Employment, Job Turnover and Trade in Producer Services: Firm-Level Evidence*

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Abstract

We provide the first firm-level evidence of the impact of the trade in producer services ("offshoring") on the labour market. Using a new dataset which measures trade in services at the firm-level, we find no evidence that importing intermediate services is associated with job losses or greater worker turnover. Using regression and propensity score matching techniques, we show that firms which start importing intermediate services experience faster employment growth than equivalent firms which do not.

Keywords: Offshoring, Exporting, Services, Employment, Job turnover

JEL Codes: F16, F2, J23, J63

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1 Introduction

The fear that offshoring may destroy large numbers of jobs in developed economies is widespread in the public mind.[1] Blinder (2006) and others have suggested that this fear arises because firms are now able to trade not just physical inputs, but also service inputs which were previously regarded as non-tradeable. Many of these services, such as research and development, customer services or IT support are also skill-intensive, suggesting that offshoring may affect workers previously regarded as insulated from international competition.

However, despite the strong policy interest, our academic understanding of trade in services is very limited, especially compared to the theoretical and empirical advances which have been made in relation to the trade in goods. This is at least partly due to the paucity of detailed and high quality data on trade in services.[2] Amiti and Wei (2005*b*, 2006) and Crinó (2008) provide the only previous studies to have explicitly looked at the role of service offshoring for employment, but they use industry-level measures of offshoring.

In this paper we provide the first firm-level evidence of the impact of the trade in producer services ("offshoring") on the labour market. To do this we use a unique dataset for the UK which records imports and exports of services at the firm-level. It also contains information on the *type* of services transacted as well as their value. This reflects the notion that traded services typically act as inputs to commercial activities rather than simply as consumables. The data therefore allow us to document the international fragmentation of production activities into components that can be produced in different countries, and to analyze its consequences for jobs.

[1] A frequently cited example is Lou Dobbs: "The shipment of American jobs to cheap foreign labor markets threatens not only millions of workers and their families, but also the American way of life ... for the first time in history, corporations are laying off Americans from well-paying jobs and replacing them with low-paid foreign workers. A recent study revealed that 14 million American jobs are now at risk of being outsourced overseas." (Dobbs 2004)

[2] See the discussion in Sturgeon (2006).

Since the work of Davis and Haltiwanger (1992), it has been widely recognised that measuring net employment change is not sufficient to determine the impact of a shock (such as increased international trade) on the labour market. This is because such shocks might entail a massive reallocation of jobs within and across firms while leaving employment levels relatively unchanged. We therefore link the trade in services data to a comprehensive database of UK firms which allows us to measure each firm's employment, job creation and job destruction. We analyse how these measures of employment and job turnover vary across firms according to their use of service offshoring.

Our results show, contrary to popular perception, that firms which start service offshoring do not reduce the size of their domestic workforce relative to observably identical firms which do not start offshoring. Offshoring firms actually have significantly faster employment growth in some specifications. However, if we also control for sales growth over the period then firms which start offshoring have identical employment growth to those which do not.

We begin in Section 2 by clarifying exactly what we mean by "offshoring" and considering what theory tells us about the possible effects of increased trade in services on labour markets. We also discuss previous empirical estimates which relate to our work. The data are described in Section 3 and some descriptive evidence is given in Section 4. Our main econometric evidence is presented in Section 5 and Section 6 concludes.

2 Background

Following the typology of organization modes proposed by UNCTAD (2004), we use the term *service offshoring* to refer to the importing of producer services. The typology distinguishes four different organizational forms based on two dimensions: (1) location and (2) internalization, or ownership. A domestically integrated firm conducts all production activities in a single country and does not make use of any independent suppliers of

producer services: all service activities are conducted in-house.

A firm is considered to engage in domestic outsourcing when all activities are performed in a single country, but some activities are purchased from an independent domestic supplier. A firm that makes uses of activities that are produced in different countries is said to engage in offshoring. In the terminology of Feenstra and Hanson (1996) this might be called "trade in [service] intermediates", or in the terminology of Grossman and Rossi-Hansberg (2008) as "trade in tasks". Offshoring can be organized at arm's length, in which case one may refer to this as international outsourcing or offshore outsourcing, or alternatively, it may be conducted in-house, resulting in intra-firm trade associated with vertical FDI.[3]

Most theoretical contributions that have analyzed the labour market effects of offshoring have adopted a general equilibrium approach and have concentrated on wage effects rather than employment effects.[4] In general, these studies conclude that almost anything can happen to wages depending on the configuration of sectoral factor-intensities, the relative factor-intensity of components relocated abroad and relative factor endowments.

In order to analyze the implications of offshoring for workers at the firm level, it may be more appropriate to focus on employment in partial equilibrium. Absent scale effects, offshoring should lead to labour productivity gains and a reduction in employment in the offshoring firm, *ceteris paribus*. However, the cost-saving and productivity gains associated with offshoring may induce an expansion in production and therefore employment. The total effect of offshoring on employment is therefore an empirical matter.

There is very little evidence at present on the effects of service offshoring on labour market outcomes, and almost none which uses data at the firm level. In fact, Heckley (2005) notes that "There are currently no data series on how many firms are offshoring sections of their

[3]See Antras (2003) and Antras and Helpmann (2004) for a theoretical analysis of these different organizational forms.

[4]See, for example, Jones and Kierzkowski (1990, 2000) Arndt (1997) and more recently Markusen (2005). Some exceptions which have considered the unemployment effects of offshoring include Davidson, Matusz and Shevchenko (2008) and Mitra and Ranjan (2009).

business or how many are selling offshoring services to foreign firms. Neither are there any data on the effect of offshoring on the labour market, showing how many jobs are lost due to firms moving sections abroad or even how many are created due to offshoring." There is, however, a substantial literature which is relevant to offshoring more generally.

Perhaps the most direct approach is that taken by Brown and Spletzer (2005), which describes the US Bureau of Labor Statistics (BLS) Mass Layoff Statistics Program. The BLS identifies "mass-layoff" firms as those which laid off at least 50 workers for more than 30 days. These firms are subsequently interviewed and asked whether the layoff involved (a) moving work to another location within the same firm, or (b) moving work to another firm. In each case firms were asked for the geographic area to which the work was moved. Brown and Spletzer find that combined outsourcing or offshoring events contributed only about 11% of all mass layoffs. Of these, the majority were within the company and within the country (55%). Only 29% were offshored within the company (vertical FDI), and only 6% were offshored to separate companies (offshore outsourcing). This suggests that less than 1% of mass-layoffs can be attributed to the movement of work overseas to separate companies. Using a small sample of firms which did experience movement of work overseas, Brown and Spletzer (Figure 5) find that employment declines by on average 10% in the year after the event, but average wages increase by over 25%. This suggests that those jobs which are offshored tend to have lower than average wages.

A second approach is to use data on the activities of multinational companies at home and abroad to assess the relationship between vertical FDI and domestic employment. For example, both Hanson, Mataloni and Slaughter (2003) and Harrisson and McMillan (2006) show that employment in US multinationals' affiliates in high-income countries is complementary to employment in parent companies, but affiliate employment in low-income countries substitutes for parent company employment. For the UK, Simpson (2007) shows that investment by multinationals in relatively low-wage economies is associated with plant closures in relatively low-skill sectors in the UK, but no such relationship exists

either for investment in high-wage economies or for plants in high-skill sectors in the UK.

A third strand of the literature, associated with the work of Feenstra and Hanson (for a summary see Feenstra and Hanson 2001), measures trade in intermediate inputs and its relationship to labour market outcomes. Although the recent debate on offshoring has been focused on trade in services,[5] trade in physical intermediate inputs may equally well have effects on the domestic labour market. Feenstra and Hanson have shown that trade in intermediate inputs has grown even faster than trade in final goods, and that this fragmentation of production is associated with increasing demand for skilled workers at the industry level.

The labour market impacts of trade in intermediate inputs have also been investigated by Egger, Pfaffermayr and Weber (2003) and Munch (2005) using worker-level data. This permits an analysis of worker flows as well as job flows. Using data for Austria, Egger *et al.* (2003) find that increases in the share of outsourcing in total trade negatively affects the probability of staying in or entering the manufacturing sector. Using Danish data, Munch (2005) finds that outsourcing has a positive and significant impact on the probability of separating from a job, but that this effect is quantitatively small.

Most work on outsourcing and labour demand uses industry level data. A fourth strand of the literature uses firm-level data on trade which permits a more focused analysis of employment effects. These papers also consider the role of exports as well as imports on labour market outcomes. Bernard, Jensen and Schott (2005) provide a descriptive analysis of US firm-level data on international trade in goods. They show that firms that trade goods internationally have higher rates of survival, and higher rates of employment growth. Employment growth at firms that start trading goods internationally is particularly large. For example, firms that start exporting between 1993 and 2000 experience a 94% growth in employment, on average. Perhaps more surprisingly, firms that start importing experience

[5] Bhagwati, Panagariya and Srinivasan (2004) argue that offshoring is "properly defined as the offshore trade in arm's length services" (Bhagwati *et al.* 2004, p.94). Thus, the trade of intermediate manufactured components is excluded.

an almost equally large increase in employment. In contrast, firms which remained non-traders grew by only 27%.

Biscourp and Kramarz (2007) describe the relationship between French firms' imports and exports of goods and their employment over the period 1986–1992. Over this period total employment in French manufacturing declined substantially, and perhaps because of this their results are strikingly different from those of Bernard *et al.*. Firms which started to import experienced *slower* employment growth than firms which never import, while firms which increase the ratio of imports to sales actually experienced substantial employment falls. They also find a strong correlation between firms' imports of *final goods* (i.e. goods in the same industrial classification as the firm's own production) and job destruction, and especially destruction of production jobs. In contrast, firms which export goods tend to have higher employment growth.

Finally, Amiti and Wei (2005*a*, 2005*b*) and Crinó (2008) provide the only other evidence on the direct relationship between trade in services and employment. Amiti and Wei use industry-level measures of service outsourcing in a labour demand model, and find little evidence that sectors with higher rates of growth in service outsourcing have slower rates of job growth either in the US or the UK. Crinó estimates the relationship between occupational employment and the share of imported services at the industry level, and finds some evidence that offshoring penalises tradeable occupations.

3 The data

3.1 The Inquiry into International Trade in Services

ITIS provides information on individual transactions in services between the United Kingdom and the rest of the world, for use in the compilation of the UK Balance of Payments. Consequently, the ITIS is consistent with the recommendations made in the IMF Bal-

ance of Payments Manual (BPM5 IMF 1993) which relate to, amongst other things, the definition, valuation and classification of trade in services.[6]

A particularly interesting feature of ITIS is that transactions are not recorded on the basis of the industry of the importing or exporting firm but on the type of service transacted. This reflects the notion that traded services typically act as inputs to commercial activities rather than simply as consumables, and contrasts with firm-level datasets that include information on trade in goods at the firm-level, which typically assume that products traded correspond to the main industry in which the trading firm is active. With the emergence of increasingly complex business structures and the rising importance of trade in intermediate inputs, this assumption becomes increasingly problematic.

The survey covers 39 different types of services, summarised in Table 1.[7] ITIS excludes: travel and transport (covered by the International Passenger Inquiry); some banking, financial and legal services; higher education (covered by Higher Education Statistics Agency); and film and television companies. In addition to the type of service traded, the data also provide information on the origin of imports and the destination of exports.

[Table 1 here.]

ITIS was first collected in 1996, and response to the survey by firms is statutory (Office for National Statistics 2003). It consists of two non-overlapping surveys: the Annual International Trade in Services survey (AITIS) and the Quarterly International Trade in Services survey (QITIS). Both are directly sampled from the Inter-Departmental Business Register (IDBR), a live register of UK businesses (Office for National Statistics 2001). The sampling methodology consists of three parts. First, so-called "known traders"[8] are

[6] Breinlich and Criscuolo (2010) use the same data to provide a general portrait of international trade in services.

[7] From 2004 onwards the number of different service types increased to 51, and some services were reclassified. Table 1 also shows the correspondence between codes over time.

[8] Those firms with more than £500,000 of trade in the previous survey.

selected from the responses of previous years. Second, filter questions in the Annual Respondent's Database (see below) are used from 2000 onward to identify traders by asking firms to indicate whether they imported services or/and exported services. All positive responses not already in ITIS are added.[9] Finally, stratified random sampling is applied to 'high propensity' industries in the IDBR, based on employment-defined strata with sampling fractions decreasing in direct proportion to employment (Office for National Statistics 2003).

As with other surveys conducted by the ONS, the survey is sent out to 'reporting units'. In the vast majority of cases a reporting unit is equivalent to a business or enterprise, but large enterprises may have several reporting units. ITIS does not include information on reporting units with less than 10 employees. In 2003 the response rate was 90% for QITIS and 85% for AITIS.

3.2 The Annual Respondent's Database (ARD)

In order to analyse the impact of services trade on employment and job turnover we link the ITIS to the Annual Respondent's Database (ARD). This is an annual survey of UK businesses which, since 1994, is also sampled from the IDBR. The 'selected sample' of the ARD is a census of all large businesses employing 250 or more, and a sample of smaller businesses. The 'non-selected sample' comprises those businesses in the sampling frame which were not selected for the survey. For firms in the selected sample the ARD provides a rich set of variables, while for non-selected firms the information available is limited to employment, industry and region (see Jones (2000) for a more detailed description). The linking process between the ARD and ITIS is relatively straightforward because both datasets include a unique identifying code that refers to the reporting unit and both sources are directly sampled from the IDBR.

[9] The sample size effectively doubled in 2001.

Table 3 lists the number of reporting units which underlie the analysis. The ITIS survey comprises about 10,000 reporting units (essentially firms) up to 2000, and was subsequently expanded to about 20,000 from 2001 onward. About one-third of all firms in the ITIS report that they either import or export services, while about 15% of firms import and export.

[Table 3 here.]

To ensure that our results are representative of all firms which import and export services, we created *ex-post* sampling weights for each firm in the sample. We did this by comparing the number of firms in ITIS in each employment-industry cell with the total number of firms in that cell in the ARD. In addition, firms which entered the ITIS via the filter questions in the selected sample of the ARD, and known traders were assigned a sampling weight of one. The resulting estimated total trade in services from the weighted data is within 5% of published totals.[10]

4 Trade in services by UK firms

We start by considering some basic aggregate patterns in service trade by UK firms. We do so because firm-level information on imports and exports of services is novel, and because we can show directly that many of the common views about offshoring are mistaken.

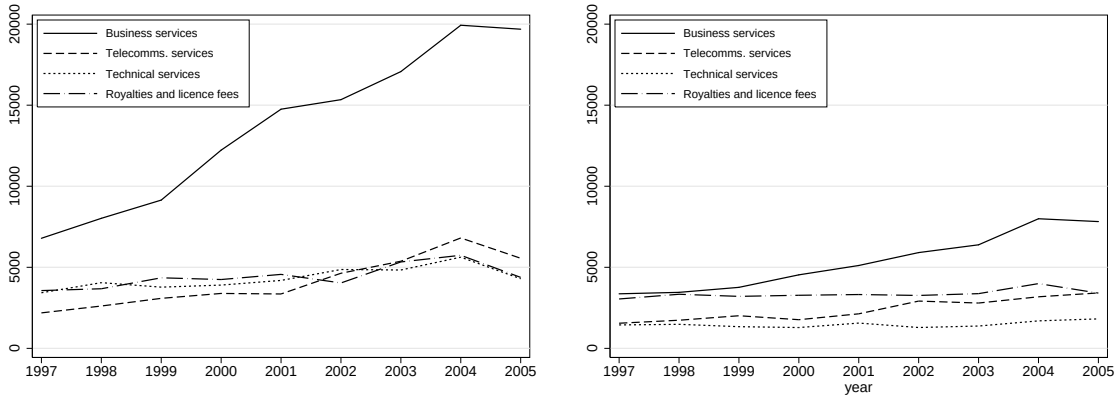
What services do UK firms trade? In Table 2 we list the value of imports and exports for each category of services trade in the ITIS, ordered by the total value of trade. The bottom panel groups these services into the more aggregate categories which we will use in our analysis. Note that the largest single item relates to 'services between related enterprises' rather than arms-length trade, and this trade may be subject to transfer pricing. The second largest single item is 'payments or receipts for intangible assets',

[10] Precise definitions of the weighting procedure is available from the authors on request.

which are essentially royalties and licence fees. One might argue that trade such as this does not represent offshoring in the usual sense. Nevertheless, since a firm has the choice between developing a production technology in-house or paying a licence fee for such a technology, such payments should be classified as such. UK firms have significant trade surpluses in all the most important categories, including computer services, research and development and financial services.

[Table 2 here.]

Figure 1 shows how exports and imports of services have evolved over the sample period. By far the greatest increase has been in business services (see Table 1 for details). In addition, there has been a significant increase in imports of telecoms services. A comparison of panels (a) and (b) in Figure 1 also shows that in every service category the UK has a large trade surplus.[11]



(a) Exports (2005 £m) (b) Imports (2005 £m)

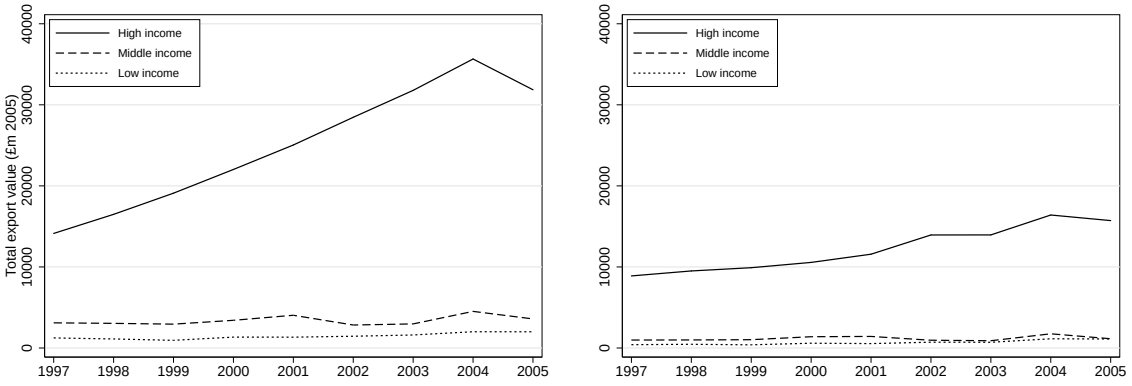
Figure 1: Trade by broad service category 1997–2005

Table 4 breaks down UK trade by region. Three quarters of all service trade by value is with Western Europe and North America, of which 25% is with the US alone. Less

[11] It is interesting to note that the UK is actually running a trade surplus in telecommunications services, despite the frequent references to call centre offshoring in the media.

than 4% of service trade is with countries whose per capita GDP is less than 10% of the UK's. Furthermore, the UK has a trade surplus with low-, middle- and high-income countries.[12] Furthermore, there is no evidence of a large-scale increase in trade with low-income countries over time, shown in Figure 2. The vast bulk of the increase in services trade is due to an increase in trade between the UK and other high income countries.

[Table 4 here.]



(a) Exports (2005 £m) (b) Imports (2005 £m)

Figure 2: Trade by partner income 1997–2005

In Table 5 we use the linked ITIS-ARD data to look at the industry of firms which are importing and exporting services. The most striking feature is that firms in manufacturing industries are involved both in a large proportion of all imports *and* all exports. Significant exports by manufacturing firms relate to intangible assets and research and development as well as engineering and technical services.

[Table 5 here.]

To summarise, we have highlighted several important features of service offshoring in the UK. The first is that increases in the viability of offshoring may have benefitted UK firms

[12] Low-income countries are defined as those with GDP per capita less than 10% of UK (105 countries). High-income countries are defined as those with GDP per capita more than 50% of UK (29 countries).

by increasing exports as well as imports of services. The second is that the vast bulk of services trade takes place between developed countries. The popular perception of a large-scale loss of jobs to low-wage economies therefore seems likely to be misplaced.

4.1 Employment, employment growth and job turnover

We now examine the relationship between our firm-level measures of trade in services and employment growth/job turnover. We follow Biscourp and Kramarz's (2007) method for decomposing employment changes between different firm types categorised by their trading status. Each firm is observed over the period 1997–2005, and for each we compute employment at the beginning and end of the sample period as

$$L_i^B = \frac{L_i^{97} + L_i^{98}}{2} \quad \text{and} \quad L_i^E = \frac{L_i^{04} + L_i^{05}}{2}.$$

Firms which enter the sample after 1997 have $L_i^B = 0$, and firms which exit before 2005 have $L_i^E = 0$. Average employment over the period is defined as

$$\bar{L}_i = \frac{L_i^B + L_i^E}{2}.$$

Employment growth over the sample period is then defined as

$$\Delta L_i = \frac{L_i^E - L_i^B}{\bar{L}_i}. \tag{1}$$

Defining employment growth in this way ensures that it lies in the range $[-2, 2]$ in the presence of firms which enter and exit the sample (Davis and Haltiwanger 1999). To aggregate employment growth across firms, ΔL_i is weighted by each firm's share of total employment. Job creation rates are defined as the weighted sum of employment growth across all firms with $\Delta L_i > 0$, and job destruction is the weighted sum of employment growth across all firms with $\Delta L_i < 0$.

Table 6 summarises employment, employment growth and job turnover. For comparison, the top panel reports these quantities for all firms in the ARD, which represent the vast majority of all UK firms.[13] The second panel shows the results for firms in the ARD which also appear in ITIS. Although only 2% of firms in the ARD appear in ITIS, the sample accounts for over one-third of total employment because the sample is so heavily weighted toward large firms. Firms which appear in ITIS are nearly twenty times larger, on average. Because the ITIS sample comprises much larger firms, the overall employment growth rate is lower, and a smaller proportion of employment growth is accounted for by entry and exit. If we compare firms which exist at the beginning and end of the sample period ("continuing firms") the difference between the ITIS sample and the population is smaller. Firms in the ITIS sample have slightly higher employment growth (0.26 compared to 0.22), experience slightly higher rates of job creation (0.40 against 0.37) and slightly lower rates of job destruction (-0.14 against -0.15) than the population of continuing firms from which they are drawn.

[Table 6 here.]

Each firm is then categorized according to its import and export behaviour over the sample period, so that each firm is in only one import or export category.[14] Amongst continuing firms, about three-quarters never import or export services. Firms which always import services are more than twice as large as those which never do so, while firms which always export services are about one-third larger than those that never do so. The largest firms of all are those which start importing during the sample period.

[13] Total employment in the UK over this period averaged about 25m; see Labour Market Trends (ONS, various years).

[14] Because firms are not observed in ITIS in every year, these categories are defined using only those years in which information on importing or exporting is available. For example, a firm which appears in ITIS in only two years and reports that it imports services in both those years is counted as "Always importing" although its import status is not known for the remaining years. We have excluded from this panel firms which have more complex patterns of import or export behaviour, such as starting and stopping within the sample period.

In line with the findings of Biscourp and Kramarz (2007) and Bernard *et al.* (2005), who analyse the firm-level relationship between trade in goods and employment, we find that the lowest rate of employment growth is amongst firms which stop importing or stop exporting. However, we do not observe the enormous growth rates observed by Bernard *et al.* (2005) amongst firms which start importing or exporting. Firms which start to trade in services have faster employment growth than firms which stop trading, but firms which never import also have faster rates of employment growth. What is clear from Table 6 is that there is no dramatic substitution away from domestic employment when firms start to import services, as the popular view of offshoring might suggest.

Trading status may affect gross job turnover independently of any effect on net employment growth. This will occur if offshoring has different effects on employment growth in different firms: offshoring might cause some firms to shrink, and others to grow. However, the final two columns of Table 6 show that differences in job creation rates are broadly in line with differences in employment growth rates; for example, firms which stop importing or stop exporting have the lowest rates of job creation and employment growth. Interestingly, the lowest rates of job destruction are actually observed in those firms which start importing services.

The aggregate picture presented in Table 6 might mask important differences according to the nature of the service being traded, nature of trading partner or nature of trading firm. In Table 7 we separate the sample using three criteria. In the top panel we focus on manufacturing firms and firms in financial and business services. We might expect different responses to service imports and exports because for manufacturing firms services trade is trade in intermediate inputs, whereas for services firms the trade is more similar to traditional trade in final goods. There is obviously a much higher employment growth rate in service sector firms (0.43 against 0.03), but within each sector the differences across firm types is quite similar. The smallest employment growth, smallest job creation and largest job destruction rates occur in those firms which stop importing services. In

contrast, firms which start importing services have higher employment growth rates. If imported services were a genuine substitute for domestic production then we would expect service sector firms which started importing to have much lower employment growth rates, but this is not the case.

[Table 7 here.]

In the second panel of Table 7 we examine trade with high- and low-income countries separately. It is striking that firms which trade with low-income countries are enormous, with an average firm size of over 800 employees.[15] However, the ranking of firm types in terms of employment growth is similar for trade with high- and low-income countries. In both cases, the highest rate of employment growth is observed in those firms which start importing services. The raw data therefore provides no support for the idea that imports of services from low-wage countries is a substitute for domestic employment.

Finally, in the third panel of Table 7 we examine trade split into three main categories of service: business services, telecoms services and technical services. It seems possible that the degree of substitutability with domestic employment varies according to the type of service being imported. In all three cases firms which always import these services have the slowest rate of employment growth, but firms which start importing tend to have faster rates of employment growth.

To summarise, firms which import (or offshore) services are larger than those which export services. Firms which offshore services to low-income countries, and those which offshore telecoms services are largest of all. These findings suggest that there exist substantial fixed costs to starting to import or export services. The fact that fixed costs for importing may be important, or even more important, than for exporting has so far received little

[15] This is consistent with the idea that there are larger fixed costs to importing services from less developed countries.

attention in the literature. The fixed costs to importing may relate to the search costs of identifying intermediate service suppliers located abroad.

We also find no evidence in the raw data that firms which start to offshore reduce employment or destroy jobs. In fact, firms which start to import services tend to have faster employment growth than firms which stop. One possibility is that we are not capturing a genuine switch from integrated domestic production to international outsourcing. Rather, these firms are simply replacing domestic outsourcing with international outsourcing. It is also noticeable that firms which never offshore tend to have faster rates of employment growth. This may be because non-offshoring firms are smaller; we therefore control for firm size in Section 5.

5 Econometric estimates

The descriptive statistics reported in the previous section might be explained by the very different characteristics of firms which trade services and those which do not. Most obviously, firms which trade services are much larger than those which do not. In addition, ITIS is a size-weighted sample. This implies that there will be a correlation between a firm's appearance pattern in the data and the trading categories we used in the previous section. For example, a firm which starts importing must be observed at least twice in the ITIS survey. This suggests that any comparison of firms should control both for their size and their appearance pattern in the ITIS survey.

In this section therefore we examine the impact of trade in services on employment growth controlling for these differences in characteristics. We use both regression and propensity score matching techniques to do this.

5.1 Continuing firms' employment growth

Our basic sample consists of firms observed in the ARD in 1997 and 2005 (continuing firms) and which appear in ITIS at least twice during that period. For firms which appear in ITIS only once we cannot calculate changes in trading behaviour. This leaves a total sample of 19,109 continuing firms.[16]

Let M_{it} be a dummy variable which equals 1 if firm i imports services at time t and zero otherwise. Let VM_{it} be the total value of imports, which will be zero if $M_{it} = 0$. X_{it} and VX_{it} are similarly a dummy for exporting and a measure of the value of exports. Our basic model is loosely based on that used by Biscourp and Kramarz (2007) and is specified as

$$\Delta L_i = \beta_0 + \beta_M \Delta M_i + \beta_{VM} \Delta VM_i + \beta_X \Delta X_i + \beta_{VX} \Delta VX_i + \boldsymbol{\beta}_x \mathbf{x}_i + \epsilon_i \qquad (2)$$

We regress the proportionate change in employment as defined in (1) on measures of the change in import and export status and change in value of imports and exports over the period 1997–2005. The change in the value of imports and exports variables are defined in exactly the same way as employment growth:[17]

$$\Delta VM_i = \frac{VM_i^E - VM_i^B}{\overline{VM}_i}.$$

We also need to control for observable differences between trading and non-trading firms. The vector $\mathbf{x}_i$ includes firms' initial sales in 1997, employment in 1997 (10 discrete categories), firms' initial import and export status, industry (33 categories), region (10 categories) and whether the firm is foreign-owned. Table 8 reports estimates of the effects of services trade on employment growth.

[16] These firms are larger than the 31,898 continuing firms reported in Table 6, but experience similar employment growth, job creation and job destruction rates.

[17] Since VM_i^E and VM_i^B are not necessarily measured in 1997 and 2005, we divide ΔVM_i and ΔVX_i by the number of years between the first and last years, to get an annual rate. Note that for firms who do not import in the first year $\Delta VM_i = 2/T$ and for firms that stop $\Delta VM_i = -2/T$ where T is the length of time between the first and last observation in ITIS for that firm.

[Table 8 here.]

Column (1) reports the base model and is consistent with the descriptive statistics presented earlier. Firms which start importing services over the sample period experience faster employment growth of about 8% per year. Firms which were already importing at the beginning of the period ($M_{i,1997} = 1$) also experience significantly faster employment growth.

It might be argued that firms which import intermediate services also typically export intermediate services, and that the positive effects observed in the first estimates are actually picking up an export effect. The results in column (2) suggest this is not the case. The coefficients on ΔM_i and $M_{i,1997}$ are quite robust to the inclusion of measures of exporting activity.

It might also be argued that the non-random nature of the sample may bias these results. Firms which appear in ITIS are larger and more successful than those which do not, and this may cause the apparent positive relationship between importing activity and employment growth. To deal with this, in column (3) we include a set of dummies which capture the number of times a firm appears in the ITIS survey. This reduces only slightly the import effect.

An important issue is whether we should also control for any *change* in firms' sales over the sample period. Biscourp and Kramarz (2007) control for the growth rate of firms' total sales to account for any shocks which might simultaneously increase the size of the firm and cause the firm to increase imports or exports. Controlling for sales growth captures the technological effect of offshoring by focusing on employment conditional on sales which, loosely speaking, corresponds to the labour intensity of the firm. If we do not control for sales growth, the estimates capture the total effect of offshoring including both its scale and technology effects.

The final column of Table 8 shows the impact of offshoring on employment conditional

on the change in sales over the same period. Changes in sales, unsurprisingly, are highly correlated with changes in employment. The coefficient estimate on ΔM_i is now much smaller and insignificantly different from zero. The coefficient on $M_{i,1997}$ is also smaller but still significant and positive. What this shows is that starting to import services is associated with an increase in the size of the firm, but that it does *not* have an impact on the labour intensity of production. In other words, offshoring is not replacing labour-intensive inputs in the firm. This is perhaps not surprising given that the vast majority of offshoring comes from the US and Western Europe (Table 4).

We then investigate whether the employment effects vary between manufacturing firms and firms in the financial and business services sector, shown in Table 9. Although imports of services might be regarded as a closer substitute for the final output of firms in the service sector, employment effects are actually larger (more positive) for service sector firms.

As noted in Section 4, one explanation for our results is that we are not observing firms switching from integrated domestic production to international outsourcing. Rather, we are observing firms switching from domestic outsourcing to international outsourcing. In this case we would not expect any direct employment displacement, but we would expect a positive output effect. This distinction is discussed by Feenstra and Hanson (1999), who argue that it is important to distinguish between imported inputs from the same industry that is purchasing the intermediate inputs, and imported inputs from other industries. Biscourp and Kramarz (2007) and Hijzen and Swaim (2007) show that the effect of offshoring on employment is positive when the components offshored are produced in industries other than that of the offshoring firm. This may be because firms are switching from domestic outsourcing to offshore outsourcing. Thus, tasks which are carried out within the firm are not themselves being outsourced.

We can investigate this issue by focusing on those firms in ITIS which are also in the ARD selected sample (see Section 3.2). For this subsample of firms, information is available

on *total* purchases of service inputs.[18] The first column of Table 10 repeats our basic estimate using only those firms which appear in the selected sample. The coefficients on ΔM_i, ΔVM_i and $M_{i,1997}$ are very similar to those reported in column (3) of Table 8.

We then split the sample between those firms whose purchases of service inputs increased over the sample period, and those firms whose purchases did not increase. If a firm is observed to be increasing their total purchases of service inputs over the period, then increases in foreign service inputs are more likely to represent a substitution away from in-house use of those inputs. For example, a firm which switches from an in-house design team to purchasing design services from overseas. In contrast, a firm which is observed to start purchasing services from abroad, but which does not increase its total spending on service inputs is more likely to be switching from a domestic supplier to a foreign supplier.

Results are presented in columns (2) and (3) of Table 10. For those firms who increase their total purchases of services (and are therefore likely to be switching from in-house provision) there is no significant change in employment growth (0.018 with a standard error of 0.025). However, firms which start to import services from abroad and which do not increase total purchases of services exhibit significantly faster employment growth (0.078 with a standard error of 0.036). This accords with the view that switching from domestic to foreign outsourcing can yield cost savings which aid the growth of the firm.

5.2 Matching estimators

An alternative approach to measuring the impact of service importing on employment growth is to explicitly match a *treated* firm (i.e. one that starts importing) with an observably similar *control* firm which does not import. This approach has several advantages over the regression-based methods used in the previous sections. Most importantly, it ensures that the predicted probability of importing for firms in the control group lies

[18] See Appendix A for a list of inputs.

within the range of predicted probabilities for firms in the treatment group. In contrast, the regression-based estimates use the whole sample, which may include firms which are extremely unlikely to ever engage in services trade.

The treatment group comprises those firms which start importing at some point during the sample period. A natural control group is firms which do not import services during the sample period. We therefore exclude from the comparison group firms which always import and firms which stop importing. Treated firms are only matched to control firms which have an identical appearance pattern in ITIS. Treated firms are then matched one-to-one to their nearest neighbour on the basis of the propensity score, which is estimated using a binary Logit regression of the treatment dummy on the same characteristics as in the regressions reported in Table 8.

Our employment growth results from this procedure are reported in the first two columns of Table 11. The unbiasedness of the propensity score estimates depends on whether the treatment and control groups can be considered observably identical after matching. In the right hand panel of Table 11 we report the results of a series of balancing tests. For each appearance pattern in ITIS we compare the means of all covariates in the treatment and the control groups, and conduct a series of t-tests. Table 11 shows that, before matching, the characteristics of the treatment and control groups are significantly different for between 10–20% of covariates. After matching, the characteristics of the treatment and control groups are effectively the same in the vast majority of cases.

Turning to the employment effects, the use of matching reduces the estimate of the off-shoring effect slightly to 0.035 (standard error 0.029), although this is now insignificantly different from zero. The results are largely unaffected by the choice of matching method.[19] We repeat the exercise for firms which start to import more or less than the median amounts. Firms which import more than the median amount have larger employment effects than those which import less, though again the impact is positive rather than

[19]Results available from the authors on request.

negative.

6 Conclusions

Despite the popular and political debate surrounding the risk of job loss from service offshoring, there is little existing evidence linking the two. In this paper we provide the first firm-level study of the relationship between offshoring and employment. Our measure of offshoring is the import of intermediate services.

First, we provide some basic stylised facts on the pattern of service trade in the UK. The vast majority of trade is with other developed countries, and the UK has a significant trade surplus in almost all significant service categories. If there is a trend towards trade with less developed countries, it is too small to detect in these data.

Second, we find no evidence that the imports of intermediate services are associated with job loss. In fact, firms which import services have faster employment growth than those which do not. This appears to result from the cost-saving effects of offshoring that give rise to an increase in the scale of production. Our finding is quite robust to the choice of estimation method, although in some specifications the effect is insignificantly different from zero. In no specification do we find any negative employment effects. An even more robust result emerges for firms which were already importing services at the beginning of the sample period. These firms experience significantly faster employment growth in every specification we estimate. Even amongst firms whose total expenditure on service inputs is growing, increasing imports of services is not associated with job loss.

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7 Tables

Table 1: Service codes used in ITIS

1996–2003 codes		*2004–2005 codes*	
(A) Business Services			
1	Legal services	11	Legal services
2	Accounting and auditing	5	Accountancy, auditing, bookkeeping and tax consulting services
3	Management consulting and public relations	7/8/10	Management consulting/public relations/other business management services
4	Advertising	6	Advertising
5	Market research and polling	12	Market research and public opinion polling
6	Research and development	16	Research and development
7/8	Insurance	29–36	Insurance
9	Financial services	27	Financial services
10	Insurance brokering	28	Auxiliary insurance services
11	Property management	15	Property management
12/50	Services between related enterprises	17	Services between related enterprises
13	Procurement	14	Procurement
14	Publishing services	23	Publishing services
15	Recruitment and training	9/41	Recruitment/training and educational services
19	Other business services	18	Other business and professional services
(B) Telecommunications Services			
21	Telephone services	20	Telecommunications services
22/23	Postal and courier services	19	Postal and courier services
24	Computer services	21	Computer services
25	Information services	22/24	News agency services/other information provision services
(C) Technical Services			
31	Architectural services	47	Architectural services
32	Engineering services	48	Engineering services
33	Surveying services	49	Surveying services
34	Construction services	25/26	Construction services (inside and outside UK)
35	Agricultural services	1	Agricultural services
36	Mining services	2	Mining services
37	Other technical services	3/4/50	Waste treatment/other on-site processing services/other technical services
(D) Miscellaneous Services			
41	Operational leasing	13	Operational leasing
(E) Cultural Services			
42/43	TV, radio/music related services	39	Audio-visual and related services
44	Other cultural and recreational services	40/42	Health services/Other personal, cultural and recreational services
(F) Royalties and license fees			
45	Payments/Receipts for the use of intangible assets	43/44	Use of franchises/other royalties and license fees
46	Payments/Receipts for the outright purchase or sale of intangible assets	45/46	Purchases and sales of franchises/royalties and licenses
(G) Trade related services			
47/48	Earnings and commission from trade in goods (merchanting)	37	Merchanting
49	Earnings from trading in commodities	38	Other trade-related services
51	Any other trade in services not shown elsewhere	51	Other trade in services

Table 2: Services traded in 2005 by total trade value, £m

	Imports	*Exports*	*Net trade*
Services between related enterprises	3,327	5,971	2,644
Use of intangible assets	3,309	4,101	792
Financial Services	899	5,677	4,778
Research and development	1,793	4,203	2,410
Computer Services	1,846	4,012	2,166
Engineering Services	1,251	2,921	1,670
Telephone Services	2,007	2,156	149
Any other trade in services	1,520	2,175	654
Management consulting and public relations	1,206	2,231	1,024
Other Technical Services	1,548	1,728	180
Legal services	519	2,696	2,176
Advertising	967	2,187	1,220
Other business services	536	1,596	1,060
Construction Services	923	792	−131
Earnings from trading in commodities	409	1,072	663
Accounting and auditing	360	997	637
Information Services	258	967	710
Earnings and commission from trade in goods	66	1,152	1,085
Insurance Broking	53	1,063	1,011
Purchase or sale of intangible assets	637	406	−231
Procurement	744	110	−634
Market Research and polling	180	586	406
Recruitment and training	192	528	336
Operational Leasing	360	312	−48
Other Cultural and Recreational services	187	358	172
Publishing services	106	352	247
Postal and courier Services	189	183	−6
Surveying Services	87	232	145
TV/Radio/Music	39	216	178
Insurance	190	16	−174
Architectural Services	12	127	116
Agricultural Services	118	18	−100
Mining Services	31	98	68
Property Management	31	71	40
Business Services	11,105	28,285	17,180
Telecommunications Services	4,300	7,319	3,019
Technical Services	3,969	5,916	1,947
Royalties and Licence Fees	3,945	4,507	561
Others	2,581	5,285	2,704

All estimates weighted by ex-post sampling weights.

Table 3: Number of reporting units used in the analysis

	All firms in ABI	*All firms in ITIS*		*Trading firms*		
		Non-traders	Traders	Importers	Exporters	Both
1996	915,685	5,017	3,602	2,409	2,821	1,628
1997	1,483,489	6,363	3,959	2,790	2,929	1,760
1998	1,555,568	6,186	4,153	2,853	3,123	1,823
1999	1,641,523	6,321	4,116	2,785	3,282	1,951
2000	1,669,442	6,079	4,583	3,132	3,574	2,123
2001	1,682,802	14,509	5,838	4,092	4,258	2,512
2002	1,709,648	14,206	6,420	4,528	4,703	2,811
2003	1,758,596	13,299	6,559	4,682	4,850	2,973
2004	1,781,594	11,408	6,985	5,020	5,135	3,170

Table 4: Trade in services by trading region, 2005, £m

	Imports	*Exports*	*Net trade*
Western Europe	14,711	25,249	10,539
North America	5,982	11,796	5,814
Eastern Asia	1,270	2,715	1,445
Caribbean	343	3,258	2,915
Western Asia	761	2,139	1,378
Eastern Europe	538	1,370	832
Africa	402	1,348	946
Oceania	568	850	282
Southeastern Asia	387	906	519
Southern Asia	394	551	157
Unknown	198	484	285
Central Asia	199	381	182
South America	134	250	116
Central America	15	17	1
Low income[a]	1,413	2,873	1,460
Middle income	1,483	5,683	4,201
High income[b]	22,888	42,454	19,565

Weighted by authors' ex-post weights.

[a] Countries with GDP per capita less than 10% of UK (105 countries).

[b] Countries with GDP per capita more than 50% of UK (29 countries).

Table 5: Trade in services by 1-digit SIC[a], 2005, £m

		Imports	*Exports*	*Net trade*
C	Mining and quarrying	556	461	−95
D	Manufacturing	5,679	8,285	2,606
E	Electricity, gas and water supply	35	11	−24
F	Construction	608	185	−424
G	Wholesale and retail trade	4,811	4,411	−399
H	Hotels and restaurants	119	47	−72
I	Transport, storage and communication	2,456	2,952	496
J	Financial intermediation[b]	1,194	6,797	5,602
K	Real estate, renting and business activities	8,844	24,335	15,491
	Missing[c]	662	1,677	1,015

[a] Excluding sections A (agriculture), B (fishing), L (public admin) M (education) N (Health) O (Community, social and personal services)
[b] The ARD does not sample certain industries within this section, notably banking and pension funding.
[c] SIC codes are not known if a business cannot be linked to the ARD.

Table 6: Employment characteristics by trading status 1997–2005

	Number of reporting units	*Total emp*	*Average emp*	*Emp growth rate*	*Share of emp change*	*Job creation rate*	*Job destruction rate*
All firms in ARD							
All firms	2,630,636	21,685,334	8.2	0.37	0.37	0.81	−0.44
Continuing firms	690,769	11,037,647	16.0	0.22	0.11	0.37	−0.15
New firms	1,160,325	6,727,891	5.8	2.00	0.62	2.00	0.00
Exiting firms	779,542	3,919,795	5.0	−2.00	−0.36	0.00	−2.00
All firms in ARD-ITIS sample							
All firms	51,236	7,843,613	153.1	0.21	0.21	0.56	−0.35
Continuing firms	31,898	5,506,615	172.6	0.26	0.20	0.40	−0.14
New firms	9,582	1,414,213	147.6	2.00	0.26	2.00	0.00
Exiting firms	9,756	922,785	94.6	−2.00	−0.25	0.00	−2.00
All continuing firms (in 1997 and 2005)							
Always import	3,017	727,899	241.3	0.16	0.01	0.37	−0.21
Never import	24,540	2,909,963	118.6	0.28	0.16	0.40	−0.13
Start importing	1,452	640,150	440.9	0.30	0.01	0.41	−0.11
Stop importing	1,296	439,296	339.0	0.15	0.01	0.35	−0.20
Always export	4,034	796,781	197.5	0.25	0.02	0.40	−0.15
Never export	23,976	3,493,020	145.7	0.27	0.16	0.40	−0.13
Start exporting	1,302	415,951	319.5	0.29	0.01	0.44	−0.14
Stop exporting	1,191	265,430	222.9	0.16	0.00	0.38	−0.21

Weighted by authors' ex-post sampling weights.

Table 7: Employment characteristics by trading status 1997–2005

	Number of reporting units	*Total emp*	*Average emp*	*Emp growth rate*	*Share of emp change*	*Job creation rate*	*Job destruction rate*
Manufacturing firms (SIC2=15–37)							
Always import	1,215	311,334	256.2	−0.06	−0.01	0.23	−0.29
Never import	9,120	774,854	85.0	0.07	0.04	0.26	−0.19
Start importing	625	143,996	230.4	0.02	0.00	0.24	−0.23
Stop importing	568	145,296	255.8	−0.19	−0.01	0.19	−0.37
Financial and business services firms (SIC2=65–74)							
Always import	976	132,146	135.4	0.42	0.03	0.55	−0.13
Never import	6,994	730,994	104.5	0.42	0.21	0.55	−0.13
Start importing	473	108,485	229.4	0.43	0.02	0.57	−0.14
Stop importing	412	79,168	192.2	0.25	0.01	0.50	−0.24
Trade with low-income countries							
Always import	168	148,745	885.4	0.10	0.00	0.30	−0.19
Never import	30,866	4,642,655	150.4	0.27	0.19	0.40	−0.14
Start importing	342	412,961	1207.5	0.30	0.01	0.36	−0.06
Stop importing	128	151,324	1182.2	0.20	0.00	0.23	−0.03
Trade with high-income countries							
Always import	1,956	505,352	258.4	0.17	0.01	0.38	−0.22
Never import	26,186	3,355,678	128.1	0.27	0.17	0.40	−0.13
Start importing	1,298	528,394	407.1	0.28	0.01	0.41	−0.13
Stop importing	971	614,329	632.7	0.25	0.01	0.36	−0.11
Business services							
Always import	1,604	325,349	202.8	0.17	0.01	0.40	−0.23
Never import	26,995	3,758,864	139.2	0.27	0.17	0.40	−0.13
Start importing	1,118	632,775	566.0	0.26	0.01	0.38	−0.12
Stop importing	849	231,040	272.1	0.21	0.00	0.41	−0.20
Telecoms services							
Always import	438	181,469	414.3	0.14	0.00	0.35	−0.21
Never import	29,940	4,410,398	147.3	0.27	0.18	0.40	−0.13
Start importing	620	263,680	425.3	0.28	0.00	0.45	−0.17
Stop importing	326	389,865	1195.9	0.29	0.01	0.36	−0.06
Technical services							
Always import	377	84,583	224.4	0.07	0.00	0.28	−0.21
Never import	30,212	5,024,865	166.3	0.27	0.19	0.40	−0.13
Start importing	378	107,285	283.8	0.26	0.00	0.40	−0.14
Stop importing	369	81,263	220.2	0.20	0.00	0.40	−0.20

Weighted by authors' ex-post weights.

Table 8: Employment growth regressions (Equation 2)

	Base model		*Include exports*		*Include ITIS appearance pattern*		*Include change in sales*	
Change in import status ΔM_i	0.077	(0.021)***	0.066	(0.022)***	0.048	(0.022)**	0.007	(0.018)
Change in value of imports ΔVM_i	0.001	(0.015)	0.005	(0.015)	0.002	(0.015)	0.0002	(0.013)
Initially importing $M_{i,1997}$	0.140	(0.015)***	0.146	(0.017)***	0.112	(0.017)***	0.067	(0.014)***
Change in export status ΔX_i			0.041	(0.020)**	0.019	(0.020)	0.027	(0.017)
Change in value of exports ΔVX_i			−0.015	(0.014)	−0.011	(0.014)	0.020	(0.012)*
Initially exporting $X_{i,1997}$			−0.014	(0.015)	−0.048	(0.015)***	0.013	(0.012)
Change in sales ΔS_i							0.499	(0.006)***
Sample size	19,109		19,109		19,109		19,109	
R^2	0.335		0.335		0.349		0.545	

All regressions include measures of initial sales, initial employment level (10 categories), industry (33 categories), region (9 categories) and foreign ownership.
All results weighted by ex-post sampling weights.

Table 9: Employment growth regressions by sector

	Manufacturing SIC2=15–37		*Services SIC2=65–74*	
Change in import status ΔM_i	0.037	(0.027)	0.087	(0.0385)***
Change in value of imports ΔVM_i	0.008	(0.020)	−0.031	(0.0277)
Initially importing $M_{i,1997}$	0.059	(0.021)***	0.094	(0.0320)***
Change in export status ΔX_i	−0.023	(0.028)	0.017	(0.0315)
Change in value of exports ΔVX_i	0.004	(0.019)	0.010	(0.0210)
Initially exporting $X_{i,1997}$	−0.062	(0.021)***	−0.039	(0.0238)*
Sample size	8,066		5,619	
R-squared	0.341		0.362	

All regressions include measures of initial sales, initial employment level (10 categories), industry (33 categories), region (9 categories) and foreign ownership.
All results weighted by ex-post sampling weights.

Table 10: Employment growth regressions: selected ARD-ITIS sample

	All firms in selected sample		*Increase use of service inputs*		*No increased use of service inputs*	
Change in import status ΔM_i	0.039	(0.023)*	0.018	(0.025)	0.078	(0.036)**
Change in value of imports ΔVM_i	0.001	(0.016)	0.009	(0.020)	−0.016	(0.024)
Initially importing $M_{i,1997}$	0.096	(0.018)***	0.096	(0.020)***	0.080	(0.027)***
Change in export status ΔX_i	0.015	(0.022)	−0.016	(0.026)	0.003	(0.033)
Change in value of exports ΔVX_i	−0.011	(0.015)	−0.054	(0.021)***	0.012	(0.021)
Initially exporting $X_{i,1997}$	−0.035	(0.015)**	−0.170	(0.019)***	−0.009	(0.022)
Sample size	16,608		8,040		8,568	
R^2	0.345		0.347		0.406	

All regressions include measures of initial sales, initial employment level (10 categories), industry (33 categories), region (9 categories) and foreign ownership.
All results weighted by ex-post sampling weights.

Table 11: Propensity score matching estimates: employment growth

	ATE	*S.E.*[a]	*Balancing tests*[b]			
			Unmatched		*Matched*	
			$p < 0.1$	$p < 0.05$	$p < 0.1$	$p < 0.05$
Starting to import between 1997 and 2004	0.035	(0.029)	97/440	72/440	13/440	5/440
Starting to import less than median (£27,000)	0.032	(0.035)	61/440	43/440	7/440	1/440
Starting to import more than median	0.107	(0.038)***	94/440	70/440	11/440	3/440

Treatment group comprises firms which start importing (exporting) between 1997 and 2005. Control group are those firms which do not start importing (exporting). Firms are matched directly on their appearance pattern in ITIS. Propensity score is calculated using the same covariates as in Table 8.

[a] Bootstrapped standard errors, 50 replications.

[b] The table shows the number of t-statistics which are greater than the indicated significance level. The propensity score is estimated using 55 covariates (initial sales, initial employment level (10 categories), industry (33 categories), region (9 categories) and foreign ownership) separately for each appearance pattern in ITIS. There are eight appearance patterns, hence $55 \times 8 = 440$ comparisons.

A Information on service inputs available in ARD

1. Amounts payable to sub-contractors
2. Value of industrial services purchased (printing services, installation, repairs and maintenance, excluding repairs and maintenance on computers and office machinery)
3. Amounts payable for hiring, leasing or renting plant (including scaffolding) machinery and vehicles
4. Amounts payable for commercial insurance premiums
5. Amounts payable for road transport services
6. Amounts payable for telecommunication services
7. Amounts payable for computer and related services (including repairs and maintenance of office machinery and computers) excluding computer hardware and software
8. Amounts payable for advertising and marketing services
9. Amounts payable to employment agencies for agency staff
10. Amounts payable for other services purchased (e.g. non-road transport and travel, professional services, postal services, research, rent paid, banking charges, legal costs and accounting fees etc.)