The editor, Jonathan Eaton, has drawn our attention to the fact that intensive margin adjustments also dominate export variations across the French manufacturing firms analyzed in Eaton, Kortum and Kramarz (2008), again because most firms export to only one foreign market.

$$\log X_{nt} \equiv \log F_{nt} + \log S_{nt} + \log \bar{x}_{nt}$$

where X_{nt} denotes the sum of exports or imports across UK firms to country n in year t, F_{nt} denotes the number of firms and S_{nt} the number of different service types traded with that country.[26] Similar to before, $\bar{x}_{nt} \equiv X_{nt}/(F_{nt}S_{nt})$ denotes the average value of trade per firm and service type.

Again, we first conduct a variance decomposition of total trade by regressing the different margins on total exports or imports. Panel A in table 12 presents the results. It can be seen that the firm extensive margin accounts for over 60% of the total variation in exports and imports across countries, and the service type margin accounts for around 30%. Differences in trade per service type and per firm explain less than 10% of the export variation and are not statistically different from zero on the import side. Thus, in contrast to the variation in firm-level trade, the intensive margin is unimportant for explaining differences in aggregate UK exports and imports across countries.

Fact 10. The variation in aggregate UK services exports and imports across countries is driven mainly by the extensive margins, i.e., number of traders and service types traded per country.

Following Bernard et al. (2007) and Mayer and Ottaviano (2007), we decompose the impact of standard gravity variables on aggregate trade into the same extensive and intensive margins as above. To enable comparability with these studies, we focus on bilateral distance and partner country gross domestic product (GDP). Columns 1 and 5 show that trade declines with distance, but increases with partner country GDP. The magnitudes of the figures are broadly similar to those in Bernard et al. (2007) and Mayer and Ottaviano (2007), and in studies on aggregate services trade (e.g., Kimura and Lee, 2006). Columns 2-4 and 6-8 in Table 12 show that the aggregate effects of distance and partner country GDP are driven mainly by the two extensive margins, and especially by the variation in number of firms across countries. The intensive margin (Table 12, columns 4 and 8) often has the opposite sign to the two extensive margins, but it is small and mostly statistically insignificant. This is in contrast to the findings in Bernard et al. (2007) and Mayer and Ottaviano (2007) of a stronger and more systematic offsetting effect of the intensive margin.[27]

Fact 11. The extensive margins explain almost all of the correlation between bilateral distance and partner country GDP, on the one hand, and aggregate trade flows, on the other hand. More distant countries and countries with higher GDP attract more UK firms and export and import a larger number of service types.

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[26] We use inverse sampling probabilities to calculate weighted sums of country-specific exports and imports across all firms reporting positive trade in the ARD-ITIS sample. We also use sample weights to calculate number of firms exporting to, or importing from, a given country. Number of service types per country is not affected by the use of weights. Again, the unweighted results are qualitatively similar and are available on request.

[27] As a robustness check, we restricted the sample to countries with a population of more than 1 million and got very similar results. We also included dummy variables for common language and colonial origins as in Mayer and Ottaviano (2007). Both variables increased trade, with the main effect working through the country-extensive margin, followed by the service-type extensive margin, while the intensive margin was again insignificant.

Discussion. The results presented in this section reinforce the impression of strong firm-level heterogeneity characterizing services trade. Even within the group of active services traders, there are vast differences among firms in terms of the trade value, number of destinations and number of services types shipped (fact 5). Similar to the links made in section 4.1, these differences can be linked to firm characteristics such as size and productivity (fact 9). Firm-level heterogeneity is also important for explaining the variation in both firm-level and aggregate trade flows (facts 8-11). For example, the fact that almost the entire cross-country variation in UK services trade can be explained by extensive margin adjustment is in stark contradiction to representative firm models in which all the variation comes from the intensive margin. Therefore, models that explicitly incorporate firm heterogeneity are not only needed to explain firm-level patterns of services trade, they also are key to understanding important aspects of aggregate trade patterns such as the adjustment channels through which trade barriers impact exports and imports.

While the stylized facts presented here at first sight seem unconnected, they point to a small set of underlying variables. Focusing first on exports, productivity differences across firms combined with fixed exporting costs are again a promising modelling device. However, models with global fixed costs for export market entry cannot explain the systematic variation in firm entry across destinations and exported products. Rather, market and service type specific fixed costs seem necessary to generate the selection patterns observed in the data. For example, the presence of such costs could explain why more productive firms export more service types, and to more markets, as well as exporting more per market and service type (fact 9). This is because they can recoup their entry costs even in smaller or more competitive markets and service types. The concentration of exports among firms selling many service types to many destinations (fact 6) follows immediately. Likewise, this reasoning explains why larger or less distant markets attract a larger number of exporters and service types (fact 11).

Market- or product-specific fixed costs are also a key element in models that try to explain the micro-patterns of goods trade which, as we have seen, are in many ways similar to the patterns described here.[28] The multi-product model in Bernard, Redding and Schott (2009) seems particularly relevant since products in their setting, can be interpreted as service types in ours. In their model, firms optimally adjust their destination and product mixes, as well as sales per destination and product, as productivity or variable trade costs change. This allows for varying patterns of extensive and intensive margin adjustments in firm-level and aggregate trade. For example, if firms increase the number of new products and markets relatively slowly compared to sales in existing product-market combinations, adjustment along the intensive margin dominates (fact 8). Likewise, if small changes in market size or accessibility trigger large changes in numbers of firms and products sold there, extensive margin adjustment will dominate aggregate trade flows (fact 10). Finally, the introduction into the model of product-market-specific demand shocks allows Bernard, Redding and Schott to account for within-firm

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[28]See Eaton, Kortum and Kramarz (2008) and Bernard, Redding and Schott (2009). These authors also introduce stochastic demand and/or cost shocks to explain other features of their data such as deviations from strict entry hierarchies of firms across markets. Introducing demand shocks also helps to explain within-firm concentration patterns, see below.

selection into primary markets and products (fact 7).[29]

As referred to in section 4.1, imports have received much less attention in the theoretical goods trade literature. However, providing a basic explanation for the import patterns in our data should be a straightforward extension of existing approaches such as Bernard, Redding and Schott's model, using similar key elements such as firm heterogeneity combined with product and market specific fixed costs for importing.

It would seem, therefore, that heterogeneous firm models for goods trade also provide a good starting point for explaining the micro-patterns of services trade. This is perhaps not surprising, given the similarities between our findings and comparable facts in the goods trade literature discussed above. However, we note a few interesting particularities of services trade patterns. For example, services traders seem to expand exports and imports mainly along the intensive margins. An opinion often found in the policy literature on trade in services (e.g., OECD, 2007) is that the costs of entering new markets and products are very high for services trade relative to the costs of expanding existing trade relationships. The importance of the intensive margin in our data provides some support for this idea.

Also, there is an absence of a strong offsetting effect of the intensive margin for explaining the impact of GDP and bilateral distance on aggregate trade. One explanation for the presence of this effect in goods trade is that the costs of exporting might depend on quantity rather than value (Bernard et al, 2007). Alternatively, closer and larger markets will allow less productive firms with lower average sales to break even when entry fixed costs are important. Both effects seem to be less pronounced for services trade, at least in our data.

Again, we think that these differences do not require major modifications to the existing models for goods trade. However, they could imply important quantitative differences in some key parameter values such as market entry or variable trade costs. This is not entirely surprising, given that the barriers to services trade can take very different forms to the barriers to goods trade. For example, trade in producer services can be impeded by differences in the policies regulating professional qualifications, restrictions on the temporary entry of foreign nationals providing services, or state monopolies in sectors such as telecommunications (see Hoekman, 2006; Markusen and Strand, 2009). Many of these barriers are subject also to discrete changes, such as deregulation and privatization, which might explain the importance of extensive margin adjustments in aggregate trade.[30]

5   Conclusions

In this paper, we provide a novel set of stylized facts on firms engaging in international trade in services, using unique firm-level data on exports and imports for the UK in the period 2000-2005. Interpreting these facts in light of the existing research on services and goods trade, a

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[29] An alternative approach would be to introduce product and market-specific fixed costs which increase as the firm enters additional products and markets. However, this would require an explanation as to why sales also vary substantially across markets/products within firms, *conditional* on firms having entered these markets/products (e.g., see column 7 in tables 9a and 9b).

[30] An interesting and open question is why the intensive margin plays such different roles in explaining the variation in firm-level and aggregate trade. E.g., what assumptions about parameter values in models such as that proposed by Bernard, Redding and Schott (2009) are needed to explain this pattern?

number of key results emerge.

First, trade in services is characterized by a strong degree of firm-level heterogeneity. This is true for both differences between services traders and non-traders (facts 1 and 2) and differences among the traders themselves (facts 5, 6, and 9, in particular). For example, we show that exporters and importers coexist with non-traders in all major sectors of the UK economy; that traders are substantially larger, more skill-intensive and more productive than non-traders; and that larger and more productive services exporters and importers trade with more foreign countries, in more service types and more per country and service.

It would seem, then, that incorporating firm heterogeneity into existing models of services trade is necessary to capture key aspects of services exports and imports. In particular, the presence of firm heterogeneity in trade status combined with other firm-level differences suggests that there might be important reallocation effects from services trade liberalization which cannot be captured in existing representative firm models. Models that explicitly incorporate firm heterogeneity should also help our understanding of the important aspects of aggregate trade patterns. For example, our analysis reveals that cross-country variation in UK exports and imports is driven almost exclusively by the extensive margins of trade, a feature absent from models with representative firms.

A second major result of this paper is that existing models for goods trade seem to be an excellent starting point for understanding trade in services. Indeed, models such as Bernard, Redding and Schott (2009) should be able (at least qualitatively) to replicate all the stylized facts presented in this paper. From a theoretical perspective, this could not necessarily be predicted given some important conceptual differences between goods and services discussed in our literature review. Empirically, however, our findings confirm the results of other studies on aggregate trade data, that goods and services trade share many common features.

Third, while the picture is broadly one of similarity, there are some interesting particularities to services trade. For example, we note that exporters of services are characterized by relatively small size (compared to both goods exporters and services importers) but also by high levels of productivity and skill-intensity. Extensive and intensive margin adjustment patterns at firm level and in aggregate trade also show interesting differences from the results in the goods trade literature. While the intensive margin dominates firm-level adjustment, aggregate trade flows are driven almost entirely by changes in the extensive margins.

Some of the differences from the existing goods trade studies are likely attributable to differences in the countries studied or the level of product aggregation. But they could also point to important quantitative differences in key parameters such as skill-intensity and variable or market entry costs. As already stressed, we do not think that these differences require major modifications to existing models of goods trade. However, they do suggest that trade liberalization in services could take very different forms to liberalization in goods trade and might have different effects on trade flows and aggregate economic activity.

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A   Data Appendix

A.1   GATS modes of supply and the residential definition of services trade

The General Agreement on Trade in Services (GATS) describes four modes through which services may be traded internationally (see European Statistical Agency (ESA), 2002, p.22ff.). It does so by considering the location of both supplier and consumer in the traded service. The first of these modes, mode 1 or *cross-border supply*, applies when a supplier of services in one country supplies services to consumers in another country without either supplier or consumer moving into the other's territory (e.g., provision of call-centre services mentioned in section 3.1). Mode 2, *consumption abroad*, describes the process by which a consumer resident in one country moves to another country to obtain a service (e.g., tourism or attendance at a training course in the example in section 3.1). Enterprises in an economy may also supply services internationally through the activities of their foreign affiliates. This mode of supply, mode 3, is called *commercial presence*. The fourth mode of supply, *presence of natural persons*, describes the process by which an individual moves to the country of the consumer in order to provide a service, whether on his or her own behalf or on behalf of an employer (e.g., the services provided by a UK-based engineer in Saudi Arabia mentioned in section 3.1).

From these definitions and the examples here and in section 3.1, it is clear that the residential definition of services trade used in this paper comprises GATS modes 1, 2, and 4. Mode 3 is not included because it involves transactions where consumer and producer are resident in the same country.

The exact link between the service transactions recorded in our data and the GATS modes is complex. In general, a given transaction may involve several GATS modes. Also, transactions in each of the service types in this paper (see Appendix A.2) can be carried out through different GATS modes. This is particularly true for producer services which apply main to our data.

For example, a consultant resident in the UK who provides services to a non-resident client may deliver the service either abroad at the client's site (mode 4) or from his or her office transmitting reports cross-border (mode 1), or through a combination of the two. Since our data contain no information on the exact form of the transaction, it is not possible to carry out our analysis by GATS mode of supply. Note that this is a general problem of data collected via the residential definition of services trade and is not limited to our data (see ESA, 2002, p. 34ff.).

A.2 List of ITIS Service Types

The ITIS inquiry asks firms to report the value of their exports and imports for 38 types of services (grouped into 10 aggregate categories), separately by country of origin or destination. The classification of service types is based on the Extended Balance of Payments Services Classification (EBOPS). Below we list service types and aggregate categories, with the corresponding EBOPS code in brackets where applicable.

- *Business Services* (274 and 278): Legal services (275), accounting and auditing (276), management consulting and public relations (277), advertising (278), market research and polling (278), property management (284), procurement (284), publishing services (284), recruitment and training (284), other business services (284), operational leasing (272).

- *Research and development* (279): Research and development (279).

- *Financial and Insurance Services* (4): Insurance premiums (253), insurance claims (253), financial services (260), auxiliary services (258).

- *Affiliated Services* (N/A): Management charges (N/A).

- *Telecommunication Services* (4): Telephone services (247), postal services (246), computer services (263), information services (264).

- *Technical Services* (280-281): Architectural services (280), engineering (280), surveying (280), agricultural services (283), mining services (283), other technical services (280), waste treatment and depollution (282), other on-site maintenance (283).

- *Construction Services* (1): Construction services (249).

- *Cultural and Health Services* (3): TV and radio related services (288), other cultural and recreational services (897), health services (896).

- *Royalties and Licences* (266): Payments/receipts for the use of intangible assets (266), payments/receipts for the outright purchase or sale of intangible assets (266).

- *Trade Related Services* (269): Merchanting (270), earnings from trading in commodities (271), any other trade in services not shown elsewhere (271, 285).

A.3 List of ITIS Countries and Territories

Aruba; Afghanistan; Angola; Anguilla; Albania; Andorra; Netherlands Antilles; United Arab Emirates; Argentina; Armenia; Antigua and Barbuda; Australia; Austria; Azerbaijan; Burundi; Belgium; Benin; Burkina Faso; Bangladesh; Bulgaria; Bahrain; Bahamas; Bosnia and Herzegovina; Belarus; Belize; Bermuda; Bolivia; Brazil; Barbados; Brunei Darussalam; Bhutan; Botswana; Central African Republic; Canada; Cocos-Keeling Island; Switzerland; Chile; China; Cote d'Ivoire; Cameroon; Democratic Republic of the Congo; Congo; Cook Islands; Colombia;

Comoros; Cape Verde; Costa Rica; Cuba; Christmas Islands; Cayman Islands; Cyprus; Czech Republic; Germany; Djibouti; Dominica; Denmark; Dominican Republic; Algeria; Ecuador; Egypt; Eritrea; Western Sahara; Spain; Estonia; Ethiopia; Finland; Fiji; Falkland Islands (Malvinas); France; Faeroe Islands; Micronesia, Federated States of; Gabon; United Kingdom; Georgia; Ghana; Gibraltar; Guinea; Guadeloupe; Gambia; Guinea-Bissau; Equatorial Guinea; Greece; Grenada; Greenland; Guatemala; French Guiana; Guyana; China, Hong Kong Special Administrative Region; Honduras; Croatia; Haiti; Hungary; Indonesia; India; Ireland; Iran (Islamic Republic of); Iraq; Iceland; Israel; Italy; Jamaica; Jordan; Japan; Kazakhstan; Kenya; Kyrgyzstan; Cambodia; Kiribati; Saint Kitts and Nevis; Republic of Korea; Kuwait; Lao People's Democratic Republic; Lebanon; Liberia; Libyan Arab Jamahiriya; Saint Lucia; Sri Lanka; Lesotho; Lithuania; Luxembourg; Latvia; China, Macao Special Administrative Region; Morocco; Moldova; Madagascar; Maldives; Mexico; Marshall Islands; The former Yugoslav Republic of Macedonia; Mali; Malta; Myanmar; Mongolia; Northern Mariana Islands; Mozambique; Mauritania; Montserrat; Martinique; Mauritius; Malawi; Malaysia; Namibia; New Caledonia; Niger; Norfolk Islands; Nigeria; Nicaragua; Niue; Netherlands; Norway; Nepal; Nauru; New Zealand; Oman; Pakistan; Palestinian Territories; Panama; Pitcairn Islands; Peru; Philippines; Palau; Papua New Guinea; Poland; Puerto Rico; Korea, Democratic People's Republic of; Portugal; Paraguay; French Polynesia; Qatar; Reunion; Romania; Russian Federation; Rwanda; Saudi Arabia; Sudan; Senegal; Singapore; Saint Helena; Solomon Islands; Sierra Leone; El Salvador; San Marino; Somalia; Saint Pierre and Miquelon; Sao Tome and Principe; Suriname; Slovakia; Slovenia; Sweden; Swaziland; Seychelles; Syrian Arab Republic; Turks and Caicos Islands; Chad; Togo; Thailand; Tajikistan; Tokelau; Turkmenistan; Timor Portugese (East Timor); Tonga; Trinidad and Tobago; Tunisia; Turkey; Tuvalu; Taiwan; United Republic of Tanzania; Uganda; Ukraine; Uruguay; United States; Uzbekistan; Saint Vincent and the Grenadines; Venezuela; British Virgin Islands; Vietnam; Vanuatu; Wallis and Futuna; Samoa; Yemen; Yugoslavia (Serbia and Montenegro); South Africa; Zambia; Zimbabwe.

A.4 Construction of sample weights

This appendix describes the construction of the sampling weights used throughout the paper. Our weights are based on ex-post sampling probabilities. That is, if the probability of inclusion of observation i in a given sample is p_i, the weight attached to observation i is $1/p_i$. The probability p_i in turn depends on the sampling design of the survey in question, which we now briefly discuss.

The ARD and the CIS3 are stratified random samples drawn from the Interdepartmental Business Register (IDBR), which is a register of the population of private businesses in the UK that are registered either for Value Added Tax (VAT) purposes or operate a Pay as You Earn (PAYE) income tax scheme (2.2 million companies in 2005, representing an estimated 99% of employment and turnover). Stratification in both the ARD and the CIS3 is by industry, region and size class, with firms with more employees having a higher probability of inclusion. For an observation i drawn from stratum s, the probability of inclusion is simply $p_i = n_{js}/n_{IDBR,s}$ where n_{js} is the number of firms present in the ARD or the CIS3 in stratum s, respectively, and $n_{IDBR,s}$ the number of firms in the IDBR in the same stratum. Calculating sampling probabilities in this way has the advantage of automatically correcting p_i for non-response of firms.

The ITIS sampling design is more complex. Its aim is to capture most of the trade in services in the UK with the exceptions of the sectors and service types discussed in section 3.1. To this end, various sampling methods are used. First, known traders, identified from the responses to the ITIS in the previous year, are selected. Firms are also selected if they give positive answers to the filter questions in the ARD, referred to in section 3.2, which identify firms that trade in services. For firms in these two groups, the inclusion probability is one since

no sampling takes place. Third, there is stratified random sampling from the IDBR in 'High Propensity Industries' – sectors with a higher likelihood of trading overseas. These include computer services, consultants industries, the production sector and wholesaling. Additional industries – known as 'mop ups' – were included after the survey was extended in 2001 to ensure full coverage of the private sector of the UK economy. For the high propensity industries and the mop-up sample, sampling probabilities are again calculated by a comparison of the number of firms in the IDBR and the ITIS.

A complication arises when we calculate the weights for the matched samples used in this paper (the ARD-CIS3 sample in section 4.1 and the ARD-ITIS sample in section 4.2). Since the ARD and the CIS3 are independently sampled from the IDBR, the probability of inclusion in the matched sample is simply $p_i(ARDCIS3) = p_i(ARD) \times p_i(CIS3)$ (see Ridder and Moffitt, 2007). The sampling probability for most observations in the matched ARD-ITIS sample is also the product of the inclusion probabilities for the ARD and the ITIS. The exceptions are observations from the ITIS that are included because of a positive response to the filter questions in the ARD. For these observations, we have $p_i(ARDITIS) = p_i(ITIS|ARD) \times p_i(ARD) = 1 \times p_i(ARD)$.[31]

The effect of weighting is to make results resemble those that would have been obtained from using the entire population of a given survey (see Deaton, 1997). This means that the results in section 4.1, which are based on the (weighted) ARD and ARD-CIS3 samples, are representative of the entire private sector of the UK economy. In contrast, the results in section 4.2, which are based on the ARD-ITIS match and only include firms with positive trade flows, are representative only of UK firms engaged in services trade. We note that this is not problematic since the aim in section 4.2 is to make statements about exactly that population.[32]

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[31] All three samples are linked via common firm-level identifiers so that bias arising from erroneous matches is unlikely (see Ridder and Moffitt, 2007, section 2). Also note that we cluster standard errors at the firm level in this paper, rather than adjusting them for sampling design. This is likely to yield conservative estimates because the samples we use are based on stratified random sampling which generally reduces standard errors compared to pure random sampling (see Deaton, 1997). We also experimented with clustering at the stratification level of our samples: the results were unaffected.

[32] Another issue is that the ITIS does not include firms with less than 10 employees, so that the ARD-ITIS sample is not representative of services traders below this threshold. However, the aggregate value of service trade reported across all firms in the ARD-ITIS is over 90% of the trade reported in the ARD alone (which also contains firms with less than ten employees).

Table 1: Comparison of Samples Used

		(1) ARD	(2) ARD-CIS	(3) ARD-ITIS
1	No. of firm-years	240446	2576	16567
2	Years	2000-2005	2000	2000-2005
3	Employment	222	301	835
4	Turnover ('000 GBP)	23269	42050	119864
5	Gross Value Added ('000 GBP)	7095	14469	39204
6	Average wages ('000 GBP)	19	21	35
7	Capital-Labour ratio	58	74	163
8	Labor productivity	29	35	56
9	TFP (logs)	0.034	0.023	0.175
10	Foreign ownership	8.0%	13.1%	37.7%
11	UK Multinational Enterprise	4.8%	11.0%	13.3%
12	% Services importers	9.7%	18.3%	77.1%
13	% Services exporters	9.7%	19.8%	66.7%

Source: Authors' calculations on the Annual Respondents Database (ARD); the Community Innovation Survey (CIS3); and the International Trade in Services Inquiry (ITIS).
Notes: Rows 3 to 9 report sample averages. All value data are in '000s of British pounds (GBP) at constant 1995 prices, using sectoral deflators from the EU KLEMS Project. 'Average wages' are defined as total labor costs divided by the number of employees. The 'Capital-Labor' ratio is defined as the value of a firm's capital stock divided by the number of employees. 'Labor productivity' is defined as gross value added per employee. 'TFP' is calculated as the residual of value added production functions, estimated in deviations from 3-digit sectoral medians via OLS. Row 10 to row 13 report shares. In row 11 information on UK MNEs come from the Annual Foreign Direct Investment (AFDI) register.

Table 2: Descriptive Statistics for Aggregate Service Types in the ARD-ITIS Sample.

Aggregate Service Type	Firms in Sample		Exports			Imports		
	Exp.	Imp.	Value £ mill.	Share (%)	Top Exp. Sector (SIC 2-digit code)	Value £ mill.	Share (%)	Top Imp. Sector (SIC 2-digit code)
Business Services	3893	6117	11901	31.0%	Other Business Activities (74)	8663	37.8%	Other Business Activities (74)
Royalties & Licenses	1986	3325	8660	22.6%	Other Business Activities (74)	5985	26.1%	Other Business Activities (74)
Telecom-munication	1521	3137	4863	12.7%	Post & Telecomm. (64)	3026	13.2%	Post & Telecomm. (64)
Technical Services	2300	2340	3811	9.9%	Other Business Activities (74)	1095	4.8%	Other Business Activities (74)
Trade Related Serv.	1390	2620	3048	8.0%	Wholesale Trade (51)	1387	6.1%	Wholesale Trade (51)
Research & Development	813	1135	2547	6.6%	Manuf. of Chemical Products (24)	848	3.7%	Manuf. of Chemical Products (24)
Affiliated Services	1476	2324	2299	6.0%	Other Business Activities (74)	1358	5.9%	Other Business Activities (74)
Cultural & Health	239	255	663	1.7%	Recreational Activ.(92)	199	0.9%	Recreational Activ.(92)
Financial & Insurance	330	1746	378	1.0%	Financial Intermediation (67)	267	1.2%	Financial Intermediation (67)
Construction Services	246	248	153	0.4%	Construction (45)	88	0.4%	Construction (45)
All	14194	23247	38321	100%		22918	100%	

Source: Authors' calculations on the matched Annual Respondents Database (ARD) and International Trade in Services Survey (ITIS), 2000-2005. Only firms reporting positive exports or imports in a given year are included.
Notes: Table shows the number of firms with positive exports or imports ('Exporters' and 'Importers'), value of exports and imports and share in total trade for each of the ten aggregate service categories reported in the first column. Also reported is the two-digit sector accounting for the majority of trade in a given aggregate service type (see Appendix Table A.1 for a full list of sectors). Trade values and shares are calculated using inverse sampling probabilities as weights (see appendix A.4). All value data are in million of British pounds at constant 1995 prices (see notes to table 1).

Table 3 – Importers and Exporters of Services in the UK (2005, aggregate, weighted)

	(1) Share of Firms				(2) Share of total trade			
					Exports		Imports	
	Notrade	EnoI	InoE	EandI	EnoI	EandI	InoE	EandI
TOTAL	**91.90%**	**4.2%**	**1.9%**	**2.0%**	**20.2%**	**79.8%**	**13.7%**	**86.4%**
Mining	77.00%	10.7%	3.8%	8.5%	36.5%	63.5%	15.1%	84.9%
Low-Medium Tech Manuf.	90.80%	3.4%	2.1%	3.7%	27.0%	73.0%	25.5%	74.5%
High-Tech Manuf.	80.30%	9.6%	4.0%	6.1%	26.5%	73.5%	20.9%	79.1%
Construction & Utilities	98.10%	0.5%	1.1%	0.3%	43.6%	56.4%	79.8%	20.2%
Wholesale & Retail	94.00%	2.3%	2.3%	1.4%	37.9%	62.1%	26.4%	73.6%
Other Services	94.80%	2.9%	1.2%	1.1%	8.0%	92.0%	11.6%	88.4%
Business Services; Computer and R&D	85.40%	8.5%	2.6%	3.5%	23.5%	76.5%	8.6%	91.4%

	(3) Trade Intensity				(4) Share of Sector in total			
	Exports		Imports		Employ-ment	Turnover	Export	Import
	(EnoI)	(IandE)	(EnoI)	(IandE)				
TOTAL	**30.7%**	**27.2%**	**9.0%**	**12.5%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Mining	63.3%	23.4%	1.4%	5.5%	0.5%	0.8%	0.5%	0.4%
Low-Medium Tech Manuf.	14.2%	16.6%	7.8%	17.3%	15.3%	8.2%	2.6%	2.8%
High-Tech Manuf.	25.0%	22.1%	6.4%	10.6%	7.7%	6.8%	9.6%	9.3%
Construction & Utilities	12.5%	7.2%	5.5%	4.7%	8.5%	6.5%	0.1%	0.4%
Wholesale & Retail	28.4%	19.1%	13.7%	20.8%	27.1%	37.6%	7.6%	7.5%
Other Services	24.0%	29.5%	10.5%	10.9%	25.8%	25.0%	31.2%	35.5%
Business Services; Computer and R&D	35.5%	31.8%	6.3%	10.3%	15.2%	15.1%	48.4%	44.1%

	(5) Employment Share				(6) Value Added Share			
	Notrade	EnoI	InoE	EandI	Notrade	EnoI	InoE	EandI
TOTAL	**77.6%**	**5.6%**	**10.1%**	**6.8%**	**70.4%**	**6.4%**	**9.8%**	**13.4%**
Mining	64.5%	8.9%	12.5%	14.1%	34.4%	3.6%	30.9%	31.2%
Low-Medium Tech Manuf.	81.3%	4.2%	8.8%	5.7%	78.1%	5.0%	9.5%	7.5%
High-Tech Manuf.	58.1%	8.6%	12.4%	21.0%	51.6%	9.2%	12.6%	26.6%
Construction & Utilities	93.4%	1.5%	3.0%	2.1%	86.6%	1.3%	5.7%	6.4%
Wholesale & Retail	83.1%	7.4%	7.1%	2.5%	81.1%	7.5%	6.8%	4.5%
Other Services	85.1%	4.1%	4.6%	6.3%	79.9%	3.2%	4.9%	12.0%
Business Services; Computer and R&D	60.5%	6.9%	22.1%	10.5%	51.0%	11.2%	17.7%	20.0%

Source: Authors' calculations on the Annual Respondents Database (ARD); 2005.
Notes: Figures reported are weighted by inverse sampling probabilities (see Appendix A.4) and refer to 2005 only. "Notrade" are firms that do not export or import services. "EnoI" are firms that export but do not import services. "InoE" are firms that import but do not export services. "EandI" are firms that both import and export services. Panels (1), (2), (5) and (6) show the numbers of firms, and the shares of trade, employment and value added for these four groups of firms, in total and by eight major sectors (see first column). Panel (3) shows the trade intensity of these groups, by major sector and in total. Export intensity is defined as the average of the ratio of firms' services export over turnover. Import intensity is defined as the average of the ratio of firms' services imports over turnover. Panel (4) shows the shares of total employment, turnover, exports and imports accounted for by the eight major sectors listed in the first column.

Table 4: Regressions of firm-level variables on trading status, services traders and non-traders (2000-2005)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Employment	Turnover	Gross Value Added	Capital Labour Ratio (2000-2004)	Wages	Labour Productivity	TFP (2000-2004)	Foreign ownership	UK MNE (2000-2004)	Fraction of highly skilled employees
Panel I: Year Fixed Effects Only										
Importer only	0.469	0.976	0.797	0.580	0.376	0.328	0.034	0.056	0.015	0.052
	(0.037)**	(0.047)**	(0.045)**	(0.051)**	(0.029)**	(0.031)**	(0.019)	(0.006)**	(0.002)**	(0.050)
Exporter only	0.004	0.320	0.497	0.637	0.478	0.493	0.100	0.019	0.006	0.175
	(0.019)	(0.030)**	(0.029)**	(0.037)**	(0.026)**	(0.023)**	(0.017)**	(0.002)**	(0.001)**	(0.043)**
Exporter-Importer	0.507	1.329	1.170	1.259	0.779	0.663	0.096	0.081	0.024	0.175
	(0.036)**	(0.054)**	(0.051)**	(0.053)**	(0.034)**	(0.035)**	(0.023)**	(0.006)**	(0.003)**	(0.041)**
R-squared	0.01	0.03	0.02	0.02	0.02	0.02	0.01	0.02	0.00	0.06
Panel II: Year and 4-Digit Industry Fixed Effects										
Importer only	0.451	0.795	0.659	0.519	0.276	0.208	0.039	0.047	0.012	-0.038
	(0.035)**	(0.043)**	(0.044)**	(0.044)**	(0.029)**	(0.030)**	(0.020)*	(0.006)**	(0.002)**	(0.037)
Exporter only	0.180	0.452	0.459	0.371	0.333	0.279	0.105	0.016	0.005	0.095
	(0.019)**	(0.029)**	(0.029)**	(0.036)**	(0.026)**	(0.022)**	(0.017)**	(0.002)**	(0.001)**	(0.036)**
Exporter-Importer	0.590	1.241	1.008	0.921	0.582	0.417	0.107	0.072	0.020	0.125
	(0.033)**	(0.050)**	(0.049)**	(0.048)**	(0.033)**	(0.033)**	(0.022)**	(0.006)**	(0.003)**	(0.034)**
R-squared	0.18	0.20	0.15	0.24	0.15	0.22	0.09	0.05	0.03	0.45
Observations	240446	240446	240446	200791	239934	240446	162580	240446	240119	2521

Source: Authors' calculations on the Annual Respondents Database (ARD) 2000-2005 and Third Community Innovation Survey (CIS3).
Notes: Table reports results for weighted least squares regressions using inverse sampling probabilities as weights (the reported number of observations refers to the unweighted count). In brackets, we report standard errors clustered at the firm-level. "Exporter only" are firms that export but do not import services. "Importer only" are firms that import but do not export services. "Exporter-Importer" are firms that both import and export services. The reference group is "Non-trader", i.e., firms that neither export nor import services. Dependent variables are in logs with the exception of Foreign Ownership, UK MNE status (binary variables) and Skills (fraction of workforce with diplomas, between 0 and 1). + significant at the 10% level. * significant at the 5% level. ** significant at the 1% level.

Table 5: Regressions of firm-level variables on trading status, services and manufacturing exporters (year 2000)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Employment	Turnover	Value Added	Capital Labour Ratio (2000-2004)	Wages	Labour Productivity	TFP (2000-2004)	Foreign ownership	UK MNE (2000-2004)	Fraction of highly skilled employees
Panel I: Year Fixed Effects Only										
Export both	0.357	0.854	0.632	0.499	0.479	0.275	0.167	0.145	0.000	0.202
	(0.106)**	(0.149)**	(0.144)**	(0.192)**	(0.102)**	(0.112)*	(0.105)	(0.059)*	(0.010)	(0.057)**
Goods Export Only	0.453	1.117	0.672	0.594	0.287	0.219	0.089	0.060	0.061	-0.001
	(0.084)**	(0.103)**	(0.085)**	(0.146)**	(0.057)**	(0.071)**	(0.056)	(0.017)**	(0.029)*	(0.018)
Services Export only	0.230	0.570	0.539	0.455	0.391	0.308	0.119	0.036	0.040	0.197
	(0.071)**	(0.108)**	(0.098)**	(0.137)**	(0.067)**	(0.077)**	(0.054)*	(0.019)+	(0.026)	(0.039)**
R-squared	0.04	0.12	0.07	0.03	0.06	0.03	0.01	0.04	0.02	0.09
Panel II: Year and 3-Digit Industry Fixed Effects										
Export both	0.355	0.938	0.641	0.660	0.460	0.286	0.184	0.118	0.014	0.095
	(0.110)**	(0.155)**	(0.150)**	(0.185)**	(0.088)**	(0.097)**	(0.069)**	(0.060)*	(0.007)*	(0.052)+
Goods Export only	0.427	0.927	0.631	0.739	0.288	0.204	0.052	0.029	0.064	-0.004
	(0.083)**	(0.107)**	(0.091)**	(0.137)**	(0.060)**	(0.070)**	(0.054)	(0.021)	(0.027)*	(0.018)
Services Export only	0.198	0.570	0.450	0.498	0.362	0.252	0.113	0.021	0.051	0.154
	(0.068)**	(0.106)**	(0.103)**	(0.118)**	(0.069)**	(0.083)**	(0.052)*	(0.020)	(0.026)+	(0.031)**
R-squared	0.22	0.33	0.25	0.26	0.26	0.29	0.37	0.14	0.41	0.41
Observations	2576	2576	2576	2555	2572	2576	2094	2576	2574	2240

Source: Authors' calculations on the Annual Respondents Database (ARD) and Third Community Innovation Survey (CIS3).
Notes: Table reports results for weighted least squares regressions using inverse sampling probabilities as weights (the reported number of observations refers to the unweighted count). In brackets, we report standard errors clustered at the firm-level. "Export both" are firms that export both manufacturing and services. "Manufacturing exports only" are firms that export goods but not services. "Services exports only" are firms that export services but do not export goods. "Export both" are firms that exports both goods and services. The reference group is "Non-trader", i.e., firms that export neither goods nor services. Dependent variables in logs with the exception of Foreign Ownership, UK MNE status (binary variables) and the fraction of highly skilled employees (fraction of workforce with diplomas, between 0 and 1). + significant at the 10% level. * significant at the 5% level. ** significant at the 1% level.

Table 6a: Export Patterns of Firms in ARD-ITIS (firms with positive exports only, 2000-2005)

	(1)	(2)	(3)	(4)	(5)	(6)
	Destinations	Services	Total Exports	Mean Firm Exports per Service	Mean Firm Exports per Destination	Mean Firm Exports per Service-Destination
Mean	5.9	1.2	4093.1	3361.3	968.6	872.5
Percentiles						
1st	1	1	0.8	0.8	0.8	0.8
25th	1	1	31.4	28.0	14.3	14.2
50th	2	1	190.4	163.1	61.7	59.5
75th	6	1	1089.9	834.5	229.0	216.1
99th	49	4	66671.4	66671.4	14037.7	13268.0
Firm-years	11048	11048	11048	11048	11048	11048

Source: Authors' calculations on the matched Annual Respondents Database (ARD) and International Trade in Services Survey (ITIS), 2000-2005.
Notes: Figures reported are weighted by inverse sampling probabilities (see Appendix A.4; the reported number of firm-years refers to the unweighted count). Columns 1-3 show means and percentiles of the number of export destinations served by firms, the number of unique service types exported and total firm exports. For columns 4-6, we first calculate means for individual firms of exports per service type, per destination country, and per service type and destination, based on observations with positive exports only. The table reports means and percentiles of these means (thus (1) * (5) need not equal (3), for example). All figures are based on firms with positive exports only.

Table 6b: Import Patterns of Firms in ARD-ITIS (firms with positive imports only, 2000-2005)

	(1)	(2)	(3)	(4)	(5)	(6)
	Destinations	Services	Total Imports	Mean Firm Imports per Service	Mean Firm Imports per Source Country	Mean Firm Imports per Service-Source Country
Mean	4.9	1.8	2930.1	2269.2	515.1	420.9
Percentiles						
1st	1	1	0.9	0.9	0.9	0.9
25th	1	1	24.3	18.3	12.7	11.8
50th	2	1	125.5	73.2	50.2	37.3
75th	5	2	600.0	343.0	217.6	176.5
99th	56	9	68505.1	68505.1	6670.4	5569.6
Firm-years	12777	12777	12777	12777	12777	12777

Source: Authors' calculations on the matched Annual Respondents Database (ARD) and International Trade in Services Survey (ITIS), 2000-2005.
Notes: Figures reported are weighted by inverse sampling probabilities (see Appendix A.4; the reported number of firm-years refers to the unweighted count). Columns 1-3 show means and percentiles of the number of countries firms import from, the number of unique service types imported and total firm imports. For columns 4-6, we first calculate means for individual firms of imports per service type, per source country, and per service type and source country, based on observations with positive imports only. The table reports means and percentiles of these means (thus (1) * (5) need not equal (3), for example). All figures are based on firms with positive imports only.

Figure 1a – Number of firms exporting to and importing from a given number of markets
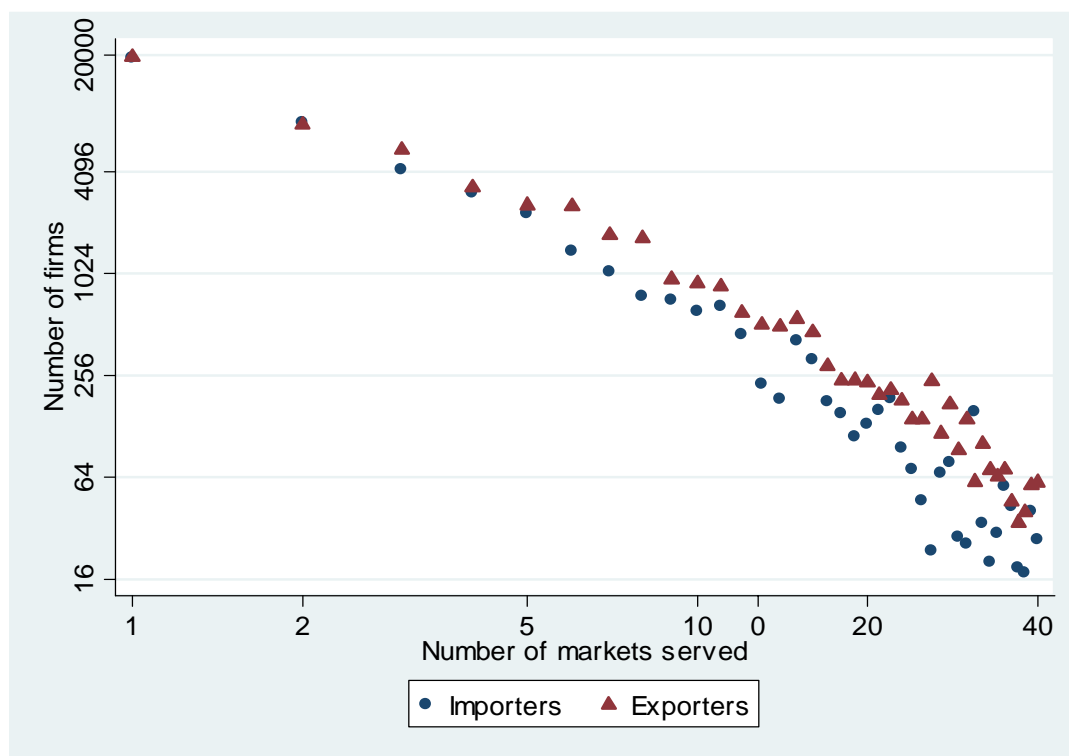
Notes: Figure shows the number of firms exporting to, or importing from, the number of markets indicated on the horizontal axis. The number of firms is a weighted count, using inverse sampling probabilities (see Appendix A.4).

Figure 1b - Number of firms exporting and importing a given number of types of services
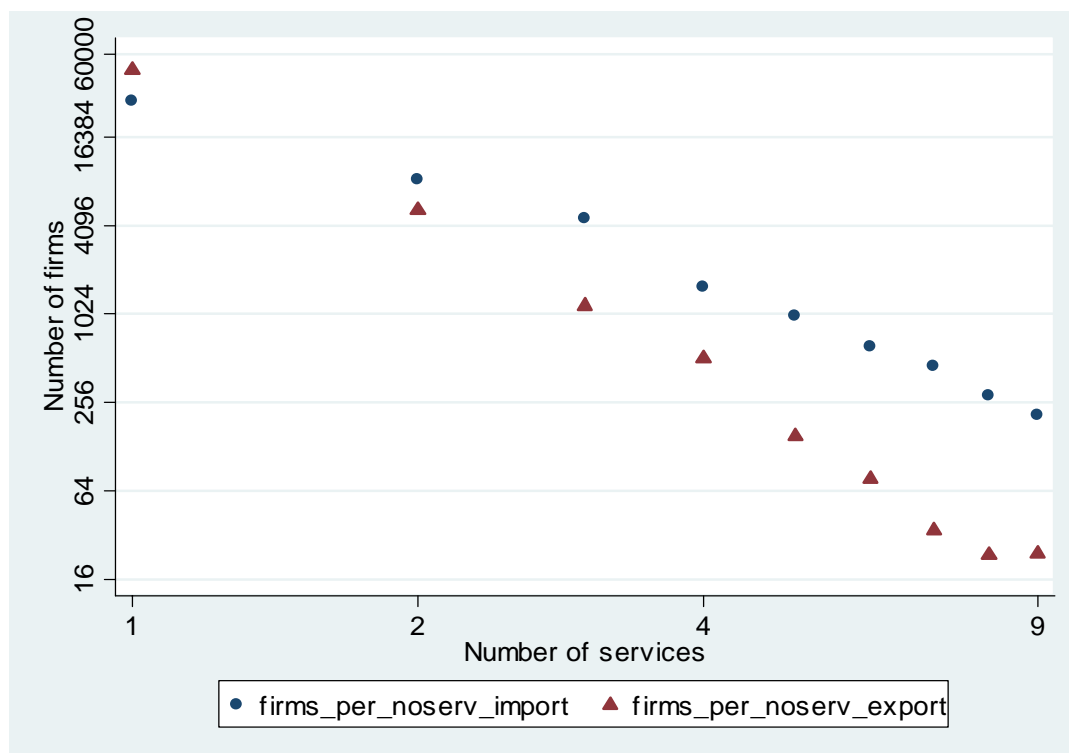
Notes: Figure shows the number of firms exporting or importing the number of service types shown on the horizontal axis. The number of firms is a weighted count, using inverse sampling probabilities (see Appendix A.4).

Table 7a (figures for 2000-2005) – Exporters (firms with positive exports only)
- concentration of activity among firms exporting to at least 1, 2, 3 etc. destinations

	(1)	(2)	(3)	(4)	(5)
Number of destinations	Number of firms	% of firms	Share of Exports (%)	Share of Employment (%)	Share of Value Added (%)
At least 1	11048	100.0%	100.0%	100.0%	100.0%
At least 2	7855	64.1%	86.0%	75.1%	85.8%
At least 3	6396	49.5%	81.6%	67.6%	80.5%
At least 5	4753	34.1%	72.1%	56.8%	71.0%
At least 10	2810	16.9%	52.2%	44.3%	59.8%
At least 31	654	3.5%	24.2%	16.5%	36.3%
>50	236	0.7%	8.9%	10.4%	25.5%

Source: Authors' calculations on the matched Annual Respondents Database (ARD) and International Trade in Services Survey (ITIS), 2000-2005.
Notes: Table shows the fraction of firms, exports, employment, and value added accounted for by firms exporting to at least 1, 2, 3, 5, 10, 31 and more than 50 destinations. Figures are based on firms with positive exports and are weighted by inverse sampling probabilities (see Appendix A.4; the number of firms reported is an unweighted count).

Table 7b (figures for 2000-2005) – Importers (firms with positive imports only)
- concentration of activity among firms importing from at least 1, 2, 3 etc. destinations

	(1)	(2)	(3)	(4)	(5)
Number of source countries	Number of firms (unweighted)	% of firms	Share of Imports	Share of Employment	Share of Value Added
At least 1	12777	100.0%	100.0%	100.0%	100.0%
At least 2	8107	58.0%	90.8%	64.9%	80.7%
At least 3	6028	41.1%	83.7%	49.9%	69.6%
At least 5	4001	25.3%	78.2%	38.9%	60.1%
At least 10	1874	12.0%	68.3%	23.0%	47.5%
At least 31	307	2.5%	28.5%	12.3%	30.8%
>50	116	1.4%	19.4%	10.2%	27.5%

Source: Authors' calculations on the matched Annual Respondents Database (ARD) and International Trade in Services Survey (ITIS), 2000-2005.
Notes: Table shows the fraction of firms, imports, employment, and value added accounted for by firms importing from at least 1, 2, 3, 5, 10, 31 and more than 50 countries. Figures are based on firms with positive imports and are weighted by inverse sampling probabilities (see Appendix A.4; the number of firms reported is an unweighted count).

Table 8a (figures for 2000-2005) – Exporters (firms with positive exports only)
- concentration of activity among firms exporting at least 1, 2, 3 etc. services

	(1)	(2)	(3)	(4)	(6)
Number of exporter services	Number of firms	% of firms	Share of Exports	Share of Employment	Share of Value Added
1+	11048	100.0%	100.0%	100.0%	100.0%
At least 2	2358	13.8%	29.6%	29.9%	27.3%
At least 3	834	3.9%	18.1%	20.9%	17.9%
At least 4	373	1.6%	11.0%	14.6%	10.9%
At least 7	76	0.3%	4.0%	7.6%	4.7%
10+	23	0.1%	2.3%	0.8%	1.8%

Source: Authors' calculations on the matched Annual Respondents Database (ARD) and International Trade in Services Survey (ITIS), 2000-2005.
Notes: Table shows the fraction of firms, exports, employment, and value added accounted for by firms exporting at least 1, 2, 3, 4, 7 and more than 10 unique service types. Figures are based on firms with positive exports only and are weighted by inverse sampling probabilities (see Appendix A.4; the number of firms reported is an unweighted count).

Table 8b (figures for 2000-2005) – Importers (firms with positive imports only)
- concentration of activity among firms importing at least 1, 2, 3 etc. services

	(1)	(2)	(3)	(4)	(6)
Number of importer services	Number of firms	% of firms	Share of Imports	Share of Employment	Share of Value Added
1+	12777	100.0%	100.0%	100.0%	100.0%
At least 2	5998	38.2%	34.5%	41.3%	43.7%
At least 3	3596	20.0%	23.8%	26.1%	29.8%
At least 4	2080	10.3%	17.9%	15.5%	22.2%
At least 7	719	3.1%	9.6%	6.5%	11.1%
10+	223	0.9%	5.5%	2.8%	6.3%

Source: Authors' calculations on the matched Annual Respondents Database (ARD) and International Trade in Services Survey (ITIS), 2000-2005.
Notes: Table shows the fraction of firms, imports, employment, and value added accounted for by firms importing at least 1, 2, 3, 4, 7 and more than 10 unique service types. Figures are based on firms with positive imports only and are weighted by inverse sampling probabilities (see Appendix A.4; the number of firms reported is an unweighted count).

Table 9a – Concentration of Firm Exports in Principal Markets (2000-2005)

Export Market Ranking	(1) Share of Market (all firms)	(2) Share of Market (Dest=1)	(3) Share of Market (Dest=2)	(4) Share of Market (Dest=5)	(5) Share of Market (Dest=10)	(6) Share of Market (Dest=25)	(7) Share of Market (Dest=40)
1	72.2%	100.0%	76.0%	55.0%	42.5%	33.9%	33.5%
2	13.8%	.	24.0%	23.7%	23.1%	14.5%	13.0%
3	5.4%	.	.	12.0%	12.0%	9.9%	8.8%
4	2.8%	.	.	6.0%	7.5%	7.2%	6.8%
5	1.6%	.	.	3.2%	5.1%	5.9%	5.2%
6	1.1%	.	.	.	3.6%	4.9%	4.0%
7	0.7%	.	.	.	2.7%	3.9%	2.9%
8	0.5%	.	.	.	1.7%	3.2%	2.3%
9	0.4%	.	.	.	1.1%	2.7%	2.2%
10	0.3%	.	.	.	0.6%	2.2%	2.0%
Herfindahl	64.9%	100.0%	67.9%	42.4%	29.9%	19.0%	17.9%
Firm-years	11048	3193	1459	542	239	62	17

Source: Authors' calculations on the matched Annual Respondents Database (ARD) and International Trade in Services Survey (ITIS), 2000-2005.
Notes: Column 1 shows the average fraction of a firm's exports accounted for by its ten most important markets. Columns 2-7 report the same figures for firms exporting to exactly 1, 2, 5, 10, 25 or 40 countries. Figures are based on firms with positive exports only and are weighted by inverse sampling probabilities (see Appendix A.4; the number of firm-years reported is an unweighted count).

Table 9b – Concentration of Firm Imports in Principal Source Countries (2000-2005)

Source Market Ranking	(1) Share of Market (all firms)	(2) Share of Market (Sources = 1)	(3) Share of Market (Sources = 2)	(4) Share of Market (Sources = 5)	(5) Share of Market (Sources = 10)	(6) Share of Market (Sources = 25)	(7) Share of Market (Sources = 40)
1	77.9%	100.0%	77.5%	59.8%	46.3%	45.0%	25.5%
2	12.2%	.	22.5%	20.6%	20.4%	13.7%	11.9%
3	4.2%	.	.	10.5%	10.8%	8.5%	8.5%
4	2.0%	.	.	5.8%	7.3%	6.3%	6.0%
5	1.1%	.	.	3.3%	5.1%	5.0%	4.7%
6	0.7%	.	.	.	3.7%	4.0%	4.2%
7	0.5%	.	.	.	2.5%	3.1%	3.7%
8	0.3%	.	.	.	1.9%	2.5%	3.2%
9	0.2%	.	.	.	1.3%	2.0%	2.8%
10	0.2%	.	.	.	0.7%	1.6%	2.7%
Herfindahl	71.5%	100.0%	69.5%	47.3%	33.0%	29.6%	13.5%
Firm-years	12778	4670	2079	641	236	28	10

Source: Authors' calculations on the matched Annual Respondents Database (ARD) and International Trade in Services Survey (ITIS), 2000-2005.
Notes: Column 1 shows the average fraction of a firm's imports accounted for by its ten most important source countries. Columns 2-7 report the same figures for firms importing from exactly 1, 2, 5, 10, 25 or 40 countries. Figures are based on firms with positive imports only and are weighted by inverse sampling probabilities (see Appendix A.4; the number of firm-years reported is an unweighted count).

Table 10a – Concentration of Firm Exports in Principal Service Type (2000-2005)

Service Ranking	(1) Share of Service (all firms)	(2) Share of Service (Serv=1)	(3) Share of Service (Serv=2)	(4) Share of Service (Serv=3)	(5) Share of Service (Serv=5)	(6) Share of Service (Serv=9)
1	96.64%	100.00%	77.31%	71.39%	62.69%	47.65%
2	2.96%	.	22.69%	21.69%	20.01%	22.15%
3	0.30%	.	.	6.92%	9.80%	13.58%
4	0.06%	.	.	.	5.40%	5.32%
5	0.02%	.	.	.	2.10%	4.14%
6	0.01%	.	.	.	.	2.31%
7	0.00%	.	.	.	.	1.91%
8	0.00%	.	.	.	.	1.67%
9	0.00%	.	.	.	.	1.28%
Herfindahl	95.5%	100.0%	69.8%	61.6%	49.2%	34.1%
Firm-years	11048	8690	1524	461	93	14

Source: Authors' calculations on the matched Annual Respondents Database (ARD) and International Trade in Services Survey (ITIS), 2000-2005.
Notes: Column 1 shows the average fraction of a firm's exports accounted for by its nine most important service types. Columns 2-6 report the same figures for firms exporting exactly 1, 2, 3, 5 or 9 unique service types. Figures are based on firms with positive exports only (see Appendix A.4; the number of firm-years reported is an unweighted count).

Table 10b – Concentration of Firm Imports in Principal Service Type (2000-2005)

Service Ranking	(1) Share of Service (all firms)	(2) Share of Service (Serv=1)	(3) Share of Service (Serv=2)	(4) Share of Service (Serv=3)	(5) Share of Service (Serv=5)	(6) Share of Service (Serv=9)
1	89.26%	100.00%	76.62%	71.20%	64.69%	61.49%
2	8.37%	.	23.38%	21.41%	21.53%	16.86%
3	1.62%	.	.	7.39%	8.23%	9.52%
4	0.45%	.	.	.	3.88%	5.58%
5	0.17%	.	.	.	1.66%	2.91%
6	0.07%	.	.	.	.	1.63%
7	0.04%	.	.	.	.	1.00%
8	0.02%	.	.	.	.	0.61%
9	0.01%	.	.	.	.	0.38%
Herfindahl	85.7%	100.0%	69.1%	60.4%	53.3%	47.6%
Firm-years	12777	6779	2402	1516	431	111

Source: Authors' calculations on the matched Annual Respondents Database (ARD) and International Trade in Services Survey (ITIS), 2000-2005.
Notes: Column 1 shows the average fraction of a firm's imports accounted for by its ten most important service types. Columns 2-6 report the same figures for firms importing exactly 1, 2, 3, 5 or 9 unique service types. Figures are based on firms with positive imports only (see Appendix A.4; the number of firm-years reported is an unweighted count).

Table 11 – Extensive and Intensive Margins of Firm-Level Trade (2000-2005)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Log(value of exp.)	Log(No. of export dest.)	Log(No. of services exported)	Log(exp. per dest/serv)	Log(value of imp.)	Log(No. of import dest.)	Log(No. of services imported)	Log(imp. per dest/serv)
Panel A								
Log(value of exp.)	1.000	0.253	0.033	0.714	1.000	0.224	0.080	0.696
	(0.000)**	(0.007)**	(0.002)**	(0.008)**	(0.000)**	(0.007)**	(0.005)**	(0.008)**
R-squared	1.00	0.32	0.06	0.76	1.00	0.28	0.10	0.69
Panel B								
Log(employment)	0.611	0.235	0.025	0.351	0.651	0.200	0.070	0.380
	(0.050)**	(0.026)**	(0.006)**	(0.045)**	(0.051)**	(0.027)**	(0.009)**	(0.037)**
Log(labour prod.)	1.278	0.338	0.027	0.912	1.019	0.304	0.041	0.674
	(0.110)**	(0.043)**	(0.009)**	(0.104)**	(0.104)**	(0.047)**	(0.018)*	(0.074)**
R-squared	0.42	0.28	0.14	0.34	0.38	0.28	0.16	0.27
Observations	11048	11048	11048	11048	12777	12777	12777	12777
Fixed effects	Year, 3-digit ind.	Year, 3-digit ind.	Year, 3-digit ind.	Year, 3-digit ind.	Year, 3-digit ind.	Year, 3-digit ind.	Year, 3-digit ind.	Year, 3-digit ind.

Source: Authors' calculations on the matched Annual Respondents Database (ARD) and International Trade in Services Survey (ITIS).
Notes: Table reports results for weighted least squares regressions using inverse sampling probabilities as weights (see Appendix 4; the reported number of observations refers to the unweighted count). See text for details of the construction of the trade margins (the dependent variables). Standard errors in brackets, clustered at the firm-level. + significant at the 10% level. * significant at the 5% level. ** significant at the 1% level.

Table 12 – Extensive and Intensive Margins of Country-Level Trade (2000-2005)

	(1) Log(value of exp.)	(2) Log(No. of exporters)	(3) Log(No. of services)	(4) Log(exp. per firm/serv)	(5) Log(value of imp.)	(6) Log(No. of importers)	(7) Log(No. of services)	(8) Log(imp. per firm/serv)
Panel A								
Log(value of exp.)	1.000	0.635	0.290	0.075	1.000	0.635	0.333	0.033
	(0.000)**	(0.015)**	(0.009)**	(0.020)**	(0.000)**	(0.016)**	(0.010)**	(0.022)
R-squared	1.00	0.83	0.76	0.15	1.00	0.79	0.73	0.03
Panel B								
Log(distance)	-0.604	-0.449	-0.157	0.002	-0.682	-0.439	-0.129	-0.115
	(0.123)**	(0.078)**	(0.038)**	(0.080)	(0.119)**	(0.075)**	(0.044)**	(0.084)
Log(GDP)	0.874	0.627	0.289	-0.042	0.848	0.640	0.347	-0.139
	(0.040)**	(0.027)**	(0.015)**	(0.031)	(0.044)**	(0.025)**	(0.016)**	(0.034)**
R-squared	0.67	0.72	0.64	0.13	0.68	0.74	0.67	0.08
Observations	1143	1143	1143	1143	1149	1149	1149	1149
Fixed effects	Year	Year	Year	Year	Year	Year	Year	Year

Source: Authors' calculations on the matched Annual Respondents Database (ARD) and International Trade in Services Survey (ITIS); country-level data are from CEPII (distances) and the World Bank (GDP).

Notes: Table reports results for OLS regressions. The independent variables are the value of aggregate exports and imports between the UK and a given foreign country (columns 1 and 5) and the three margins of trade: the number of firms per country (columns 2 and 6), the number of service types per country (columns 3 and 7) and the value of trade per firm and service types (columns 4 and 8). We use inverse sampling probabilities as weights to construct total trade and the number of firms per country. See text for details of the construction of the trade margins and Appendix A.4 for the derivation of the sample weights. Standard errors in brackets, clustered at the firm-level. + significant at the 10% level. * significant at the 5% level. ** significant at the 1% level.

Table A1 Description of industry aggregation used

2-digit	UK-SIC 2-digit description	Industry Group
10	MINING OF COAL AND LIGNITE; EXTRACTION OF PEAT	Mining
11	EXTRACTION OF CRUDE PETROLEUM AND NATURAL GAS; SERVICE ACTIVITIES INCIDENTAL TO OIL AND GAS EXTRACTION EXCLUDING SURVEYING	Mining
14	OTHER MINING AND QUARRYING	Mining
15	MANUFACTURE OF FOOD PRODUCTS AND BEVERAGES	Low-medium tech manuf
16	MANUFACTURE OF TOBACCO PRODUCTS	Low-medium tech manuf
17	MANUFACTURE OF TEXTILES	Low-medium tech manuf
18	MANUFACTURE OF WEARING APPAREL; DRESSING AND DYING OF FUR	Low-medium tech manuf
19	TANNING AND DRESSING OF LEATHER; MANUFACTURE OF LUGGAGE, HANDBAGS, SADDLERY, HARNESS AND FOOTWEAR	Low-medium tech manuf
20	MANUFACTURE OF WOOD AND OF PRODUCTS OF WOOD AND CORK, EXCEPT FURNITURE; MANUFACTURE OF ARTICLES OF STRAW AND PLAITING MATERIALS	Low-medium tech manuf
21	MANUFACTURE OF PULP, PAPER AND PAPER PRODUCTS	Low-medium tech manuf
22	PUBLISHING, PRINTING AND REPRODUCTION OF RECORDED MEDIA	Low-medium tech manuf
23	MANUFACTURE OF COKE, REFINED PETROLEUM PRODUCTS AND NUCLEAR FUEL	Low-medium tech manuf
24	MANUFACTURE OF CHEMICALS AND CHEMICAL PRODUCTS	High tech manuf
25	MANUFACTURE OF RUBBER AND PLASTIC PRODUCTS	Low-medium tech manuf
26	MANUFACTURE OF OTHER NON-METALLIC MINERAL PRODUCTS	Low-medium tech manuf
27	MANUFACTURE OF BASIC METALS	Low-medium tech manuf
28	MANUFACTURE OF FABRICATED METAL PRODUCTS, EXCEPT MACHINERY AND EQUIPMENT	Low-medium tech manuf
29	MANUFACTURE OF MACHINERY AND EQUIPMENT NOT ELSEWHERE CLASSIFIED	High tech manuf
30	MANUFACTURE OF OFFICE MACHINERY AND COMPUTERS	High tech manuf
31	MANUFACTURE OF ELECTRICAL MACHINERY AND APPARATUS NOT ELSEWHERE CLASSIFIED	High tech manuf
32	MANUFACTURE OF RADIO, TELEVISION AND COMMUNICATION EQUIPMENT AND APPARATUS	High tech manuf
33	MANUFACTURE OF MEDICAL, PRECISION AND OPTICAL INSTRUMENTS, WATCHES AND CLOCKS	High tech manuf
34	MANUFACTURE OF MOTOR VEHICLES, TRAILERS AND SEMI-TRAILERS	High tech manuf
35	MANUFACTURE OF OTHER TRANSPORT EQUIPMENT	High tech manuf
36	MANUFACTURE OF FURNITURE; MANUFACTURING NOT ELSEWHERE CLASSIFIED	Low-medium tech manuf
37	RECYCLING	Low-medium tech manuf
40	ELECTRICITY, GAS, STEAM AND HOT WATER SUPPLY	Construction & Utilities
41	COLLECTION, PURIFICATION AND DISTRIBUTION OF WATER	Construction & Utilities
45	CONSTRUCTION	Construction & Utilities
50	SALE, MAINTENANCE AND REPAIR OF MOTOR VEHICLES AND MOTORCYCLES; RETAIL SALE OF AUTOMOTIVE FUEL	Wholesale & Retail
51	WHOLESALE TRADE AND COMMISSION TRADE, EXCEPT OF MOTOR VEHICLES AND MOTORCYCLES	Wholesale & Retail
52	RETAIL TRADE, EXCEPT OF MOTOR VEHICLES AND MOTORCYCLES; REPAIR OF PERSONAL AND HOUSEHOLD GOODS	Wholesale & Retail
55	HOTELS AND RESTAURANTS	Other Services
60	LAND TRANSPORT; TRANSPORT VIA PIPELINES	Other Services
61	WATER TRANSPORT	Other Services
62	AIR TRANSPORT	Other Services
63	SUPPORTING AND AUXILIARY TRANSPORT ACTIVITIES; ACTIVITIES OF TRAVEL AGENCIES	Other Services
64	POST AND TELECOMMUNICATIONS	Other Services
66	INSURANCE AND PENSION FUNDING, EXCEPT COMPULSORY SOCIAL SECURITY	Other Services
67	ACTIVITIES AUXILIARY TO FINANCIAL INTERMEDIATION	Other Services
70	REAL ESTATE ACTIVITIES	Other Services
71	RENTING OF MACHINERY AND EQUIPMENT WITHOUT OPERATOR AND OF PERSONAL AND HOUSEHOLD GOODS	Other Services
72	COMPUTER AND RELATED ACTIVITIES	Computer
73	RESEARCH AND DEVELOPMENT	R&D
74	OTHER BUSINESS ACTIVITIES	Business Services
80	EDUCATION	Other Services
85	HEALTH AND SOCIAL WORK	Other Services
90	SEWAGE AND REFUSE DISPOSAL, SANITATION AND SIMILAR ACTIVITIES	Other Services
91	ACTIVITIES OF MEMBERSHIP ORGANISATIONS NOT ELSEWHERE CLASSIFIED	Other Services
92	RECREATIONAL, CULTURAL AND SPORTING ACTIVITIES	Other Services
93	OTHER SERVICE ACTIVITIES	Other Services