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

Alex Hijzen
OECD and GEP

Mauro Pisu
National Bank of Belgium and GEP

Richard Upward
University of Nottingham and GEP

Peter Wright
University of Nottingham and GEP

September 20, 2007

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

*This work contains statistical data from ONS which is Crown copyright and reproduced with the permission of the controller of HMSO and Queen's Printer for Scotland. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. The authors thank the staff of the Business Data Lab at the Office for National Statistics for their help in accessing the data. We thank David Greenaway and participants at a Department for Work and Pensions seminar on job security for helpful comments. Financial support from the DTI (PCN 0506) and the Leverhulme Trust (under Programme Grant F114/BF) is gratefully acknowledged. All remaining errors are our own.

1 Introduction

In this paper we provide the first firm-level evidence of the impact of the trade in producer services ("offshoring") on the labour market. Specifically, we compare the employment growth of firms which import (and export) producer services with observably identical firms which do not.

The fear that offshoring may destroy large numbers of jobs in developed economies is widespread in the popular media.[1] Blinder (2006) and others have suggested that this fear arises because offshoring has the potential to impact workers who were previously insulated from international competition. This is essentially for two reasons. First, firms are now able to trade not just physical inputs, but also service inputs which were previously regarded as non-tradeable. Second, some of these services, such as research and development, customer services or IT support are not typically thought of as being "low-skilled". Thus, offshoring may affect high-skilled workers in service occupations. However, there is a stark contrast between the popular perception of offshoring (see Smith (2006) for some examples) and the limited academic literature which examines the actual impact on firms and the labour market (e.g. Amiti and Wei (2005)).

Despite the strong policy interest, our 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, 2006) 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.

[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 recent discussion in Sturgeon (2006).

We examine whether there is evidence that offshoring actually costs jobs or affects job security in the UK. To do this we use a relatively new dataset for the United Kingdom, the *Inquiry into International Trade in Services* (ITIS). ITIS is the only UK dataset to systematically collect information on imports and exports of services at the firm-level. ITIS covers the import and export of *intermediate services*. Imports of services in the data therefore correspond closely to the concept of "offshoring".

We link ITIS to a comprehensive database of UK firms which allows us to measure each firm's employment, job creation and job destruction. 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.

This paper thus presents the first firm-level study of the impacts of trade in services on employment and job turnover. 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. 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

The data we use reflects the international fragmentation of production activities into components that can be produced in different countries. Initially, this phenomenon was associated with manufacturing activities, but firms are increasingly able to fragment service activities as well. Indeed, popular concerns regarding outsourcing have tended to focus on these service activities.

In the present paper, 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: location and 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. This will typically be associated with trade in intermediates (Feenstra and Hanson 1996) or in the terminology of Grossman and Rossi-Hansberg (2006) "trade in tasks". Offshoring, moreover, 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 therefore tended to focus on wages. Early contributions typically made use of graphical analyses using Lerner-Pearce diagrams to analyse the wage effects of offshoring in a Heckscher-Ohlin-Samuelson setting (Jones and Kierzkowski 1990, Jones and Kierzkowski 2000, Arndt 1997). Kohler (2004) algebraically analyses the effects of offshoring in a model in which the scale of offshoring is endogenously determined using a production structure based on a continuum of intermediate inputs à la Dixit and Grossman (1982). In general, these studies conclude that almost anything can happen depending on

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

the configuration of sectoral factor-intensities, the relative factor-intensity of components relocated abroad and relative factor endowments. Markusen (2005) considers the role of offshoring in a broad set of relevant configurations using a variety of trade models, but also concludes that anything may happen.

Grossman and Rossi-Hansberg (2006) present a model where production of final goods consists of a continuum of tasks. By placing a restriction on the offshoring technology they are able to obtain relatively clear-cut results. Rather than assuming that certain activities in certain industries can be offshored as in previous work, they propose an offshoring technology that only varies across tasks and not across sectors. As a result, they point out that, as long as prices are determined on world markets, low-skilled workers benefit from an increase in real wages when low-skilled tasks are being relocated abroad. This is because of what they call a productivity-like effect. This is due to the cost savings generated by offshoring tasks of low-skilled workers. It will have the same effects as a low-skill labour augmenting technological change, which will cause the wage of workers whose tasks have been offshored to rise. When the tasks of workers of all skill levels are offshored, this will lead to Hicks-neutral productivity-like effects which, in turn, will increase the compensation of all workers. It is worth noting that these will be the only effects of offshoring in a small Heckscher-Ohlin economy. In this case, there are not relative price and labour supply effects. Grossman and Rossi-Hansberg show that in a large Heckscher-Ohlin economy, the relative price effect will work in the opposite direction to the productivity-like effect. In addition, when there are more factors than finished goods there will be also a labour supply effect. They clarify which conditions will lead each effect to dominate. However, for the purpose of this paper, since we are using a firm-level data set, the conclusions drawn assuming a small Heckscher-Ohlin economy are more pertinent.

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. However,

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.[4]

Amiti and Wei (2005, 2006) provide the only previous studies to have explicitly looked at the role of service offshoring for employment. Using industry-level data for the US, they find a small negative effect of service offshoring on employment when using a very finely disaggregated industry classification, but that these effects disappear when using more aggregated data.

However, the cost-saving and productivity gains associated with offshoring may induce an expansion in the scale of production and therefore employment. The total effect of offshoring on employment is therefore an empirical matter. Amiti and Wei (2006) and Hijzen and Swaim (2007*a*) show, using industry-level data for the manufacturing sector in a range of OECD countries, that these scale effects can be very large and may even offset the direct effect on employment due to the substitution of home value-added by foreign value-added. Feenstra and Hanson (1999) further suggest 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*a*) show that the effect of offshoring on employment is positive when the components offshored are produced in other industries 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.

In addition to affecting wages and employment, it has recently been suggested that offshoring may also affect the volatility of labour demand, and therefore job turnover. Since the work of Davis and Haltiwanger (1992) on job creation and destruction it is well known that firm-level idiosyncratic shocks are the main source of job reallocation within and across firms.

[4]Criscuolo and Leaver (2005) use the same data to examine offshoring and productivity issues.

Bergin, Feenstra and Hanson (2006) are the first to analyse this issue. They show that value-added in Maquiladora industries[5] in Mexico is about twice as volatile as that in the corresponding industries in the United States. They propose two alternative general equilibrium models to explain how offshoring may decrease industry-level volatility in the originating countries and increase it in the recipient country. In these models, production is based on a continuum of inputs and the authors show how, due to offshoring, shocks originating in the home country may be transmitted in an amplified manner to the recipient country.

In addition, in a partial equilibrium context, offshoring may affect job turnover through the ease with which firms can substitute domestic workers by their foreign counterparts in response to changes in relative wages across countries (Rodrik 1997, OECD 2007). Hijzen and Swaim (2007*b*) provide empirical evidence for a range of OECD countries that this may indeed be the case.

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

In line with BPM5 recommendations, ITIS employs the *residential* definition to document trade in services. This implies that transactions are not included on the basis of nationality or legal criteria, but "on a transactor's centre of economic interest"

[5]Industries that import materials and equipment on a duty-free and tariff-free basis for assembly or manufacturing and then re-export the assembled product, usually back to the originating country.

(p.26 UN 2002). This definition differs slightly from that employed within the framework of the General Agreement on Trade in Services (GATS). The GATS considers four 'modes' through which services can be traded internationally, which are based on the respective location of the consumer and supplier during the transaction. Under the residential definition, trade in services will generally include: services that are being supplied across borders without either the consumer or the supplier having to move into the economic territory of the other (Mode 1); services that are being supplied by which a consumer resident in one country moves to the resident country of the supplier (Mode 2), and services that are being supplied by which a supplier resident in one country temporarily moves to the resident country of the consumer, either on his/her own behalf or of that of his/her employer (Mode 4). Trade in services to residents of a foreign country through commercial presence in that country is excluded (Mode 3) and is covered by a separate survey (Foreign Affiliates Trade in Services).

BPM5 further recommends that transactions are valued at market prices. It seems plausible, however, that in a great number of cases trade in services does not take the form of "arm's length" transactions at market prices, but instead reflects intra-firm transactions subject to transfer pricing. However, there is no information available in ITIS on whether trade takes the form of arm's length or intra-firm transactions.

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. Firm-level datasets that include information on trade in goods at the firm-level 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. 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.

ITIS was first collected in 1996, and response to the survey by firms is statutory (ONS 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 (ONS 2001). The sampling methodology consists of three parts. First, 'known traders' are selected from the responses of previous years. Second, filter questions in the Annual Business Inquiry (see below) are used from 2000 onward to identify traders by asking reporting units to indicate whether they imported services or/and exported services. All positive responses not already in ITIS are added.[6] 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 (ONS 2003). From 2001 the sampling design was extended to 'mop up' industries on a rotational basis to improve the coverage of the economy.

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.

[6]The sample size effectively doubled in 2001.

3.2 The Annual Business Inquiry

In order to analyse the impact of services trade on employment and job turnover we link the ITIS to the Annual Business Inquiry (ABI). This is an annual survey of UK businesses which, since 1994, is also sampled from the IDBR. The 'selected sample' of the ABI 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 ABI 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 ABI 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.

4 Some descriptive statistics

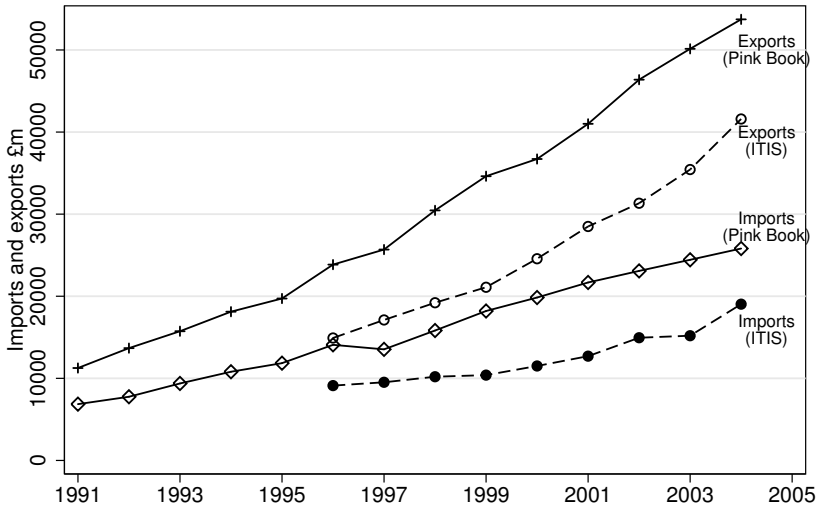
4.1 The sample

Table 1 lists the number of reporting units which underlie the analysis. The ITIS 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 1 here.]

4.2 Trade in services by UK firms

The ITIS survey appears to measure the majority of trade in services by UK firms, excluding transportation and travel and financial services. In Figure 1 we plot total imports and exports as measured by ITIS against the equivalent entries from the UK balance of payments ONS (2006). The unweighted ITIS estimates accounts for about 80% of official estimates.[7]



Source: Pink Book (ONS 2006), ITIS (ONS 2004)
Excludes transportation and travel, financial services, and government services for consistency with ITIS

Figure 1: UK Trade in services 1991–2004, current prices

Figure 1 suggests that trade in services has grown tremendously since the early 1990s. As is well-known, the UK runs a substantial balance of payments surplus in services trade, which has also grown significantly and is currently worth over £20 billion annually. The increase in the sample in 2001 did not have a dramatic effect on the estimated value of services trade, suggesting that the majority of large trading firms were already in the sample before that point.

What services do UK firms trade? In Table 2 we list the value of imports and exports

[7]Note that the Pink Book estimates reported in Figure 1 already exclude financial services.

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 groups which we will use in our analysis. The largest single item is 'payments or receipts for intangible assets', 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 offshoring.

UK firms have significant trade surpluses in the eight most important categories, including computer services, research and development and financial services. The most important service where the UK runs a deficit is in telephone services, which accords with the popular perception of call-centre offshoring.

[Table 2 here.]

Table 3 breaks down UK trade by region. Three quarters of all trade by value is with Western Europe and North America, of which 25% is with the US alone. Less than 4% 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.

[Table 3 here.]

To examine the regional aspect more closely, Table 4 breaks down the four main categories of trade (as defined in Table 2) against trading region by income. Interestingly, the only area in which the UK has a trade deficit is in Telecommunication Services (which includes call centres) with low-income countries. Nevertheless, this deficit is dwarfed by surpluses elsewhere.

[Table 4 here.]

Finally, in Table 5 we use the linked ITIS-ABI 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* exports. Since these firms are, by definition, not producing services as a final output, manufacturing firms are exporting as well as importing intermediate inputs. For example, a manufacturing firm might export blueprints or research and development to other firms, possibly including firms which are within the same enterprise group. In contrast, exports by firms in Real Estate, Renting and Business Activities may include exports of the final output of the firm. The fact that firms may import and export intermediate inputs is not, we believe, widely recognised.

[Table 5 here.]

4.3 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 1997–2004, and for each we compute employment at the beginning and end of the sample period as

$$L_i^B = \frac{L_i^{97} + L_i^{98}}{2} \quad \text{and} \quad L_i^E = \frac{L_i^{03} + L_i^{04}}{2}.$$

Firms which enter the sample after 1997 have $L_i^B = 0$, and firms which exit before 2004 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 ABI, which represent the vast majority of all UK firms.[8] The second panel shows the results for firms in the ABI which also appear in ITIS. Although only about 2% of firms in the ABI 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. Firms in ITIS which exist in 1997 and 2004 ("continuing firms") experience very strong employment growth (25% over the period) and account for 71% of total employment in the sample. These firms also experience higher rates of job creation and lower rates of job destruction than the population of continuing firms from which the ITIS sample is 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.[9] Amongst

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

[9] Because firms are not observed in ITIS in every year, these categories are defined using only

continuing firms, about three-quarters never import or export. Firms which always import services are more than twice as large as those which never do so, while firms which 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, or those which change their import status more often. This is in fact a result of the size-weighted sample: to be observed starting to import, a firm must be observed at least twice in the ITIS survey, and the number of times a firm is in the ITIS survey is strongly positively associated with its size. This suggests that any comparison of firms should control for their appearance pattern in the ITIS survey.

In line with the findings of Biscourp and Kramarz (2007) and Bernard, Jensen and Schott (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, the pattern of employment growth amongst the other groups of firms seems less clear-cut. In particular, we do not observe the enormous growth rates observed by Bernard *et al.* (2005) amongst firms which start trading. We do find that 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. This may be related to their smaller initial size. There is also little evidence in Table 6 of a relationship between firm exit and trading status. Approximately the same proportion of exiting firms are importing and exporting services as amongst continuing firms.

Even if trading status does not affect net employment growth, it is possible that it has effects on gross job turnover. 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

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.

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. 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 into 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 undoubtedly the trade in intermediate inputs, whereas for services firms the trade is more similar to traditional trade in final goods. Table 7 shows that, as with the whole sample, firms which start to import services have much higher growth rates than firms which stop importing services. Interestingly, manufacturing firms which start to export services experience the largest employment falls and particularly large job destruction rates, whereas services firms which start exporting services have particularly high employment growth.

[Table 7 here.]

In Table 8 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 1000 employees. However, the ranking of firm types in terms of employment growth is identical for trade with high- and low-income countries. Firms which never import actually have the highest growth rates, and firms which start importing do better than firms which stop. In terms of exports, firms which start exporting have the fastest employment growth and firms which stop the slowest employment growth.

[Table 8 here.]

Finally, in Table 9 we examine trade split into business services, telecoms services and technical services. Firms which trade in telecoms are larger than those which trade in business or technical services, but the patterns of employment growth are once again very similar. Firms which never trade or which start trading tend to grow faster than firms which stop trading or which continue trading.

[Table 9 here.]

To summarise, firms which import services (offshore) 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 the fixed costs for importing may be as important, or even more important, than for exporting has so far received little attention in the literature. The fixed costs to importing may relate to the search costs of identifying intermediate suppliers located abroad.

There is no evidence that firms which start to offshore experience employment falls or that they destroy jobs. In fact, firms which start to import services tend to have faster employment growth than firms which stop. However it is possible 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 could be related to their smaller size.

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 this section 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 ABI in 1997 and 2004 ("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 19,114 continuing firms.[10]

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 1997–2004. The change in the value of imports and exports variables

[10] These firms are larger than the 32,403 continuing firms reported in Table 6, but experience almost identical employment growth, job creation and job destruction rates.

are defined in exactly the same way as employment growth:

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

The only slight difference is that VM_i^E and VM_i^B are not necessarily measured in 1997 and 2004, because firms are not observed in ITIS every year. So we also divide ΔVM_i and ΔVX_i by the number of years between the first and last years, to get an annual rate.[11]

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.

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.

On the other hand, if a firm's trading pattern influences both employment growth and sales, then controlling for the latter will lead to attenuated estimates of the effect on employment growth, since sales and employment growth are likely to be highly correlated. If we do not control for sales growth, the estimates capture the total effect of offshoring including both its scale and technology effects.

Therefore, in Tables 10 and 11 we report two sets of estimates of the effect of ser-

[11] 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.

vices trade on employment. The estimates in Table 10 are unconditional estimates, because they do not condition on the change in firm sales over the sample period. The estimates in Table 11 are conditional on sales growth.

[Tables 10 and 11 here.]

The first column of results in Table 10 are 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. In addition, there is an additional positive relationship with increases in the quantity of imports. Firms which were already importing at the beginning of the period also experience significantly faster employment growth. Weighting the results by firm size (bottom panel) increases the coefficient on ΔVM_i but also increases the size of the standard errors considerably, and so these estimates are generally insignificantly different from zero.[12]

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 second column suggests this is not the case. The coefficients on ΔM_i and ΔVM_i are quite robust to the inclusion of measures of exporting activity. The effects of exporting itself on employment growth appears to be small and generally insignificant. When weighting by firm size there appear to be some negative effects from starting to export which are counteracted by positive volume effects. Weighting by firm size can have large effects on the results because the size distribution is so skewed.

It might be that the highly 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,

[12]When weighting by firm size standard errors are clustered by firm.

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, and actually increases the negative effect of exporting on employment growth.

In columns (4) and (5) we split the sample between manufacturing and business services firms. Firms in the business services sectors have larger estimated effects on ΔM_i but smaller volume effects.

The equivalent results in Table 11 show 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 estimates on ΔM_i and ΔVM_i are smaller than those reported in Table 10, and in almost all cases insignificantly different from zero. This is particularly true in the size-weighted results. What this suggests is that starting to import services is associated with an increase in the size of the firm (whether measured by sales or employment), 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 3).

The exporting results contradict the common result that exporting firms "do better" than non-exporters. However, we would stress that these results are new and distinct from previous findings for several reasons.

First, we are looking at exports of services rather than goods. Most, if not all the evidence, on exporters focuses on exports of goods of manufacturing firms (see the literature reviews of Greenaway and Kneller (2007) and Wagner (2007). It may be that the sunk costs of exporting services are lower than those of exporting goods,

in which case the selection of firms into exporters and non-exporters will be less extreme.

Second, we should keep in mind that these firms are not typically exporting their final output, but rather exporting a service which is itself an input into the production process. This is the case for all the manufacturing firms in our sample, as well as some proportion of the service sector firms.

Third, we include simultaneously imports and exports of services. There is little comparative evidence which does this. Exceptions are Muûls and Pisu (2007), who show that in Belgian manufacturing and services industries importers are more productive and larger than exporters. Considering the manufacturing sector only, we show that controlling for imports reduces dramatically the size of the export dummy. Thus, since most of exporting firms also importers, a large part of the success of exporters is apparently explained not by their exporting activities, but by their imports.

Bernard *et al.* (2005) report indirectly similar findings for the US. They show that importers are larger than exporters and that the growth in employment was faster for importers than exporters. Finally, MacGarvie (2006) shows that importing activities cause the number of foreign patents cited by importers to increase, whereas this is not true for exporters. This is taken as evidence that imports, contrary to exports, facilitate access to foreign technology.

5.2 Quantile regressions

The regression results in Table 10 suggest that rather than destroying jobs, offshoring is positively associated with employment growth at the mean. This finding is, however, still consistent with increased job instability if offshoring leads to greater job turnover. For example, offshoring might increase job destruction in some firms but increase job creation by more in others. In Table 12 we use quantile regression

to examine the effects of offshoring at different points in the distribution of ΔL_i. The 10th percentile is associated with large employment falls $\Delta L = -0.5$, the 36th percentile corresponds to static labour demand $\Delta L_i = 0$, and the 85th percentiles corresponds to large employment increases $\Delta L_i = 1$.

Evidence that offshoring is associated with greater job turnover would exist if we found that the import variables had opposite signs at opposite ends of the distribution of ΔL. In other words, if importing services caused greater job loss in declining firms and greater job creation in expanding firms. There is little evidence for this. The coefficients on ΔM_i and ΔVM_i are positive at all three points in the distribution. This is, however, a rather weak test of the effects of offshoring on job turnover, because we cannot observe simultaneous creation and destruction within firms.[13] In particular, we cannot rule out the important possibility that offshoring causes firms to change the skill composition of their workforce, by laying off (for example) unskilled workers but hiring more skilled workers.

5.3 Matching estimators

An alternative approach to measuring the impact of importing on employment growth is to explicitly match a *treated* firm (i.e. one that imports) with an observably similar *control* firm which does not import. This approach has several advantages over the regression methods used in the previous sections. Most importantly, it ensures that firms in the treatment and control groups are on the common support i.e. both types of firms have a positive probability of being observed to import. The regression-based estimates use the whole sample, which may include firms which are extremely unlikely to ever engage in services trade.

We begin by considering the impact of starting to import services. The treatment

[13] Table 6 shows that the job destruction rate is lower amongst firms which start to import compared to firms which never import.

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 firms which always import and firms which stop importing. We then use single nearest neighbour propensity score matching[14] to match a treated firm with a control firm, but we do so only for firms which have identical appearance patterns in ITIS. Thus a firm which appears in ITIS three times is only compared with another firm which appears in ITIS three times. Treated firms are matched one-to-one to their nearest neighbour on the basis of the propensity score. The propensity score is estimated using a binary Logit regression of the treatment dummy on the same characteristics as in the regressions reported in Table 10.

The unbiasedness of the propensity score estimates depends on whether the treatment and control groups can be considered observably identical after matching. In Table 14 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 14 shows that, before matching, the characteristics of the treatment and control groups are significantly different

Our employment growth results are reported in Table 13, and are largely consistent with the regression results. Starting to import services has a significant effect on employment growth, while starting to export has no significant effect.

We repeat the exercise for firms which start to trade more or less than the median amounts. Firms which import more than the median amount have larger employment effects, but firms which start exporting more than the median experience significant employment falls.

[14]The results are largely unaffected by the choice of matching method. In Table 15 we report estimates of the average treatment effect for a variety of matching methods.

6 Conclusions

Despite the popular and political debate surrounding offshoring and job loss, there is still little hard evidence linking the two. In this paper we provide the first firm-level evidence on the relationship between offshoring and employment. Our measure of offshoring is the import of intermediate services. We relate both the import and export of services to employment growth, job turnover and the probability of firm exit. Two key results emerge.

First, we can find no evidence that the imports of intermediate services is 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 or productivity effects of offshoring that give rise to an increase in the scale of production. Our finding is robust to the choice of estimation method (regression and propensity score matching).

Second, a large number of firms are engaged in the export and import of intermediate services. For those firms in the manufacturing sector these exports are *not* the export of their final good. This process is of course a logical consequence of the globalisation of production. When a firm fragments its production into stages, some services will be exported as well as imported. Thus it is not really appropriate to describe the export of these intermediate services as "inshoring". Interestingly, we find much less evidence of a positive relationship between exports and employment growth, and in some cases we find that increased exporting is associated with job loss.

These results represent initial descriptive evidence of services trade and employment at the firm-level. Two key issues call for further research. First, we would like to be able to distinguish between firms which start offshore-outsourcing from those that switch from domestic to offshore-outsourcing. It may be that the positive employment effects we observe arise because firms are engaged in the latter. To

analyse this issue requires data on firms' domestic and offshore outsourcing activities. Second, we would like to analyse how offshoring affects worker turnover within the firm, as well as employment and employment growth. In short, firms which engage in international production may lay-off some workers and hire others. Thus job security may decline despite increases in employment overall. To analyse this issue requires linked worker-firm data which includes information on firms' outsourcing activities.

References

Amiti, M. and Wei, S. (2005), "Fear of service outsourcing: Is it justified?", *Economic Policy* **20**(42), 308–347.

Amiti, M. and Wei, S. (2006), "Service offshoring and productivity: evidence from the United States", NBER working paper 11926.

Antras, P. (2003), "Firms, contracts and trade structure", *Quarterly Journal of Economics* **118**(4), 1375–1418.

Antras, P. and Helpmann, E. (2004), "Global sourcing", *Journal of Political Economy* **112**(3), 552–580.

Arndt, S. (1997), "Globalization and the open economy", *North American Journal of Economics and Finance* **8**(1), 71–79.

Bergin, P., Feenstra, R. and Hanson, G. (2006), "Outsourcing and volatility", Mimeo, University of California, Davis.

Bernard, A., Jensen, J. and Schott, P. (2005), "Importers, exporters and multinationals: a portrait of firms in the US that trade goods", NBER working paper 11404.

Biscourp, P. and Kramarz, F. (2007), "Employment, skill structure and international trade: firm-level evidence for France", Forthcoming in *Journal of International Economics*.

Blinder, A. (2006), "Offshoring: the next industrial revolution?", *Foreign Affairs* **85**(2), 113–128.

Criscuolo, C. and Leaver, M. (2005), "Offshore outsourcing and productivity", Presented at OECD conference on Globalisation of Production.

Davis, S. and Haltiwanger, J. (1992), "Gross job creation, gross job destruction and employment reallocation", *Quarterly Journal of Economics* **107**, 819–863.

Davis, S. and Haltiwanger, J. (1999), "Gross job flows", *in* O. Ashenfelter and D. Card, eds, *Handbook of Labor Economics*, Vol. 3, Elsevier Science, pp. 2711–2805.

Dixit, A. and Grossman, G. (1982), "Trade and protection with multistage production", *Review of Economic Studies* **49**(4), 583–594.

Dobbs, L. (2004), *Exporting America: why corporate greed is shipping American jobs overseas*, Warner Business Books.

Feenstra, R. and Hanson, G. (1996), "Globalisation, outsourcing and wage inequality", *American Economic Review* **86**, 240–245.

Feenstra, R. and Hanson, G. (1999), "The impact of outsourcing and high-technology capital on wages: estimates for the United States 1979–1990", *Quarterly Journal of Economics* pp. 907–940.

Greenaway, D. and Kneller, R. (2007), "Firm heterogeneity, exporting and foreign direct investment", *The Economic Journal* **117**, F134–F161.

Grossman, G. and Rossi-Hansberg, E. (2006), "Trading tasks: a simple theory of offshoring", NBER working paper 12721.

Hijzen, A. and Swaim, P. (2007*a*), "Does offshoring reduce industry employment?", *National Institute Economic Review* . Forthcoming.

Hijzen, A. and Swaim, P. (2007*b*), "Offshoring, labour market institutions and the elasticity of labour demand", Mimeo, OECD.

IMF (1993), "Balance of payments manual", 5th Edn. International Monetary Fund.

Jones, G. (2000), "The development of the Annual Business Inquiry", *Economic Trends* (564), 49–57.

Jones, R. and Kierzkowski, H. (1990), "The role of services in production and international trade: a theoretical framework", *in* R. Jones and A. Krueger, eds, *The Political Economy of International Trade*, Oxford: Basil Blackwell.

Jones, R. and Kierzkowski, H. (2000), "A framework for fragmentation", Tinbergen Institute Discussion Paper 2000-056/2.

Kohler, W. (2004), "International outsourcing and factor prices with multistage production", *The Economic Journal* **114**(494), C166–C185.

MacGarvie, M. (2006), "Do firms learn from international trade?", *restat* **88**(1), 46–60.

Markusen, J. (2005), "Modeling the offshoring of white-collar services: from comparative advantage to the new theories of trade and FDI", Mimeo, University of Colarado, Boulder.

Muûls, M. and Pisu, M. (2007), "Imports and exports at the level of the firm: Evidence from belgium", National Bank of Belgium Working paper 114.

OECD (2007), "OECD workers in the global economy: Increasingly vulnerable?", *in Employment Outlook*, OECD, pp. 105–156.

ONS (2001), "Review of the Inter-Departmental Business Register", Office for National Statistics Quality Review Series No. 2.

ONS (2003), "Report on the triennial review of the International Trade in Services Inquiry", Office for National Statistics.

ONS (2006), "United Kingdom balance of payments: The Pink Book", Office for National Statistics.

Rodrik, D. (1997), *Has Globalization Gone Too Far?*, Institute for International Economics, chapter Consequences of Trade for Labour Markets and the Employment Relationship.

Smith, D. (2006), "Offshoring: political myths and economic reality", *The World Economy* **29**(3), 249–256.

Sturgeon, T. (2006), "Services offshoring working group: Final report", Industrial Performance Centre, MIT.

UN (2002), "Manual on statistics of international trade in services", ST/ESA/STAT/SER.M/86, United Nations: New York.

UNCTAD (2004), "World investment report 2004: the shift towards services", United Nations Conference on Trade and Development.

Wagner, J. (2007), "Exports and productivity: A survey of the evidence from firm-level data", *The World Economy* **30**(1), 60–82.

A Tables

Table 1: 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 2: Services traded in 2003 by total trade value, £m

	Imports	*Exports*	*Net trade*
Payment/Receipts for the use of intangible assets	3,010	5,044	2,033
Computer Services	1,165	3,089	1,924
Research and Development	1,062	3,070	2,007
Financial Services	748	3,311	2,563
Any other trade in Services	1,435	2,573	1,138
Engineering	869	2,907	2,038
Management Charges	834	1,428	595
Legal Services	410	1,817	1,407
Telephone Services	1,174	974	−200
Advertising	689	1,414	725
Other Technical	335	1,510	1,175
Commission from Trade in Goods	424	1,093	669
Information Services	293	1,096	803
Management Consulting and PR	432	820	388
Insurance Broking	20	1,232	1,212
Other Business Services	305	788	483
Accounting and Auditing	278	621	343
Earnings from Trading in Commodities	177	383	206
Market Research and Polling	149	298	149
Operational Leasing	219	218	−1
Other Cultural and Recreational	142	271	129
Payment/Receipts for purchase or sale of intangible assets	272	138	−134
Own account earnings Related to Trade in services	33	329	296
Publishing Services	86	232	146
Recruitment and Training	97	134	37
Insurance: Premiums	169	11	−158
TV and Radio Related Services	36	137	101
Construction Services	68	83	16
Courier Services	63	61	−2
Procurement	52	51	−1
Property Management	43	58	15
Mining Services	29	63	34
Architectural	17	72	55
Surveying	21	55	33
Music Related Services	7	28	21
Postal Services	23	5	−19
Insurance: Claims	4	12	8
Agricultural Services	1	10	9
Business Services[a]	5,380	15,297	9,918
Royalties and Licence Fees	3,282	5,182	1,900
Telecomm. Services[b]	2,718	5,224	2,506
Technical Services[c]	1,339	4,699	3,360
Any other trade in services	1,435	2,573	1,138
Trade Related Services	634	1,805	1,171
Cultural services	185	436	251
Leasing	219	218	−1

[a] Business services comprise: Legal Services, Accounting and Auditing, Management Consulting & PR, Advertising, Market Research and Polling, Research and Development, Insurance, Financial Services, Property Management, Management Charges, Procurement, Publishing Services, Recruitment and Training.

[b] Telecommunications services comprise: Telephone Services, Postal Services, Courier Services, Computer Services, Information Services.

[c] Technical services comprise: Architectural Services, Engineering services, Surveying, Construction Services, Agricultural Services, Mining Services.

Table 3: Trade in services by trading region, 2003, £m

	Imports	*Exports*	*Net trade*
Western Europe	7,803	16,596	8,793
North America	4,320	9,176	4,857
East Asia	831	2,223	1,392
Middle East	693	1,713	1,020
Caribbean	248	1,412	1,165
Southeast Asia	154	1,405	1,251
Africa	316	910	594
Eastern Europe	202	581	378
Oceania	176	493	317
South Asia	214	277	63
Unknown	116	278	162
Central Asia	61	191	130
South America	53	158	105
Central America	6	21	15
United States	4,077	8,465	4,388
China	49	220	171
India	126	122	−5
Low income[a]	689	1,563	874
Middle Income	873	2,890	2,018
High income[b]	13,561	30,894	17,333

[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 4: Trade in services by service type and income of trading regions, 2003, £m

	Low income	*Middle income*	*High income*
Business Services			
Imports	97	277	4,960
Exports	347	995	13,894
Net Trade	250	719	8,934
Telecomm. Services			
Imports	249	167	2,293
Exports	80	264	4,875
Net Trade	−169	97	2,582
Technical Services			
Imports	232	148	955
Exports	721	550	3,423
Net Trade	490	402	2,468
Royalties and Licence fees			
Imports	11	42	3,220
Exports	158	708	4,309
Net Trade	147	665	1,089

Table 5: Trade in services by 1-digit SIC[a], 2003, £m

		Imports	*Exports*	*Net trade*
C	Mining and Quarrying	334	425	91
D	Manufacturing	4,330	7,070	2,740
E	Electricity, Gas and Water Supply	27	27	−1
F	Construction	71	38	−33
G	Wholesale and Retail Trade	1,496	2,622	1,127
H	Hotels and Restaurants	105	15	−90
I	Transport, Storage and Communication	1,703	2,128	425
J	Financial Intermediation[b]	1,125	4,751	3,626
K	Real Estate, Renting and Business Activities	4,884	14,056	9,172
	SIC not known[c]	557	3,054	2,497

[a] Excluding sections A (agriculture), B (fishing), L (public admin) M (education) N (Health) O (Community, social and personal services)

[b] The ABI 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 ABI.

Table 6: Employment characteristics by trading status 1997–2004

	Number of reporting units	*Total emp*	*Average emp*	*Emp growth rate*	*Share of emp change*	*Job creation rate*	*Job destruction rate*
All firms in ABI							
All firms	2,497,587	21,479,109	9	0.354	0.354	0.768	−0.414
Continuing firms	746,052	11,535,786	15	0.199	0.107	0.338	−0.139
New firms	1,027,186	6,299,652	6	2.000	0.587	2.000	0.000
Dying firms	724,349	3,643,671	5	−2.000	−0.339	0.000	−2.000
All firms in ABI-ITIS sample							
All firms	49,890	8,145,076	163	0.347	0.347	0.639	−0.292
Continuing firms	32,403	5,793,924	179	0.245	0.175	0.371	−0.126
New firms	9,147	1,526,798	167	2.000	0.375	2.000	0.000
Dying firms	8,340	824,355	99	−2.000	−0.202	0.000	−2.000
Continuing firms							
Always import	3,248	859,201	265	0.139	0.015	0.327	−0.188
Never import	24,978	3,157,855	126	0.291	0.113	0.411	−0.120
Start importing	1,481	630,176	426	0.293	0.023	0.375	−0.082
Stop importing	1,267	416,022	328	0.073	0.004	0.234	−0.161
Start and stop importing	1,429	730,670	511	0.229	0.021	0.327	−0.097
Always export	4,198	853,550	203	0.208	0.022	0.329	−0.121
Never export	24,450	3,748,363	153	0.270	0.124	0.387	−0.117
Start exporting	1,274	430,806	338	0.194	0.010	0.366	−0.173
Stop exporting	1,194	296,326	248	0.104	0.004	0.306	−0.202
Start and stop exporting	1,287	464,880	361	0.255	0.015	0.367	−0.112
Entering firms							
Imports	1,748	462,031	264	2.000	0.113	2.000	0.000
Does not import	7,399	1,064,767	144	2.000	0.261	2.000	0.000
Exports	1,915	340,020	178	2.000	0.083	2.000	0.000
Does not export	7,232	1,186,779	164	2.000	0.291	2.000	0.000
Exiting firms							
Imports	1,294	210,521	163	−2.000	−0.052	0.000	−2.000
Does not import	7,046	613,834	87	−2.000	−0.151	0.000	−2.000
Exports	1,404	167,125	119	−2.000	−0.041	0.000	−2.000
Does not export	6,936	657,230	95	−2.000	−0.161	0.000	−2.000

Table 7: Employment characteristics by trading status 1997–2004; manufacturing and services

	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)							
All firms	18,045	2,271,034	126	−0.072	−0.072	0.378	−0.449
Continuing firms	12,485	1,702,217	136	−0.009	−0.007	0.213	−0.222
Entrants	2,086	247,571	119	2.000	0.218	2.000	0.000
Exiters	3,474	321,246	92	−2.000	−0.283	0.000	−2.000
Continuing firms							
Always import	1,347	396,108	294	−0.072	−0.013	0.203	−0.276
Never import	9,376	848,151	90	0.035	0.013	0.227	−0.192
Start importing	662	163,197	247	0.052	0.004	0.239	−0.187
Stop importing	540	116,019	215	−0.116	−0.006	0.154	−0.270
Always export	1,006	209,507	208	−0.030	−0.003	0.198	−0.228
Never export	10,017	1,102,692	110	0.035	0.017	0.225	−0.190
Start exporting	516	144,158	279	−0.294	−0.019	0.141	−0.435
Stop exporting	464	107,329	231	−0.028	−0.001	0.221	−0.248
Financial and business services firms (SIC2=65–74)							
All firms	16,580	1,895,588	114	0.510	0.510	0.809	−0.298
Continuing firms	9,731	1,255,989	129	0.383	0.254	0.518	−0.134
Entrants	4,015	441,283	110	2.000	0.466	2.000	0.000
Exiters	2,834	198,316	70	−2.000	−0.209	0.000	−2.000
Continuing firms							
Always import	1,076	160,589	149	0.457	0.039	0.528	−0.072
Never import	7,179	766,886	107	0.418	0.169	0.552	−0.134
Start importing	476	121,024	254	0.335	0.021	0.453	−0.118
Stop importing	411	81,225	198	−0.008	0.000	0.339	−0.348
Always export	2,315	230,799	100	0.375	0.046	0.458	−0.083
Never export	5,890	711,884	121	0.412	0.155	0.560	−0.148
Start exporting	505	95,931	190	0.406	0.021	0.481	−0.075
Stop exporting	468	93,076	199	0.100	0.005	0.382	−0.282

Table 8: Employment characteristics by trading status 1997–2004; low- and high-income trading partners

	Number of reporting units	*Total emp*	*Average emp*	*Emp growth rate*	*Share of emp change*	*Job creation rate*	*Job destruction rate*
Trade with low-income countries							
Always import	155	155,618	1004	0.046	0.001	0.214	−0.168
Never import	31,519	5,008,334	159	0.257	0.158	0.389	−0.132
Start importing	247	328,138	1328	0.214	0.009	0.271	−0.057
Stop importing	140	157,106	1122	0.164	0.003	0.191	−0.027
Always export	413	372,803	903	0.187	0.009	0.270	−0.083
Never export	30,851	5,122,587	166	0.251	0.158	0.380	−0.129
Start exporting	385	90,625	235	0.378	0.004	0.460	−0.082
Stop exporting	267	43,218	162	0.126	0.001	0.291	−0.165
Trade with high-income countries							
Always import	1,999	548,446	274	0.155	0.010	0.316	−0.161
Never import	26,861	3,686,886	137	0.274	0.124	0.402	−0.128
Start importing	1,308	521,569	399	0.258	0.016	0.346	−0.088
Stop importing	940	594,776	633	0.149	0.011	0.248	−0.099
Always export	2,725	484,807	178	0.188	0.011	0.318	−0.130
Never export	26,627	4,299,433	161	0.257	0.135	0.383	−0.126
Start exporting	1,070	513,490	480	0.261	0.016	0.326	−0.065
Stop exporting	910	181,094	199	0.098	0.002	0.331	−0.232

Table 9: Employment characteristics by trading status 1997–2004; type of service traded

	Number of reporting units	*Total emp*	*Average emp*	*Emp growth rate*	*Share of emp change*	*Job creation rate*	*Job destruction rate*
Business services							
Always import	1,646	355,883	216	0.199	0.009	0.354	−0.155
Never import	27,664	4,097,918	148	0.268	0.135	0.392	−0.125
Start importing	1,175	628,630	535	0.249	0.019	0.323	−0.074
Stop importing	797	209,819	263	0.005	0.000	0.244	−0.239
Always export	1,745	424,568	243	0.272	0.014	0.339	−0.067
Never export	28,452	4,676,671	164	0.250	0.144	0.378	−0.128
Start exporting	820	289,320	353	0.225	0.008	0.317	−0.092
Stop exporting	625	149,046	238	0.134	0.002	0.353	−0.219
Telecoms services							
Always import	484	206,150	426	0.030	0.001	0.214	−0.184
Never import	30,597	4,758,895	156	0.257	0.150	0.386	−0.129
Start importing	506	237,265	469	0.248	0.007	0.382	−0.134
Stop importing	328	392,650	1197	0.217	0.010	0.268	−0.051
Always export	403	154,288	383	0.030	0.001	0.213	−0.183
Never export	31,310	5,196,795	166	0.252	0.161	0.381	−0.129
Start exporting	243	304,875	1255	0.272	0.010	0.305	−0.033
Stop exporting	217	51,044	235	0.223	0.001	0.401	−0.177
Technical services							
Always import	417	97,226	233	0.115	0.001	0.299	−0.183
Never import	30,771	5,310,648	173	0.250	0.163	0.374	−0.124
Start importing	363	114,859	316	0.210	0.003	0.323	−0.113
Stop importing	375	87,737	234	0.200	0.002	0.373	−0.173
Always export	930	120,723	130	0.136	0.002	0.279	−0.143
Never export	30,253	5,391,022	178	0.254	0.168	0.379	−0.125
Start exporting	393	64,174	163	0.192	0.002	0.291	−0.099
Stop exporting	428	60,270	141	0.042	0.000	0.265	−0.222

See Table 2 for relevant definitions.

Table 10: Unconditional employment growth regressions (Equation 2)

	Base model		*Include exports*		*Include ITIS appearance pattern*		*Manufacturing SIC2=15–37*		*Services SIC2=65–74*	
(a) Unweighted										
Change in import status ΔM_i	0.0787	(0.0168)	0.0817	(0.0176)	0.0508	(0.0174)	0.0326	(0.0222)	0.0923	(0.0357)
Change in value of imports ΔVM_i	0.0367	(0.0146)	0.0335	(0.0149)	0.0312	(0.0146)	0.0302	(0.0189)	0.0038	(0.0294)
Initially importing $M_{i,1997}$	0.0736	(0.0127)	0.0966	(0.0142)	0.0410	(0.0143)	0.0307	(0.0181)	0.0618	(0.0304)
Change in export status ΔX_i			−0.0015	(0.0183)	−0.0304	(0.0180)	−0.0409	(0.0244)	−0.0015	(0.0330)
Change in value of exports ΔVX_i			0.0223	(0.0144)	0.0232	(0.0141)	0.0264	(0.0202)	0.0281	(0.0240)
Initially exporting $X_{i,1997}$			−0.0486	(0.0138)	−0.0983	(0.0139)	−0.0558	(0.0194)	−0.0846	(0.0252)
Sample size	19,114		19,114		19,114		8,085		5,772	
R-squared	0.2848		0.2858		0.3119		0.3088		0.293	
(b) Weighted by firm size										
Change in import status ΔM_i	0.0700	(0.0493)	0.0970	(0.0466)	0.0577	(0.0486)	0.0210	(0.0386)	0.0631	(0.0885)
Change in value of imports ΔVM_i	0.0774	(0.0640)	0.0388	(0.0609)	0.0662	(0.0672)	0.1257	(0.0405)	0.1093	(0.0982)
Initially importing $M_{i,1997}$	0.0795	(0.0424)	0.1049	(0.0507)	0.0658	(0.0474)	0.0341	(0.0402)	0.0503	(0.0875)
Change in export status ΔX_i			−0.1195	(0.0643)	−0.1383	(0.0604)	−0.1022	(0.0555)	−0.1031	(0.0794)
Change in value of exports ΔVX_i			0.2101	(0.0634)	0.2036	(0.0650)	0.0200	(0.0597)	0.1765	(0.0837)
Initially exporting $X_{i,1997}$			−0.0729	(0.0503)	−0.0835	(0.0516)	−0.0657	(0.0522)	−0.0967	(0.0672)
Sample size	19,114		19,114		19,114		8,085		5,772	
R-squared	0.2526		0.2569		0.2932		0.2712		0.3113	

All regressions include measures of initial sales, initial employment level (10 categories), industry (33 categories), region (9 categories) and foreign ownership.

Table 11: Conditional employment growth regressions (Equation 2)

	Base model		*Include exports*		*Include ITIS appearance pattern*		*Manufacturing SIC2=15–37*		*Services SIC2=65–74*	
(a) Unweighted										
Change in import status ΔM_i	0.0367	(0.0139)	0.0341	(0.0146)	0.0104	(0.0145)	0.0157	(0.0178)	0.0171	(0.0306)
Change in value of imports ΔVM_i	0.0208	(0.0121)	0.0201	(0.0123)	0.0191	(0.0121)	0.0059	(0.0151)	0.0162	(0.0252)
Initially importing $M_{i,1997}$	0.0530	(0.0105)	0.0577	(0.0118)	0.0148	(0.0119)	0.0132	(0.0145)	0.0288	(0.0260)
Change in export status ΔX_i			0.0101	(0.0151)	−0.0129	(0.0150)	0.0356	(0.0195)	0.0187	(0.0282)
Change in value of exports ΔVX_i			0.0070	(0.0119)	0.0080	(0.0117)	0.0210	(0.0162)	−0.0030	(0.0205)
Initially exporting $X_{i,1997}$			−0.0098	(0.0114)	−0.0500	(0.0115)	0.0276	(0.0155)	−0.0446	(0.0216)
Change in sales ΔS_i	0.5219	(0.006)	0.5214	(0.0056)	0.5095	(0.0055)	0.5432	(0.0081)	0.4762	(0.0104)
Sample size	19,114		19,114		19,114		8,085		5,772	
R-squared	0.5105		0.5107		0.5246		0.5564		0.4827	
(b) Weighted by firm size										
Change in import status ΔM_i	−0.0004	(0.0308)	0.0201	(0.0344)	−0.0060	(0.0332)	0.0142	(0.0272)	0.0017	(0.0667)
Change in value of imports ΔVM_i	0.0749	(0.0404)	0.0566	(0.0414)	0.0754	(0.0424)	0.0554	(0.0308)	0.0286	(0.0718)
Initially importing $M_{i,1997}$	−0.0133	(0.0302)	0.0040	(0.0407)	−0.0265	(0.0368)	0.0043	(0.0264)	−0.0110	(0.0709)
Change in export status ΔX_i			−0.0746	(0.0431)	−0.0970	(0.0416)	−0.0918	(0.0458)	−0.0827	(0.0692)
Change in value of exports ΔVX_i			0.0973	(0.0426)	0.1048	(0.0409)	0.0463	(0.0393)	0.1597	(0.0558)
Initially exporting $X_{i,1997}$			−0.0469	(0.0410)	−0.0619	(0.0404)	−0.0421	(0.0319)	−0.0508	(0.0595)
Change in sales ΔS_i	0.5844	(0.0241)	0.5824	(0.0240)	0.5648	(0.0236)	0.6512	(0.0280)	0.5603	(0.0409)
Sample size	19,114		19,114		19,114		8,085		5,772	
R-squared	0.5288		0.5299		0.5452		0.5992		0.5195	

All regressions include measures of initial sales, sales growth rate, initial employment level (10 categories), industry (33 categories), region (9 categories) and foreign ownership.

Table 12: Employment growth quantile regressions (Equation 2)

	10th percentile		*36th Percentile*		*85th percentile*	
	$\Delta L = -0.5$		$\Delta L = 0$		$\Delta L = 1$	
Change in import status ΔM_i	0.0021	(0.0333)	0.0485	(0.0155)	0.0838	(0.0274)
Change in value of imports ΔVM_i	0.0484	(0.0280)	0.0199	(0.0129)	0.0099	(0.0242)
Initially importing $M_{i,1997}$	−0.0161	(0.0267)	0.0243	(0.0127)	0.0631	(0.0223)
Change in export status ΔX_i	−0.0595	(0.0352)	−0.0032	(0.0162)	−0.0767	(0.0279)
Change in value of exports ΔVX_i	0.0329	(0.0280)	0.0022	(0.0127)	0.0411	(0.0218)
Initially exporting $X_{i,1997}$	−0.1110	(0.0258)	−0.0520	(0.0123)	−0.1409	(0.0219)
Sample size	19,114		19,114		19,114	
Pseudo R-squared	0.1021		0.1377		0.2733	

All regressions include measures of initial sales, initial employment level (10 categories), industry (33 categories), region (9 categories) and foreign ownership.

Table 13: Propensity score matching estimates: employment growth

	ATT	*S.E.*[b]
Import effects[a]		
Starting to import between 1997 and 2004	0.102	(0.024)
Starting to import less than median (£27,000)	0.051	(0.033)
Starting to import more than median	0.100	(0.040)
Export effects[a]		
Starting to export between 1997 and 2004	0.012	(0.026)
Starting to export less than median (£42,000)	0.086	(0.039)
Starting to export more than median	−0.076	(0.035)

[a] Treatment group comprises firms which start importing (exporting) between 1997 and 2004. 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 10.

[b] Bootstrapped standard errors, 50 replications.

Table 14: Propensity score matching estimates: balancing tests

	Unmatched		*Matched*	
	$p < 0.1$	$p < 0.05$	$p < 0.1$	$p < 0.05$
Import effects[a]				
Starting to import between 1997 and 2004	95/385	71/385	9/385	3/385
Starting to import less than median (£27,000)	87/385	68/385	8/385	2/385
Starting to import more than median	61/385	45/385	6/385	1/385
Export effects[a]				
Starting to export between 1997 and 2004	80/385	65/385	9/385	3/385
Starting to export less than median (£42,000)	68/385	43/385	7/385	0/385
Starting to export more than median	52/385	34/385	4/385	1/385

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 seven appearance patterns, hence $55 \times 7 = 385$ mean comparisons.

Table 15: Propensity score matching estimates: robustness to choice of matching

Matching method	*Number of neighbours*	*Common support*	*Sampling w. replacement*	*Caliper*	*Treatment*	*Control*	*ATT*	*S.E.*
(a) Import effects								
Raw difference	N	not imposed	no	none	1407	13337	0.024	(0.019)
Nearest neighbour	1	imposed	yes	none	1373	1103	0.102	(0.024)
Nearest neighbour	1	not imposed	yes	none	1388	1105	0.105	(0.024)
Nearest neighbour	1	imposed	no	none	1373	1373	0.079	(0.026)
Nearest neighbour	2	imposed	yes	none	1373	1988	0.110	(0.026)
Nearest neighbour	1	imposed	yes	yes (0.05)	1370	1103	0.099	(0.029)
Kernel matching	N	imposed	-	-	1370	12945	0.082	(0.025)
(b) Export effects								
Raw difference	N	not imposed	no	none	1205	13306	0.015	(0.020)
Nearest neighbour	1	imposed	yes	none	1182	987	0.012	(0.026)
Nearest neighbour	1	not imposed	yes	none	1197	989	0.012	(0.032)
Nearest neighbour	1	imposed	no	none	1182	1182	0.031	(0.029)
Nearest neighbour	2	imposed	yes	none	1182	1784	0.039	(0.029)
Nearest neighbour	1	imposed	yes	yes (0.05)	1179	987	0.009	(0.028)
Kernel matching	N	imposed	-	-	1179	12983	0.019	(0.020)