

# **Investigation into the Extensive and Intensive margins of Growth in the Value of UK Exports and the Role of SME Exporters**

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## Executive summary

This report uses firm-level trade data for the UK to gain a better understanding of how growth in the value of goods and services exports is related to the extensive and intensive margins of trade. It explores in particular how these margins may vary across markets, sectors, and size of exporters. It also considers aggregate trade behaviour across products, markets and time in the context of the UK Government's twin objective of increasing total exports to £1 trillion and the number of exporters by 100,000 by 2020. It then uses the analysis to model the potential effects on customs revenues likely to result from changes in import documentation.

We summarise the main findings in four sections below: the literature review; the analysis and modelling of UK goods exports data; analysis and modelling of UK services exports data; modelling the potential impact of changes in import documentation.

### Part 1: Literature review

As a first step, the literature review explains how total exports can be 'decomposed' into different 'margins' on which variations in export volumes and values can occur. In this report, four margins of trade are defined: The number of exporting firms, the average number of countries these firms export to, and the average number of products they export to, a country are the three 'extensive margins'. The intensive margin is average firm exports, either in total, or, in its tightest definition, the average value of a product exported to a destination country.

The literature is subsequently reviewed to derive five stylized facts on the export margins, based on firm-level data analysis:

**Stylized Fact 1:** Exporting firms are very different from each other in terms of the value of their exports: a minority is responsible for the bulk of total trade. Large exporters are typically firms selling many products to many markets.

**Stylized Fact 2:** The extensive and intensive margins of trade vary considerably across destination countries. However, most of the variation in aggregate exports across countries is due to the extensive margins with the intensive margin playing a secondary role

**Stylized Fact 3:** The extensive margins are positively related to the size of the destination country and negatively related to distance to the destination country. The intensive margin is negatively related to the size of the destination country and positively related to distance to the destination country.

**Stylized Fact 4:** When considering a short time interval (a year or less) changes in aggregate exports are largely driven by changes in the intensive margin. When considering a medium to long time interval (5 to 10 years) changes in aggregate exports are mostly driven by changes of the extensive margins.

**Stylized Fact 5:** Export status is characterized by a high degree of persistency. Nevertheless, many new firms start exporting every year selling little but very few of the new exporters keep exporting for two years or more. New exporters account for a little share of trade levels but for about half of trade growth over a 10 years horizon.

**The evidence on trade in services is more limited, but finds significant differences from the patterns identified in the literature for goods:**

- (i) The degree of concentration of exports values among firms for trade in services is lower than for trade in goods;
- (ii) There are many more single-country and/or single product large exporters; and
- (iii) Across firms, the country and product extensive margins are relatively less important for service trade.

## **Part 2: Data analysis and modelling: UK Exports of goods**

The second part of the project provided some new analysis of the characteristics of UK goods exports, using, firm-level transaction export data from HM Revenues and Customs matched to data on firm size and sector from the FAME dataset. The analysis included both descriptive statistics, and econometric analysis of trade margins.

The UK trade data displays a wide span of export destinations, with the EU, the US and OECD being the largest. Considering the different products exported, finished manufactures is the most exported product category representing close to half the total export value and the largest number of firms. The main findings for trade in goods are:

*Exports of goods are highly concentrated among a few large firms.* Large firms (more than 250 employees) are a minority of exporting firms, but responsible for 68% of total trade in goods. They tend to sell many products to many markets. Across all size bands, larger values of export sales are clearly associated with selling more products to many markets.

Classifying firms in terms of the number of products and countries they export to, it is shown that 29.9% of UK exporting firms export only one product to only one market but account for only 1.1% of total exports. In contrast, 24.4% of firms export four products or more to 6 countries or more but account for the bulk of trade (87.4%).

*The variation in aggregate exports across destination countries, as well as the dominance of the EU and USA in the case of the UK, is largely due to the extensive margins, rather than to the intensive margin.* The analysis of UK exports of goods found that the size of the respective contributions of the extensive and intensive margins varies significantly across destination markets. For example, total exports to the US are 340% higher than those to China and the number of exporting firms is 222% greater. However, the average number of products exported to the US is only 39% greater while average exports per firm per product are less than 1% higher when exporting to the US. In contrast, total exports to China are 62% higher than those to India but the number of firms exporting to India is higher and the number of products exported only 1.7% greater in China. The difference in aggregate exports is mainly driven by average exports being 62% higher.

*When looking at the dynamics of trade, it is shown that there is a lot of churn within the exporter population, but the number of exporting firms remains stable.* This is because the number of firms beginning to export over this period was approximately matched by the number of firms who dropped out of exporting over the period. Specifically, for goods, 2009 there were 82,263 exporters, and in 2011 there were 81,085; 33.4% of those exporting in 2009 had ceased to do so by 2011 and were replaced by new exporters.

*Long term exporters contribute most to total export value.* Firms that remained exporters in both 2009 and 2011 represented about 94% of total exports in each year: they export more, to a larger numbers of products and to more destinations. New exporters and exiting firms export little, a small number of products to only a few countries.

*However, when looking at the growth in aggregate exports, new exporters are responsible for more than half of it over a long time frame (2005 to 2011).* Over a short time interval (a year

or less), changes in aggregate exports are largely driven by changes in the intensive margin. When considering a medium to long time interval (5 to 10 years), however, changes in aggregate exports are mostly driven by changes of the extensive margins. Focussing on the dynamics of non-EU exports of goods between 2005 and 2011, the analysis found that new exporters accounted for 54.9% of exports growth over this period. The highest contributions to growth in exports were by both the largest firms (250+) and the smallest firms (1-50 employees). Most of the remaining exports growth can be attributed to existing large exporters that remained so through time.

Modelling export margins, a Poisson econometric model is estimated via Quasi-Maximum-Likelihood to investigate the determinants of each of the four margins decomposing total UK exports of goods: the firm, product and country extensive margins and the intensive margin. The analysis shows how these margins vary with size and distance of the destination export market, and are consistent with findings in the literature relating to goods exports from other countries:

- Firms export higher average values to large and nearby countries, and to countries with common language;
- The average number of products exported by each exporting firm is also greater for exports to larger and nearby countries as well as for ex-colonies and countries with common language;

Our analysis then uses the econometric model to provide a sophisticated prediction of future UK exports growth and the contributions of the various margins. Based on the descriptive analysis, our analysis made the assumption that the number of exporters remains stable. Our modelling therefore focused on the determinants of changes over time in the product and country extensive margins, and in the intensive margin. Furthermore, we assume stability in factors other than time and GDP growth in destination countries. Our model uses GDP growth forecasts to 2017 available from IMF.

The model shows that a continuing trend of globalisation and current GDP growth forecasts for destination countries would imply an increase in UK trade in goods by almost 60% between 2011 and 2017: the number of export destinations per firms will increase by 12.13%, the number of product exported per firm per destination by 13.56% and the exports of a typical product by a firm in a given destination by 25.35%. Total UK goods exports are predicted to increase to 478,188 million £ by 2017.

### **Part 3: Data analysis and modelling: International services exports**

The report describes and analyses data from the Office for National Statistics on exports of services by UK firms. It is matched to data on firms' employment and industry. The export destinations for services present similar patterns as those for goods. In terms of products, the most important category is Business services, both in terms of total transactions value and the weighted number of firms.

The pattern for service exports shows much less concentration, with large firms accounting for only around a quarter of exports by value. There is also a much less clear association between export value and the number of products and markets, with many more firms exporting large values of a single project, and/or to a single-country. More than 80% of UK services exporters export only one product, and half of these export only to one country.

The margins decomposition by country shows the same variation in margins contributions across destinations as in the case of goods. The EU has the highest value of total exports as well as the largest extensive margins in terms of products and countries. While total exports of services to the US are 375% higher than to China, the number of exporting firms is 595% larger. The number of products exported is only 8% higher and the average exports 411% higher in the US than in China. As is the case for goods exports, it is the intensive margin that is the driver of higher exports to China than to India due to a larger GDP. By firm size, the margins show the same pattern although margins' differences between size categories are smaller and there are relatively many more small firms exporting services than goods.

Finally, service exports dynamics show less of a dominance of large firms in exports growth. In the case of services our analysis focused on total UK services exports for the shorter period 2003-2005, due to data availability. Despite the shorter period, the corresponding contribution of new exporters is actually even higher, at 79.9% of which around half was attributable to firms with more than 250 employees, with the smallest group (10-49 employees) again accounting for the second largest share in total export value growth. This figure is not directly comparable to that for exports of goods given the survey nature of the data for services exports.

Predicting future UK service exports cannot be done as precisely as for goods due to a lack of data but we make the further assumption that their value is likely to grow at least as rapidly



over the period as the value of goods. In total, it can be predicted that total exports from the UK (goods and services) in 2017 will be over £860,000 million.

#### **Part 4: Modelling the potential impact of changes in customs formalities**

In the final section of the project, we use the model we developed in the earlier part of the project to evaluate the impacts of custom formalities and paperwork on the different margins of UK imports of goods, and to derive estimations of the likely potential impact on HMRC revenue of changes in the documentation required for importing into the UK, so contributing to tax policy making and development which part of one key HMRC function (policy development).

Our estimations indicate that each additional import document decreases UK imports from non-EU countries by roughly 8%. Therefore, the 4 documents currently required to import in the UK correspond to 32% less imports from extra-EU countries. From HMRC revenue perspective, eliminating one of such four documents would increase revenues from custom duties by 240 million £. Nevertheless, it is important to highlight that custom formalities and paperwork represent a compromise between different needs. On the one hand firms may dislike them. On the other hand formalities are needed, besides other things, to ensure tax compliance and the safety for UK consumers. Therefore, our results do not mean that custom formalities are unnecessary barriers to trade but certainly call for a more in-depth cost-benefit analysis.

#### **Conclusions and Policy recommendations**

The report provides some conclusions and recommends that policies should focus not on the total number of exporters that is bound to remain very stable. Our analysis suggests that achieving the government's target will require:

- Policies to help ensure that UK firms are able to capture the full potential of high GDP growth markets such as Brazil, China, India and Russia;
- Policies to help ensure a continuing annual influx of new exporters, and to help ensure successful persistence in exporting among more of those who begin to export;

- Policies which focus on large firms as well as on SMEs and new exporters. In addition to the necessity of new exporters, the model also confirms the important contribution to exports growth of large firms with more than 250 employees.

By exploiting the opportunities offered by globalisation and GDP growth in export destinations £1 trillion exports objective might be achieved.

Concerning the current level of UK customs formalities on imports our analysis uncovers some sizeable costs in terms of both foregone trade and customs duties while suggesting the need for policies involving ways of simplifying the documentation such that the practical burden could be reduced.

## 1 Introduction

Firm-level trade data has been heavily used by the recent academic literature to provide sharper and deeper insights on the nexus between the high degree of firm heterogeneity in dimensions like productivity and innovation on the one side and the substantial variation across firms in terms of trade participation and performance on the other side. Firm-level trade data has also been used to improve our understanding of aggregate trade behaviour across products, markets and time. In particular, such data can be used to gain quantitative insights on the respective contributions of the extensive and intensive margins of trade to growth in the value of exports. This report seeks to do so for UK exports of both goods and services, by exploring how these margins may vary across markets, sectors, and size of exporters. This is of particular importance in the context of the UK Government's twin policy aims relating to export growth:

- To increase the total value of UK exports to £1tr by 2020
- To increase the total number of UK exporters by 100,000 by 2020

Both objectives require an above-trend increase in the export percentage of GDP and imply some combination of an increase in the export incidence among UK businesses ('extensive margin') and/or an increase in export intensity among UK businesses who are already exporting ('intensive margin'). The recent literature on international trade, surveyed in Bernard et al. (2012), has indeed highlighted the key role of firm heterogeneity, productivity, and allocation effects in determining trade performance. More specifically, such literature points to the importance of micro trade data which, by providing the researcher with the possibility of analysing the different margins of trade, allows for a sharper and deeper analysis of trade flows and trade dynamics.

The research was commissioned by UKTI to help provide deeper understanding of the respective contributions to growth in the value of UK exports, in order to understand better the contributions which its services can make to this growth, and over what time period. Specifically, the UKTI research aims were to:

- Document exporter numbers and size profile, for both goods and services;
- Document the respective contributions of exporter groups to the value of exports of goods and services;
- Document the respective contributions to export value growth of new and established exporters, and the incidence of exporter persistence and its effects on growth in export value;
- Document the respective contributions of exporter numbers and average export values to differences in total UK export values to different market destinations;
- Predict the contributions of intensive and extensive margins to future export growth;
- Predict the contributions of firms of different size bands to future export growth;
- To draw out policy implications relating to the 2020 export value growth target.

The analysis of HMRC data on UK goods exports has been carried out with the further two aims, which seek to benefit policy development in HMRC, specifically with respect to customs formalities and the resulting revenue flows:

- To apply the analysis of extensive and intensive margins to model the impact of customs formalities on trade flows, in aggregate and for particular regions;
- To derive estimates of the potential impact on customs revenues of changes in the required level of customs documentation for imports into the UK.

To address the descriptive research aims, this study develops a cutting-edge research design, inspired by recent methodologies used in the field of applied international trade, to analyse the contribution of the extensive and intensive margins to the value and growth of UK exports, both across all destination markets as well as with respect to some specific markets. Subsequently, to address the predictive aims of this project we use a trade growth model similar to the one developed in Behrens et al. (2013) to predict future UK exports growth. The model is particularly suited for this analysis as it allows for growth along different margins of trade (extensive, product and country export portfolio, intensive, etc.).

In this study we have paid particular attention to two dimensions of heterogeneity across firms: firm size and industry affiliation. Indeed, in order to maximize the effectiveness of UKTI services and help achieve the UK Government's objectives, it is important to understand whether targeting specific firms would eventually lead to higher exports' growth.

To better qualify the scope of our research we also want to stress what this report is not about. In performing our analysis we will be using micro data on trade in goods and trade in services for the UK. However, our service trade data is a sample while goods trade data does not correspond to the universe of exporters because of non-negligible reporting thresholds for trade with EU countries. Therefore, the different figures on the number of exporters reported in our analysis are bound to be considerably lower than the real ones. The reader interested in more accurate figures on the number of exporters of goods and/or services in the UK can nevertheless refer a recent ONS report.<sup>3</sup>

The rest of this report is organized as follows. Section 2 provides a review of the literature on the extensive and intensive margins of trade while Section 3 delivers a number of stylized facts about such margins and relates them to both the underlying theory and the specific data used. In Section 4 we analyze UK trade in goods and provide a number of descriptive results as well as our findings about the exports growth model estimation and predictions. In Section 5 we do the same for trade in services. We draw our conclusions and policy implications in Section 6 and provide some additional information and Tables in Annexes I and II.

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<sup>3</sup> “Annual Business Survey (ABS): Exporters and importers in Great Britain”, ONS Information Paper, 30 April 2013.

## 2 Literature Review

### 2.1 Definitions of the Extensive and Intensive Margins of Trade.

The terms extensive and intensive margins of trade refer to different elements in the differences or changes which occur across firms, markets or time in the volume and value of exports and imports, and which combine to result in the observed differences in overall volume and value at aggregate level. Thus for example any given level of change in total exports over time may result from myriad different combinations of change in any of the following:

- Firms: (a) Total number of exporters, or (b) value or volume of exports per firm;
- Countries: (a) Total number of export destination countries, or (b) value or volume of exports per country;
- Product: (a) Total number of products exported, or (b) value or volume of exports per product;

The economic literature refers to these different elements as different ‘margins’ along which trade values and volumes can vary, and describes the analysis of the respective contributions of these different margins to total export or import levels or growth as ‘decomposition’ analysis. The terms ‘extensive’ and ‘intensive’ refer respectively to (a) differences in the total number (of exporters, or of markets, or of products), and (b) differences in the average volume or value (per exporter, or per market, or per product). Thus a change in the number of exporters from the UK would be referred to as a change at the ‘extensive margin’, while a change in the average value or volume per exporter would be referred to as a change at the ‘intensive margin’.

The number of possible combinations of these elements is clearly large, and can cause confusion over terminology and interpretation. For example, a study which is focusing on decomposition of UK export growth to particular destination countries, might refer to the ‘product extensive margin’ to refer to the total number of products exported by the UK to the destination country, or might also refer to the ‘firm product extensive margin’, to refer to the average number of products exported by each individual exporter. By contrast, another study might focus on decomposition of export growth by individual firms, and hence be interested in analysis of the ‘market and product extensive and intensive margins’, to see what lies behind the export value growth achieved by these exporters.

Different studies have used different definitions for the extensive and intensive margins, and so have focused on different decompositions of aggregate trade. Moreover, some studies have focused on individual firms, while other studies have used aggregate sector level data, in which changes within the trade values and volumes by individual firms cannot be identified. However, the definitions of intensive and intensive margins which appear in the literature do share similar traits, can in most cases be related to each other, and overall provide a coherent picture of trade patterns across firms, countries, products and time.

In what follows we refer to studies using *firm-level* based decompositions and related definitions of the extensive and intensive margins.

The simplest way to decompose, for example, total exports  $\mathbf{X}$  of the UK in a given year is the following:

$$\mathbf{X} = f * x, \quad (1)$$

where  $f$  is the number of UK exporting firms (extensive margin) and  $x = \mathbf{X}/f$  is average exports per firm (intensive margin). Equation (1) can also be used to decompose total UK exports to a specific country into the number of firms exporting to that country and their average exports. At the same time, equation (1) can be used to decompose total UK exports of specific firm groups (Ex., large and small firms or firms belonging to different industries) into the number of exporting firms belonging to a group and their average exports.

Decomposition (1) has been the first one to be used in the literature due to the relatively low amount of information needed. It is also simple to understand, and has a clear and direct interpretation relevant to the respective policy aims of seeking to increase the number of exporters on the one hand, and seeking to help established exporters achieve growth in the value of their exports, on the other.

However, with the increasing availability of information on firms' exported products and destination countries finer decompositions of a country's total exports  $\mathbf{X}$  have become possible. For example, Bernard et al. (2009) use the following decomposition:

$$\mathbf{X} = \sum_c \mathbf{X}_c = \sum_c f_c * p_c * d_c * y_c, \quad (2)$$

where  $\mathbf{X}$  stands, as in (1), for total exports of the UK in a given year. To get (2) Bernard et al. (2009) start from total UK export to country  $c$  ( $\mathbf{X}_c$ ) being equal to the number of exporting firms to country  $c$  ( $f_c$ ), times the number of products exported by those firms to country  $c$  ( $p_c$ ), times average exports per firm-product combination to country  $c$  ( $z_c = \mathbf{X}_c / (p_c * f_c)$ ). This more detailed decomposition also has a clear and direct interpretation relevant to export support policy, as the distinction between helping firms to increase the number of countries to which they export, and encouraging more firms to begin exporting to particular markets – such as high growth markets - on the one hand, and on the other hand helping firms to achieve growth in the value of their exports to particular markets by increasing the number of products exported to the market.

An important empirical finding of this literature is that most firm-product combinations ( $p_c * f_c$ ) correspond to zero trade, i.e., they are not observed in the data.<sup>4</sup> In order to take account of this, Bernard et al. (2009) further decompose the term  $z_c$  into the share of firm-product combinations actually observed in the data ( $d_c$ ) and average exports per firm-product referring to combinations with positive trade ( $y_c$ ) with  $z_c = d_c * y_c$ . Equation (2) thus decomposes total UK exports  $\mathbf{X}$  into the sum of exports to each country  $c$  ( $\mathbf{X}_c$ ) with the latter

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<sup>4</sup> Depending on reporting thresholds used for capture of trade data, the appearance of zero trade could in reality mean that trade for this particular firm-product combination is too small to be recorded in the data.

being divided into the number of firms exporting to country  $c$  ( $f_c$ ), the number of exported products ( $p_c$ ), the *density of trade* ( $d_c$ ), and average exports per firm-product for combinations with positive trade ( $y_c$ ). Bernard et al. (2009) refer to  $f_c$ ,  $p_c$ , and  $d_c$  as the extensive margins (firm, product and density margins, respectively) and to  $y_c$  as the intensive margin.

There is a simple relationship between decompositions (1) and (2). Based on (1) total exports to country  $c$  can be decomposed as  $\mathbf{X}_c = f_c * x_c$  where  $f_c$  is the same as in (2), i.e., the number of firms exporting to country  $c$ , and  $x_c = \mathbf{X}_c / f_c$  corresponds to average exports per firm in country  $c$  and is such that  $x_c = p_c * d_c * y_c$ . Therefore, what corresponds to the intensive margin in (1), can be further decomposed by (2) into two extensive margins (product and density) and a finer intensive margin  $y_c$ . As in the case of (1), equation (2) can be used to decompose total UK exports of specific firm groups (Ex., large and small firms or firms belonging to different industries). In addition to (1), equation (2) can be used to decompose total UK exports of specific product groups (Ex., consumer durables, capital goods, etc.).

In our analysis we will make use of a decomposition similar to (2) and first introduced in the literature by Behrens et al. (2013). Starting from total UK exports  $\mathbf{X}$  in a given year Behrens et al. (2013) decompose them as follows:

$$\mathbf{X} = f * \bar{c} * \bar{p} * \bar{x}, \quad (3)$$

where  $f$  is the number of UK exporting firms,  $\bar{c}$  is the average number of countries these firms export to,  $\bar{p}$  is the average number of products firms export in a country, and  $\bar{x} = \mathbf{X} / (f * \bar{c} * \bar{p})$  corresponds to average firm exports of a product in a country. Behrens et al. (2013) refer to  $f$ ,  $\bar{c}$  and  $\bar{p}$  as the extensive margins (firm, country and product margins, respectively) and to  $\bar{x}$  as the intensive margin.

There is a simple relationship between decompositions (1) and (3). The number of exporting firms  $f$  is the same in both decompositions while average firm exports in (1) are such that  $x = \bar{c} * \bar{p} * \bar{x}$ . Again, what corresponds to the intensive margin in (1), can be further decomposed by (3) into two extensive margins (country and product) and a finer intensive margin  $\bar{x}$ . As in the case of (2), equation (3) can be used to decompose total UK exports to specific countries and/or UK exports of specific firm groups and/or specific product groups.

To gain more insights into the flexibility of use and amount of information embedded into (3) let us consider UK exports to the US:  $\mathbf{X}_{US}$ . Building on (1) one can decompose  $\mathbf{X}_{US}$  into the number UK firms exporting to the US ( $f_{US}$ ) times the average exports of such firms ( $x_{US}$ ). Building on (3) one can instead decompose  $\mathbf{X}_{US}$  into  $f_{US}$  times the average number of products sold by these firms ( $\bar{p}_{US}$ ) times average exports per product sold by these firms ( $\bar{x}_{US}$ ).

Clearly  $x_{US} = \bar{p}_{US} * \bar{x}_{US}$ . However, the second decomposition provides more information in that it allows distinguishing between situations where  $x_{US}$  is high because of a high number of products exported or because of a few products associated to large exports. This type of information becomes very important when comparing firm export performance across different markets as well as firm export performance across different firm groups. For example, total exports of large UK firms (that we shall index with L) can be decomposed as  $\mathbf{X}_L = f_L * \bar{c}_L * \bar{p}_L * \bar{x}_L$ , where  $f_L$  is the number of large UK firms,  $\bar{c}_L$  is the average number of countries they export to,  $\bar{p}_L$  is the average number of products such firms sell per market and  $\bar{x}_L$  are average sales per product sold in a market.

Using the same reasoning one can decompose total exports of small and medium UK firms (that we shall index with S) as  $\mathbf{X}_S = f_S * \bar{c}_S * \bar{p}_S * \bar{x}_S$ . Clearly, the total number of UK exporters is  $f = f_L + f_S$  while total UK exports are  $\mathbf{X} = \mathbf{X}_L + \mathbf{X}_S$ . At the same time average exports of large (small and medium) UK firms are  $x_L = \bar{c}_L * \bar{p}_L * \bar{x}_L$  ( $x_S = \bar{c}_S * \bar{p}_S * \bar{x}_S$ ). Crucially, the full decomposition allows understanding whether, for example, large firms export on average more than small and medium firms because they export to more countries and/or export more products per country and/or export more of a typical product in a country.

Furthermore, by comparing the different margins of  $\mathbf{X}_L$  and  $\mathbf{X}_S$  across country groups one can gain further insights into how differently small and large firms perform. For example, small and medium firms might not be necessarily selling on average fewer products to less EU countries than large firms suggesting that export hurdles within the EU do not disproportionately affect small and medium firms.

## 2.2 Theoretical Foundations of the Extensive and Intensive Margins

The simplest trade model featuring both an extensive and an intensive margin of trade is Krugman (1980). In Krugman (1980) all firms participate to trade, i.e., the extensive margin of UK exports would correspond to the total number of UK firms. Furthermore, all UK firms would export the same amount of goods and services to a given country while charging the same price. These features are shared by a class of models that can be labelled as ‘representative-firm trade models’, because they are based on analysis of a theoretical business population in which differentiated characteristics and behaviour at individual firm level do not feature. In such models, since there are no differences across individual firms, changes cannot occur in the number of firms exporting, and total exports of the UK across different countries would vary only because of variation in the intensive margin of trade. Variation of the intensive margin in these models is typically related to trade costs (transportation, tariffs, information, etc.) being different across different countries.

Growing empirical evidence has shown, among other important findings, that only a fraction of firms exports, and that those who do export differ significantly from those who do not. In particular, the evidence demonstrated that the most productive firms are more likely to be exporters, and that firms’ export participation varies widely depending on the destination



country (Bernard and Jensen, 1999). These stylized facts could not be understood using the theoretical framework of representative firm trade models.

This has led to the emergence of ‘heterogeneous-firms trade models’, pioneered by Melitz (2003). More recent models, like Bernard et al. (2011) and Mayer et al. (2011), feature multi-product firms that are heterogeneous in terms of their productivity and optimally choose the products they sell and the countries they export to. Self-selection is at work with only the most productive firms being able to absorb the costs of exporting which have both a country and a product component. In these models part of the costs of exporting is fixed, i.e., not related to the value of exports, so implying that export scale matters for firms. Furthermore, in dynamic versions of these models (Impullitti et al., 2013) the costs of exporting include a sunk component, i.e., costs that have already been incurred and cannot be recovered, which implies hysteresis/persistency in firm export participation. In this respect, the empirical literature provides strong evidence of the presence of sizeable fixed and sunk export costs (Das et al., 2007) that are to some extent market-specific (Moxnes, 2010).

A more recent strand of the literature is concerned with the dynamics of the extensive and intensive margins of trade and the massive presence of short-lived export participations. Though characterized by an overall strong degree of persistency over time, export activity can be erratic, especially when considering young exporters (Eaton et al., 2008). This literature highlights the importance of marketing costs (Arkolakis, 2010), learning about foreign demand (Eaton et al., 2012), and learning about the foreign partner (Araujo et al., 2012) in order to rationalize the presence of small exporters, short-lived export participations and the spectacular exports growth of some young exporters.

### 3 Stylized Facts about the Extensive and Intensive Margins

Stylized facts about the extensive and intensive margins of trade can be broadly divided into cross-sectional and dynamics. The former group refers to patterns of the extensive and intensive margins at a given point in time. The latter group comprises instead patterns of the extensive and intensive margins across time. For most stylized facts there is more evidence referring to trade in goods because of better data quality and availability. However, there is an increasing number of contributions on the extensive and intensive margins of trade in services to which we will refer in what follows.

#### 3.1 Cross-sectional Stylized Facts

**Stylized Fact 1:** *Exporting firms are very different from each other in terms of the value of their exports with a minority of them being responsible for the bulk of total trade. Large exporters are typically firms selling many products to many markets.*

Stylized fact 1 has been first highlighted by Bernard et al. (2009) with US data on trade in goods and has been confirmed by numerous subsequent studies. Of particular interest among these studies is Mayer and Ottaviano (2007) who provide supporting evidence using data on trade in goods for 7 EU countries including the UK (Germany, France, United Kingdom,

Italy, Hungary, Belgium and Norway).<sup>5</sup> Mayer and Ottaviano (2007) show that, despite the degree of concentration of exports values depends on the specific country considered and data type, the overall picture is rather consistent with the top 10% of exporters accounting for at least 70-80% of total trade in goods. Furthermore, large exporters are typically multi-country and multi-product firms.

These findings have been confirmed for trade in services by Breinlich and Cariuscolo (2011) for the UK, Kelle and Kleinert (2010) for Germany, Gaulier et al. (2011) for France, Federico and Tosti (2010) for Italy, Walter and Dell'mour (2010) for Austria, and Ariu (2012) for Belgium. Though, these studies suggest that the degree of concentration of exports values for trade in services is lower than for trade in goods and that there are many more single-country and/or single product large exporters in service trade.

In terms of the connections with economic theory stylized fact 1 is consistent with heterogeneous-firms trade models. In these models underlying differences in productivities across firms not only map into trade participation of a subset of firms, but also into substantial differences in traded values among exporting firms. Thus in these models firms with higher productivity will also export larger values, conditional on beginning to export.

Furthermore, the fact that large exporters are typically multi-country and multi-product firms is consistent with Bernard et al. (2011) and Mayer et al. (2011). To enter a new market and/or export a new product firms need to incur additional costs that only the largest and most productive firms are able to profitably cover.

**Stylized Fact 2:** *The extensive and intensive margins of equation (2) vary considerably across destination countries. However, most of the variation in aggregate exports across countries ( $X_c$ ) is due to the extensive margins (number of firms that trade and the number of products that are traded, i.e.,  $f_c$ ,  $p_c$  and  $d_c$ ) with the intensive margin ( $y_c$ ) playing a secondary role.*

Stylized fact 2 has been first highlighted by Bernard et al. (2009) with US data on trade in goods and has been confirmed by numerous subsequent studies. Of particular interest among these studies is, again, Mayer and Ottaviano (2007) who provide supporting evidence using a similar decomposition with data on trade in goods for 7 EU countries including the UK.

These findings have been confirmed for trade in services by Breinlich and Cariuscolo (2011) for the UK, Kelle and Kleinert (2010) for Germany, Gaulier et al. (2011) for France, Federico and Tosti (2010) for Italy, Walter and Dell'mour (2010) for Austria, and Ariu (2012) for Belgium. Though, these studies suggest that the extensive margins are relatively less important for service trade.

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<sup>5</sup> FAME data has been used for the UK. The 'export' variable in this dataset is 'overseas turnover', which does not distinguish between revenues derived from exports and those derived from sales by overseas subsidiaries. The dataset also has limited coverage of data for SMEs, and lacks detail on export destinations and products. It has been used in the literature in the absence of access to a better source of firm level export data for the UK.

In terms of the underlying theory stylized fact 2 has the following implications: In Bernard et al. (2011) and Mayer et al. (2011) variable trade costs (like tariffs and transportation costs) and the size of the destination country affect both the extensive and intensive margins. However, conditional on exporting a given product in a given market, the value of a firm exports is not affected by market- and/or product-specific fixed and sunk costs. Indeed, conditional on exporting firms decide how much to exports by simply equating marginal costs (which includes variable trade costs) and marginal revenues (which includes the size and elasticity of foreign demand).

Therefore, stylized fact 2 suggests that market- and/or product-specific fixed and sunk costs are extremely important to understand the cross-country variation of exports.

**Stylized Fact 3:** *The extensive margins of equation (2) are positively related to the size of the destination country and negatively related to distance to the destination country, i.e., more firms export and more products are exported to large and close countries. The intensive margin of equation (2) is negatively related to the size of the destination country and positively related to distance to the destination country, i.e., average exports values are smaller for large and close countries.*

Stylized fact 3 has been first highlighted by Bernard et al. (2007) with US data on trade in goods and has been confirmed by numerous subsequent studies. Of particular interest among these studies is, again, Mayer and Ottaviano (2007).

These findings have been confirmed for trade in services by Breinlich and Ciruscolo (2011) for the UK, Kelle and Kleinert (2010) for Germany, Gaulier et al. (2011) for France, Federico and Tosti (2010) for Italy, Walter and Dell'mour (2010) for Austria, and Ariu (2012) for Belgium.

The fact that more firms export and more products are exported to large and close countries is rather intuitive. Distance is a good proxy for both variable and fixed/sunk trade costs. Therefore, closer countries are characterized by lower overall trade costs and firms will be, ceteris paribus, more likely to export in those markets and offer a wider range of their products. Furthermore, larger countries correspond to larger demand for the products of a firm thus increasing its capacity to cover fixed/sunk trade costs and the likelihood of its presence.

Though apparently counter-intuitive, the fact that average exports values are smaller for large and close countries is actually consistent with heterogeneous-firms trade models. First, it is important to point out that average exports values across countries refer to different samples of firms, i.e., UK exporters selling to France are not necessarily exporting to the US and vice versa. Second, these different sub-groups of the exporter population will vary systematically depending on the country considered.

For example, given that France is relatively close, UK firms which are smaller and less productive might be able to export there. On the other hand, these smaller and less productive exporters would probably not be able to profitably sell in the distant US market.

Therefore, the smaller and less productive exporters are likely to comprise a larger proportion of the population of firms exporting to France than to the US.

Moreover, the same firm exporting in both markets would in all likelihood export more to France than to the US because trade costs will be higher. However, due to the composition effect resulting from differences across exporters in the total value of exports to the destination country, observed average exports values might be increasing or decreasing with distance to the destination country. Crozet and Koenig (2010) analyse this composition effect and show that, conditional on a firm productivity, exports values are *increasing* with the size of the destination country, and *decreasing* with the distance to the destination country, which is what the theory truly predicts.

The finding that the more productive firms are likely to be able to export profitably to more markets, also helps to explain the stylised fact reported under *Stylised fact 1*, that firms with higher productivity are likely to export higher values, conditional on exporting.

### 3.2 Dynamic Stylized Facts

Turning to patterns of the extensive and intensive margins across time the existing contributions refer almost entirely to trade in goods with Ariu (2012), who analyzes both goods and service exports over time for Belgium, being one noticeable exception.

**Stylized Fact 4:** *When considering a short time interval (a year or less) changes in aggregate exports are largely driven by changes in the **intensive margin**;  $y_c$  in equation (2). When considering a medium to long time interval (5 to 10 years) changes in aggregate exports are mostly driven by changes of the **extensive margins**;  $f_c$ ,  $p_c$  and  $d_c$  in equation (2).*

Stylized fact 4 has been first highlighted by Bernard et al. (2009) with US data on trade in goods, and has been confirmed by some subsequent studies on trade in goods including Eaton et al. (2008) for Colombia, Amador and Opromolla (2013) for Portugal, Behrens et al. (2013) for Belgium and Bricongne et al. (2012) for France.

For services, much less empirical analysis is available. Our study addresses this and to the best of our knowledge is the first study to do so.

In terms of the underlying theory stylized fact 4 can be understood in the following way. In truly dynamic trade models like Impullitti et al. (2013) the timing of investments is of essence. In these models the costs of exporting include a sunk component, i.e., costs that have already been incurred and cannot be recovered, which implies hysteresis/persistency in firm export participation in a given market and/or for a given product.

What stylized fact 4 suggests is that in practice sunk costs do represent a big chunk of exporting costs. Firms enter new markets and/or introduce new products slowly over time because it is a costly investment requiring a large amount of resources, and a long stream of future additional revenues is required to recover these costs.

This can explain the observed empirical fact that changes of the extensive margins impact aggregate trade significantly only in the medium to long term, while the intensive margin, on which firms have more leverage over a short time interval, determines yearly aggregate trade changes. Under this scenario, if economic conditions deteriorate sharply and significantly firms would be reluctant to exit markets and/or drop products to avoid incurring those sunk costs again. To the extent the deterioration is perceived as temporary little would thus happen to the extensive margins, and all of adjustment would take place be along the intensive margin. This is exactly what happened during the recent trade collapse. As shown in Behrens et al. (2013) for Belgium and Bricongne et al. (2012) for France all of the 25-30% aggregate trade drop as of June 2009 was due to a decline of the intensive margin.

**Stylized Fact 5:** *Export status is characterized by a high degree of persistency. Nevertheless, many new firms start exporting every year selling little but very few of the new exporters keep exporting for two years or more. New exporters account for a little share of trade levels but for about half of trade growth over a 10 years horizon.*

Stylized fact 5 has been first highlighted by Eaton et al. (2008) with Colombian data on trade in goods and has been confirmed by Amador and Opromolla (2013) for Portugal.

For services, as for Fact 4, there is to the best of our knowledge no available evidence.

The fact that many firms start exporting every year selling little and exit within a year or two is apparently at odds with the presence of large sunk costs. However, this can be explained by the fact that exporting might have a very different meaning and degree of involvement for different firms. Some firms send samples of their goods to foreign retailers; some others send occasionally specific products to their foreign subsidiaries, while a third group, due to the nature of the business, trade only intermittently. All of these instances would appear in the data as short-lived export participations involving little amounts. Although being partly an artefact of the data, as export values in some instances may just be dropping below reporting thresholds, such patterns are certainly suggestive of the importance of the firm's own perceptions about the extent of the potential export market for its products and how this evolves over time. This is consistent with evidence coming from PIMS surveys showing that the receipt of unsolicited orders is an important element to understand the firms' export activity and in particular entry (Mion and Novy, 2013). There is a burgeoning literature exploring this dimension and highlighting the importance of marketing costs (Arkolakis, 2010), learning about foreign demand (Eaton et al., 2012), and learning about the foreign partner (Araujo et al., 2012).

Table 1 below provides a summary overview of the empirical literature on the extensive and intensive margins of trade and related stylized facts.

**Table 1: Summary overview of empirical literature on the extensive and intensive margins of trade**

<i>Paper</i>	Country of analysis	Stylized Facts	Data type	Trade type
Amador and Opromolla (2013)	Portugal	4 and 5	Micro	Goods
Ariu (2012)	Belgium	1, 2 and 3	Micro	Services
Behrens et al. (2013)	Belgium	4	Micro	Goods
Bernard et al. (2009)	USA	1, 2, 3 and 4	Micro	Goods
Breinlich and Ciuscolo (2011)	UK	1, 2, and 3	Micro	Services
Bricongne et al. (2012)	France	4	Micro	Goods
Eaton et al. (2008)	Colombia	4 and 5	Micro	Services
Federico and Tosti (2010)	Italy	1, 2 and 3	Micro	Services
Gaulier et al. (2011)	France	1, 2 and 3	Micro	Services
Kelle and Kleinert (2010)	Germany	1, 2 and 3	Micro	Services
Mayer and Ottaviano (2007)	Germany, France, United Kingdom, Italy, Hungary, Belgium and Norway	1, 2 and 3	Micro	Goods
Walter and Dell'mour (2010)	Austria	1, 2 and 3	Micro	Services

**Stylized Fact 1:** *Exporting firms are very different from each other in terms of the value of their exports with a minority of them being responsible for the bulk of total trade. Large exporters are typically firms selling many products to many markets.*

**Stylized Fact 2:** *The extensive and intensive margins of trade vary considerably across destination countries. However, most of the variation in aggregate exports across countries is due to the extensive margins (number of firms that trade and the number of products that are traded) with the intensive margin playing a secondary role*

**Stylized Fact 3:** *The extensive margins are positively related to the size of the destination country and negatively related to distance to the destination country, i.e., more firms export and more products are exported to large and close countries. The intensive margin is negatively related to the size of the destination country and positively related to distance to the destination country, i.e., average exports values are smaller for large and close countries.*

**Stylized Fact 4:** *When considering a short time interval (a year or less) changes in aggregate exports are largely driven by changes in the intensive margin. When considering a medium to long time interval (5 to 10 years) changes in aggregate exports are mostly driven by changes of the extensive margins.*

**Stylized Fact 5:** *Export status is characterized by a high degree of persistency. Nevertheless, many new firms start exporting every year selling little but very few of the new exporters keep exporting for two years or more. New exporters account for a little share of trade levels but for about half of trade growth over a 10 years horizon.*

**Service trade specificities:** **(i)** Degree of concentration of exports values for trade in services is lower than for trade in goods and there are many more single-country and/or single product large exporters; **(ii)** the extensive margins are relatively less important for service trade.

## 4 International Trade in Goods – descriptive results

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In this chapter we first describe the data we have used for analysis of trade in goods, and then set out the results of our analysis to address the descriptive research aims of this project.

### 4.1 Data Description

Firms in the UK submit declarations of an almost comprehensive record of annual exports and imports by destination/origin country at the eight-digit product level to HM Revenues and Customs. Firm-level data is available to researchers in the HMRC datalab. Information is given on the value of trade (used for trade statistical purposes: Free on Board for Exports and Cost Insurance Freight for Imports) products (at the 8-digit Combined Nomenclature level and 5-digit SITC code), countries of destination or origin and mode of transport. For trade flows from and to countries outside the European Union, the data covers the period between 1996 and 2011, but for within the EU, it is only available from 2008 to 2011.

Reporting thresholds exist for compulsory declarations inside the European Union. These thresholds vary through time and by flow, although many firms report their transactions despite being under the thresholds. In 2010 these thresholds were set at £600,000 for arrivals (imports) and £250,000 for dispatches (exports). For businesses below these thresholds, the HMRC provides an estimation of so-called "Below Threshold Trade Allocations" (BTTA) by initially summing the values of arrivals and dispatches supplied on firms' VAT returns. The BTTA process estimates the total value, net mass and supplementary units for each combination of 8-digit commodity code and partner country for below threshold businesses.<sup>6</sup>

The HMRC dataset can be matched to the 'FAME' dataset provided by the Bureau van Dijk including information on the size of each firm in terms of employment and its sector of activity.

### 4.2 Exports of goods by country of destination

Unsurprisingly, the UK trade data displays a wide span of export destinations as shown in **Table 2** that provides the destinations of exports in 2011 by country/region. We consider as destinations the EU27, the US, other OECD countries, Brazil, China, India, Russia, the rest of the World (RoW) as well as countries in which less than 20 firms exports (Small). In the rest of the analysis we will not consider observations pertaining to Small countries anymore. For each destination we report the number of firms exporting, the total value of exports (in

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<sup>6</sup> More details on methodological issues can be found in HMRC (2010).

thousands pounds) as well as the number of transaction where a transaction is defined as a firm-country-product triple.

In terms of value, the EU is by far the preferred market of UK exporters, with close to £150 billion worth of goods being exported there in 2011. However, the number of firms exporting to the EU appears in the data to be smaller than those exporting to the US or the rest of the OECD countries. This result is likely to be a misleading picture, however, due to the much higher reporting thresholds for export value which are applied to EU trade compared with thresholds for non-EU trade. This threshold difference means that much more of the tail of many small value exporters would be captured in data on exports to non-EU markets than for data on exports to EU countries.

The analysis of the margins of exports in **Section 4.5** will further decompose these preliminary results.

Among the BRIC countries, China is leading in terms of total exports value and number of transactions although India still attracts the most exporters, probably due to the historical links between India and the UK.

**Table 2: Exports of goods by destination**

	Number of firms	Total exports value (th £)	Number of transactions
EU	22,945	148,088,739	1,351,909
USA	31,120	38,605,714	124,118
OECD- non			
EU/USA	41,780	32,278,979	257,616
Brazil	4,282	2,321,923	10,965
China	9,662	8,772,321	28,339
India	9,823	5,410,391	28,330
Russia	5,488	4,781,072	18,451
RoW	46,959	43,213,055	445,542
Small	172	1,604,402	273
Total	81,092	285,076,597	2,265,543
Total without Small	81,085	283,472,195	2,265,270

### 4.3 Exports of goods by product category

In the customs declarations, products are described according to two different codes: the 8-digit Combined Nomenclature level and the 5-digit SITC codes. **Table 3** describes the number of exporters, total exports values and the total number of transactions by aggregates of 1-digit SITC codes typically used in Balance of Payments statistics.



**Table 3: Exports of goods by product category**

Category	Number of firms	Total exports (th £)	Total number of transactions
Food, beverages and tobacco (SITC 0 + 1)	5,874	18,298,208	128,889
Basic materials (SITC 2 + 4)	4,884	9,050,785	30,052
Fuels (SITC 3)	1,454	28,181,666	8,754
Semi-manufactures (SITC 5 + 6)	35,682	88,340,409	660,226
Finished manufactures (SITC 7 + 8)	65,573	137,777,541	1,430,511
Miscellaneous (SITC 9)	1,357	1,823,586	6,838
<b>Total</b>	<b>81,085</b>	<b>283,472,195</b>	<b>2,265,270</b>

Finished manufactures is the most exported product category representing close to half the total export value. 65,573 out of 81,085 exporting firms sell at least one product belonging to this aggregate which account for more than half of transactions. Semi-manufacturers is the second most popular products aggregate followed by Food, beverages and tobacco in terms of number of exporting firms and transactions and by fuels in terms of exporting values.

#### 4.4 Number of Markets Served and Products Sold

The academic literature has recently been analysing trade flows by decomposing them into different margins: *the extensive margin* (number of exporters, products and destinations) and the *intensive margin* (average exports per firm, per product, per market). Whilst this decomposition is analysed more systematically in the next section, what follows here presents the distribution of firms and export values across the number of products and countries exported to. This gives a first insight into the different margins and highlights the quantitative importance of multi-country and multi-product exporters.

##### 4.4.1 Number and shares of exporting firms

Table 4 and Table 5 report, respectively, the number and share of firms exporting a given numbers of CN8 products (rows) to a given numbers of markets (columns) in 2011. As shown already for other countries (Bernard et al., 2009 or Mayer and Ottaviano, 2007), the tables display *a bipolar pattern*: the largest numbers of firms are concentrated in the top left-hand and bottom right-hand cells. For example, 29.9% of UK exporting firms export only one product to only one market, which is roughly the same figure as in France (Mayer and Ottaviano, 2007). In contrast, 24.4% of firms export four products or more to 6 countries or more.

**Table 4: Distribution of exporters of goods by number of products and export destinations – 2011**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	24,262	1,735	572	440	618	27,627
2	4,566	5,057	961	668	761	12,013
3	1,636	2,147	1,824	905	892	7,404

4+	2,746	2,978	3,223	5,299	19,795	34,041
All	33,210	11,917	6,580	7,312	22,066	81,085

**Table 5: Share of exporters by number of products and export destinations - 2011**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	29.9%	2.1%	0.7%	0.5%	0.8%	34.1%
2	5.6%	6.2%	1.2%	0.8%	0.9%	14.8%
3	2.0%	2.6%	2.2%	1.1%	1.1%	9.1%
4+	3.4%	3.7%	4.0%	6.5%	24.4%	42.0%
All	41.0%	14.7%	8.1%	9.0%	27.2%	100%

In order to distinguish the effect of EU trade on these figures, Table 6 and Table 7 present similar results but considering the EU as one single destination. Results are qualitatively similar with respect to Table 4 and Table 5 with the distribution remaining bipolar even though there is 5% less firms being in the bottom right cell and about 1.5% more firms in the cell corresponding to one product being sold to one market.

**Table 6: Distribution of exporters of goods by number of products and export destinations (EU as one) – 2011**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	25,419	1,490	390	203	125	27,627
2	5,147	5,194	894	512	266	12,013
3	1,990	2,293	1,838	836	447	7,404
4+	4,789	3,562	3,806	6,180	15,704	34,041
All	37,345	12,539	6,928	7,731	16,542	81,085

**Table 7: Share of exporters by number of products and export destinations (EU as one)- 2011**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	31.3%	1.8%	0.5%	0.3%	0.2%	34.1%
2	6.3%	6.4%	1.1%	0.6%	0.3%	14.8%
3	2.5%	2.8%	2.3%	1.0%	0.6%	9.1%
4+	5.9%	4.4%	4.7%	7.6%	19.4%	42.0%
All	46.1%	15.5%	8.5%	9.5%	20.4%	100%

#### 4.4.2 Share of export value

In a similar way, **Table 8** displays the shares of aggregate exports accounted by firms exporting a given numbers of products to a certain number of destinations. As is the case in

other countries (Mayer and Ottaviano, 2007), there is no bipolarity here: firms exporting four or more products to six or more markets account for the bulk of trade (87.4%) while firms selling one product to one country account for only 1.1% of total exports while being close to one third in terms of the number of exporting firms.

**Table 8: Share of export value by number of products and export destinations - 2011**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	1.1%	1.0%	0.2%	0.2%	0.9%	3.4%
2	0.3%	0.3%	0.1%	0.3%	1.0%	2.1%
3	0.2%	0.2%	0.2%	0.3%	1.8%	2.6%
4+	0.9%	0.8%	0.9%	1.9%	87.4%	91.9%
All	2.4%	2.3%	1.4%	2.7%	91.1%	100%

**Table 9: Share of export value by number of products and export destinations (EU as one) - 2011**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	2.6%	0.5%	0.1%	0.1%	0.2%	3.4%
2	1.0%	0.4%	0.1%	0.3%	0.3%	2.1%
3	1.2%	0.2%	0.3%	0.2%	0.6%	2.6%
4+	10.3%	2.3%	2.4%	3.7%	73.1%	91.9%
All	15.1%	3.5%	2.9%	4.3%	74.2%	100%

This distribution is slightly less skewed when considering the EU as one single country in Table 9 with firms exporting to one country only now accounting for 15.1% of total exports value.

Our results confirm the quantitative importance of multi-country and multi-product exporters for total goods trade values at a given point in time found in other studies.

However, as we will see later on, *firms who are large exporters in a given year do not necessarily contribute more than small firms to exports growth which is particularly true when considering a long time span.*

#### 4.5 Margins of export

As was mentioned above, export values can be decomposed into different margins. The decomposition first introduced in the literature by Bernard et al (2009) and further refined in Behrens et al. (2013) is applied here. As detailed in equation (3) above total UK exports  $X$  in year  $t$  can be decomposed as:

$$X = f * \bar{c} * \bar{p} * \bar{x},$$

where  $f$  is the number of UK exporting firms,  $\bar{c}$  is the average number of countries these firms export to,  $\bar{p}$  is the average number of products firms export in a country, and  $\bar{x} = \mathbf{X}/(f * \bar{c} * \bar{p})$  corresponds to average firm exports of a product in a country. We refer to  $f$ ,  $\bar{c}$  and  $\bar{p}$  as the extensive margins (firm, country and product margins, respectively) and to  $\bar{x}$  as the intensive margin.

The different margins are here compared across two dimensions: export destination and firm size.

#### 4.5.1 Margins by destination

In **Table 10** we decompose total UK exports to a given destination, as well as total UK exports to all destinations, into the margins provided in equation (4). The first column indicates the export destination. The second column refer to total exports values while the third and fourth columns refer to the number of firms exporting and average firm exports to that destination, respectively.

Multiplying, in a given row, values in the third and fourth columns delivers total exports value in a given destination (column 2). At the same time, columns five, six and seven contain values of  $\bar{c}$ ,  $\bar{p}$  and  $\bar{x}$  referring to a given destination market, i.e., the mean number of countries served, the mean number of products per country sold, and the average exports per firm-country-product.

Multiplying, in a given row, values in the fifth, sixth and seventh columns delivers mean firm exports value in a given destination (column 4).

Finally, given the strong degree of skewness in firm-level exports data, we report in columns eight to eleven median as opposed to mean values. As one can appreciate, median values are indeed very different and do provide valuable additional information.

As was shown above in Table 2, the region attracting the greatest number of exporting firms is the OECD (excluding the USA and the EU), followed by the US. This could be due to the reporting thresholds applied to EU exports. However, the EU displays the highest value of total exports as well as the largest extensive margins in terms of products and countries. In comparison to the USA and China, which have the largest average sales per exporter-country-product, the EU intensive margin is much smaller. This suggests that whilst it is more difficult to export to the USA or BRIC countries than to the EU, those firms that do achieve exporting to those markets will export larger values for each product exported or country exported to.

The size of the respective contributions of the extensive and intensive margins varies significantly across destination markets. For example, total exports to the US are 340% higher than those to China and the number of exporting firms is 222% greater. But the average number of products exported to the US is only 39% greater and the average exports per firm per product is less than 1% higher when exporting to the US. In contrast, exports to China are 62% higher than those to India but the number of firms exporting to India is higher

and the number of products exported only 1.7% greater in China. The difference in aggregate exports is mainly driven by average exports being 62% higher. This reflects the effect of the size of the destination market highlighted in Stylized Fact 3.

**Table 10: Export margins by destination -2011**

Region	Total exports (th. £)	Number of firms	Mean exports	Mean number of countries	Mean number of products per country	Average exports per firm-country-product	Median exports	Median countries exported to	Median products exported per country	Median exports per firm-country-product
EU	148,088,739	22,945	6,454,074	8.24	6.43	121,669	670,411	6.00	1.88	11,788
USA	38,605,714	31,120	1,240,544	1.00	3.99	311,040	18,071	1.00	2.00	5,194
OECD-non										
EU/USA	32,278,979	41,780	772,594	2.35	2.01	163,318	19,032	1.00	1.25	4,914
Brazil	2,321,923	4,282	542,252	1.00	2.56	211,758	20,149	1.00	1.00	9,764
China	8,772,321	9,662	907,920	1.00	2.93	309,549	21,906	1.00	1.00	8,985
India	5,410,391	9,823	550,788	1.00	2.88	190,977	15,526	1.00	1.00	6,745
Russia	4,781,072	5,488	871,187	1.00	3.36	259,123	33,120	1.00	1.00	13,125
RoW	43,213,055	46,959	920,229	3.78	1.87	130,398	23,056	2.00	1.00	5,194
Total	283,472,195	81,085	3,495,988	6.48	2.78	194,275	46,402	2.00	1.33	5,361

#### 4.5.2 Margins by size

The same decomposition is applied in Table 11, but now differentiating between firms with different numbers of employees; a measure of firm size. The number of employees of each firm is obtained by matching the firm-level export dataset to the FAME dataset. This yields size information for over 17,000 firms out of the 81,085 exporters in 2011.

The decomposition reveals the same pattern found in the literature for other countries (Mayer and Ottaviano, 2007): larger firms export a larger value of a larger number of products to a larger number of countries. This is the case across almost all margins of our four size categories with some exceptions arising only when comparing firms with zero to fifty employees to firms with fifty one to one hundred employees. Though, these exceptions to the rule are, as suggested by median values, likely due to some outliers.

**Table 11: Export margins by firm size -2011**

Number of employees	Total exports (th. £)	Number of firms	Mean exports	Mean number of countries	Mean number of products per country	Average exports per firm-country-product	Median exports	Median countries exported to	Median products exported per country	Median exports per firm-country-product
0-50	23,532,668	6,191	3,801,109	9.54	3.35	119,061	321,407	4.00	1.68	7,071
51-100	13,334,896	3,562	3,743,654	13.14	3.52	80,898	703,286	7.00	1.89	7,362

101-250	24,299,213	3,279	7,410,556	14.78	4.04	124,202	1,166,095	8.00	2.00	8,642
250+	137,910,402	4,159	33,159,510	15.99	7.77	267,097	1,636,375	8.00	2.25	8,673
Total	199,077,179	17,191	11,580,314	12.84	4.58	196,685	687,677	6.00	2.00	7,703

### 4.5.3 Margins and matching

In interpreting the results of Table 11, it is important to understand whether the subsample of exporters for which employment is available is different to non-matched firms. Table 12 compares export margins of firms that can be matched to FAME and for which employment is available to those that aren't. It appears that exporters for which we are able to get employment figures are also larger in terms of average exports and export margins. Given that presence in the FAME dataset is largely a question of firm size, Table 12 reinforces the message provided by Table 11 that top exporters at any given point in time are the largest firms. As we mention above, when we focus on export growth over time, in the next section on dynamics of export value growth, we find that the contribution of these largest exporters looks quite different.

**Table 12: Export margins by FAME matched status -2011**

Employment Available from FAME	Total exports (th. £)	Number of firms	Mean exports	Mean number of countries	Mean number of products per country	Average exports per firm-country-product	Median exports	Median countries exported to	Median products exported per country	Median exports per firm-country-product
Matched	199,077,179	17,191	11,580,314	12.84	4.58	196,685	687,677	6.00	2.00	7,703
Not matched	84,395,016	63,894	1,320,860	4.76	2.29	120,947	28,662	2.00	1.17	4,936
Total	283,472,195	81,085	3,495,988	6.48	2.78	194,275	46,402	2.00	1.33	5,361

## 4.6 Dynamics of export value growth

The previous section has established that the largest firms at any given point in time are also the top exporters. However, in order to reach predictions about export growth, it is crucial to understand the dynamics of exports which is to large extent a fully different animal.

This is done first by comparing the export behaviour of firms that remain exporters through time vs. new exporters or firms that stop exporting over a short time span: two years. **Table 13** presents some export characteristics for the 54,727 firms exporting in 2009 that are still exporting in 2011 (*Stayers*) and compares them to those firms that export in 2009 but not in 2011 (*Exiters*) and vice versa (*New*).

*Stayers* represent about 94% of total exports in both 2009 and 2011. *New exporters* and *exiters* share common features: they export little, a small number of products to only a few countries. Interestingly, despite declaration thresholds having been stable over this time frame, the number of recorded exporting firm has actually slightly decreased. Specifically, in 2009 there were 82,263 exporters, and in 2011 there were 81,085; something we will come back to later on.

**Table 13: Dynamics of goods exporters between 2009 and 2011**

	Number of firms	Total Exports [th £]	Average number of products	Average number of countries	Average exports [£]	Number of firms share	Total exports share
<b>2009</b>							
Stayers	54,727	205,131,231	12.21	8.30	3,748,264	66.53%	93.90%
Exiters	27,536	13,316,300	2.85	2.11	483,596	33.47%	6.10%
Total	82,263	218,447,531				100%	100%
<b>2011</b>							
Stayers	54,727	267,452,352	12.33	8.54	4,887,027	67.49%	94.35%
New	26,358	16,019,842	3.05	2.19	607,779	32.51%	5.65%
Total	81,085	283,472,195				100%	100%

Whilst it is not possible to access data for *EU* exports in 2005,

**Table 14** focuses on *non-EU* exports only in order to perform the same exercise as in Table 13, but on a wider time span: 2005 to 2011. The importance of stayers is slightly diminished with a longer time frame: their total share in 2005 exports value is only 65.18%. They retain nevertheless the same features of exporting more, to a larger numbers of products and to more destinations.

Again, there is no sign of a significant increase in the number of exporting firms even over this wider time horizon, and despite the fact that this is for a set of countries in which total exports have increased considerably.

Table 14, which is of particular relevance in our analysis of exports growth, as it shows that the contribution of new exporters to this growth is quantitatively very important: The table shows that UK goods exports to non-EU countries grew between 2005 and 2011 from 90,968 million £ to 135,383 million £. Among those firms contributing to the 90,968 million £ exports in 2005, the table shows that while some do not export anymore in 2011, others still do, and that these account for a total value of 111,001 million £ in 2011, which means a growth of £20.033 million over the period. However, total export growth in between 2005 and 2011 has been equal to £135,383 less £90,968= £44,415 million. **Therefore, less than half of such growth in due to firms which had been exporting in 2005, while new exporters accounted for the lion share (54.9%) of exports growth over this period.**

As highlighted in other studies, therefore, despite new exporting firms account for a small portion of the value of exports at a given point in time, they are responsible for more than half of exports growth over a time frame of 6 years.

**Table 14: Dynamics of non-EU goods exporters between 2005 and 2011**

	Number of firms	Total Exports [th £]	Average number of products	Average number of countries	Average exports [£]	Number of firms share	Total exports share
<b>2005</b>							
Stayers	35,698	59,293,688	9.52	6.19	1,660,980.68	48.17%	65.18%
Exiters	38,408	31,673,899	3.79	2.71	824,669.31	51.83%	34.82%
Total	74,106	90,967,587				100%	100%
<b>2011</b>							
Stayers	35,698	111,001,278	13.54	6.99	3,109,453.69	48.01%	81.99%
New	38,663	24,382,178	4.56	2.66	630,633.37	51.99%	18.01%
Total	74,361	135,383,456				100%	100%

Finally, in order to complete the description of the export dynamics, **Table 15** compares exports amounts of firms that remain exporters between 2005 and 2011, with those that either leave before 2011, or are new in 2011. This concerns non-EU exports only, and is broken down by firm size in 2005 and 2011. The evidence for the UK is in line with the stylised fact for other countries, that changes in aggregate exports are mostly driven by changes in the extensive margin

When considering export values changes of firms trading in 2005 (last two columns) by firm size band, it is interesting to note that the highest growth in exports was due by both the largest firms (250+) and the smallest firms (1-50 employees), irrespectively of whether considering or not the contribution of exiters. Furthermore, considering new exporters in 2011, they accounted for 54.9% of exports growth over this period; those that exported the most are in the zero or not known category, suggesting they are actually small and young firms. Very large firms were also strong new exporters.

In sum, these findings show that over a 6-year period, firms in the smallest size band in the starting year, who contribute little to the total value of exports in that year, actually contribute substantially to the growth of export value over time.



**Table 15: Stayers, entrants and exiters by firm size among non-EU goods exporters between 2005 and 2011 (thousand GBP)**

Export Values in 2011 by exporter type and firm size in 2005 and 2011 (th GBP)							Export Values in 2005 by exporter type and firm size in 2005 (th GBP)			Export Value changes 2005-2011 (th GBP)	
Number of employees in 2011							Total Exports in 2011	Total Exports in 2005	Stayers, Entrants and Exiters	Stayers and Entrants	
1-50	51-100	101-250	251+	Zero or not known							
<b>Firms Exporting in 2011 but not in 2005: Entrants</b>											
	2,363,955	771,307	3,045,971	8,434,641	9,766,303	24,382,178	0		24,382,178	24,382,178	
Number of employees in 2005	Firms Exporting in 2005 and in 2011: Stayers						Firms Exporting in 2005 but not in 2011: Exiters	Firms Exporting in 2005 and in 2011: Stayers			
1-50	8,642,903	913,715	n/a	n/a	1,336,930	11,507,673	2394202.77	6,251,897	8,646,100	2,861,573	5,255,775
51-100	398,272	2,428,954	n/a	n/a	522,738	5,816,328	525192.568	3,345,732	3,870,924	1,945,404	2,470,597
101-250	424,654	821,296	4,248,314	1,198,336	291,392	6,983,993	922786.137	4,523,499	5,446,285	1,537,708	2,460,494
251+	n/a	n/a	1,076,733	59,645,081	701,001	61,870,514	15348023.1	28,047,898	43,395,921	18,474,593	33,822,617
Zero or not known	n/a	n/a	363,945	1,469,323	21,379,561	24,822,770	12483694.3	17,124,663	29,608,357	-4,785,587	7,698,107
<b>Total</b>	10,636,140	5,051,294	8,387,234	62,694,987	24,231,622	111,001,278	31,673,899	59,293,688	90,967,587	20,033,691	51,707,589
<b>Column Total</b>	13,000,095	5,822,601	11,433,205	71,129,628	33,997,925	135,383,456	31,673,899	59,293,688	90,967,587	44,415,868	76,089,767

## 4.7 Modelling export margins

In this Section we prepare the ground for addressing the predictive research questions by first developing and estimating an econometric model to identify the determinants of growth in UK goods exports over the period 2005-2011. In the following section we will use this model to predict growth in goods exports in the future period.

### 4.7.1 Econometric model

We first derive an econometric model based on the decomposition of exports into four margins provided by equation (3) and subsequently estimate it using UK goods exports data over the period 2005-2011.<sup>7</sup> In the case of the intensive margin  $\bar{x}$  we start from the firm-country-product-year combinations  $x_{icpt}$  indicating export values of firm  $i$  in country  $c$  of product  $p$  in year  $t$  and, while bearing in mind that  $\bar{x}$  is nothing else than the average of  $x_{icpt}$ , estimate the following (log-linear) model:

$$x_{icpt} = \text{const} * FC_{it}^{\beta_1} * CC_{ct}^{\beta_2} * PC_p^{\beta_3} * e^{\delta t} * \varepsilon_{icpt}, \quad (4)$$

where  $\varepsilon_{icpt}$  is an idiosyncratic error component and we use for the following vectors of controls:

- Firm characteristics  $FC_{it}$ . We use firm size (measured by employees' number categories) and industry (measured by two-digit NACE rev 1.1 codes). Whenever information on firm size or industry is not available we associate observations to corresponding residual categories.
- Country characteristics  $CC_{ct}$ . We use GDP per capita in current £, total GDP in current £, distance between country  $c$  capital and London, a common language dummy, an ex-colony dummy and country groups dummies referring to the following markets: the EU27, the US, other OECD countries, Brazil, China, India, Russia, the rest of the World (RoW).<sup>8</sup>
- Product characteristics  $PC_p$ . We use product groups dummies referring to the following aggregates: Food, beverages and tobacco (SITC 0 + 1), Basic materials (SITC 2 + 4), Fuels (SITC 3), Semi-manufactures (SITC 5 + 6), Finished manufactures (SITC 7 + 8) and Miscellaneous (SITC 9).
- Time dummies  $\delta_t$ .

Model (4) is log-linear and could in principle be estimated via OLS once taking logs of both sides. However, since we are interested in reproducing closely export values rather than log exports values a Poisson model is preferable. Furthermore, as showed in Santos Silva and Teneyro (2006), the Poisson model is also preferable to a log-OLS model when considering cross-sectional data because of the presence of heteroscedasticity. We thus consider a Poisson model and estimate equation (4) in levels using a Quasi-Maximum-Likelihood estimator and consider robust standard-errors.

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<sup>7</sup> For exports towards EU countries we use data over 2008-2011 only.

<sup>8</sup> GDP level and per capita data for the period 2005-2011 come from the World Outlook Database provided by the IMF. Data on distances, common language and ex-colonial status come from the CEPII database.

In the case of the product margin  $\bar{p}$  we start from the firm-country-year triples  $p_{ict}$  indicating the number of exported products of firm  $i$  in country  $c$  in year  $t$  and, while bearing in mind that  $\bar{p}$  is nothing else than the average of  $p_{ict}$  estimate the following model:

$$p_{ict} = \text{const} * \text{FC}_{it}^{\beta 1} * \text{CC}_{ct}^{\beta 2} * e^{\delta t} * \varepsilon_{ict}, \quad (5)$$

where  $\varepsilon_{ict}$  is an idiosyncratic error component,  $\text{FC}_{it}$  and  $\text{CC}_{ct}$  are the same firm and country covariates described above and  $\delta_t$  are time dummies. For the very same reasons as above we consider a Poisson model and estimate equation (5) in levels using a Quasi-Maximum-Likelihood estimator while considering robust standard-errors.

For the country margin a similar methodology applies:

$$c_{it} = \text{const} * \text{FC}_{it}^{\beta 1} * e^{\delta t} * \varepsilon_{it}, \quad (6)$$

where  $c_{it}$  indicates the number of countries firm  $i$  exports to in year  $t$ ,  $\bar{c}$  is the average of  $c_{it}$ ,  $\text{FC}_{it}$  are the same firm covariates described above,  $\varepsilon_{it}$  is an idiosyncratic error component and  $\delta_t$  are time dummies. Again we use a Poisson model and estimated via Quasi-Maximum-Likelihood while considering robust standard-errors.

Turning to the firm margin only time trends matter in our sequential approach and, as showed in the descriptive evidence provided in Table 13 and

Table 14, this is a very stable margin even in the more rapidly expanding trade with non-EU countries. Therefore, in our analysis below we will consider the firm margin as stable.

#### 4.7.1 Estimation results

**Error! Reference source not found.** reports estimated coefficients and t-ratios of the intensive margin Poisson model (4). Coefficients signs and magnitudes are, overall, in line with expectations. In the case of firm size the reference category is represented by firms with one to fifty employees. A coefficient of -0.348 for firms with fifty one to one hundred employees means that these firms are predicted to export, on average,  $(e^{-0.344} - 1) * 100 = -29.11\%$  less per product sold to a market with respect to the reference category.

With the exception of this case the other coefficients reveal that larger firms are expected to have larger intensive margins with firm with more than 250 employees having a 193.88% higher intensive margin. On the other hand firms for which employment is zero or not known because, for example, of the absence of a match with FAME records, the intensive margin is instead estimated to be lower  $((e^{-0.145} - 1) * 100 = -13.32\%)$  than for firms with one to fifty employees (the reference category).

In terms of country characteristics results are also in line with expectations. The intensive margin is higher (with an elasticity of 43.9%) the higher is total GDP of the destination country and is also higher (with an elasticity of 1.9%) the higher is GDP per capita of the destination country, i.e., the closer the GDP per capita gets to the UK one.

Distance has a negative impact on the intensive margin while common language has a positive impact suggesting that our model is able to get rid of those composition effects present in the raw data (in a more distant market only the largest firms manage to exports and those export a lot).

In terms of the estimated country group dummies they are all positive and significant indicating that the reference group (the EU27) is, after controlling for firm characteristics, size and distance of the destination country, etc., the market characterized by the lowest intensive margin. This is in line with the raw data presented in Table 10 where the EU27 scores the lowest intensive margin.

Last but not least a full set of product, industry and time dummies has been used in estimations but estimates are not reported here to ease the exposition. What is reported in **Error! Reference source not found.** is the estimate and t-ratio of the time dummy corresponding to the year 2011 (2005 being the reference category) for reasons that will become clear in the next Section.

Table 17 reports estimated coefficients and t-ratios of the product margin Poisson model (5). Coefficients signs and magnitudes are, overall, in line with expectations. Larger firms export more products while at the same time larger and richer countries get a wider set of UK goods products. At the same time closer markets in terms of distance, language spoken and colonial ties with the UK also receive, on average, more products.

Interestingly, the EU27 stands out as the market where, everything else equal, more products are exported with the estimated country group dummies being all are negative and significant. China comes second in this ranking. Last but not least a full set of industry and time dummies has been used in estimations but estimates are not reported here to ease the exposition. What is reported in

Table 17 is the estimate and t-ratio of the time dummy corresponding to the year 2011.

Finally, Table 18 contains estimated coefficients and t-ratios of the country margin Poisson model (6). Again, nothing surprising here with larger firms exporting to more countries. A full set of industry as well as year dummies is used in estimations with the estimate and t-ratio of the time dummy corresponding to the year 2011 being reported in Table 18.

**Table 16: Intensive Margin Analysis. Poisson QML Estimations**

Covariates		Estimates	T-ratios
Firm Size Bands	1-50	Reference	
	51-100	-0.344***	-8.07
	101-250	0.111**	2.54
	250+	1.078***	24.99
	Not known	-0.143***	-2.96
Industry Dummies	YES		
Country Controls	GDP	0.439***	42.01
	GDP per capita	0.019*	1.80
	Distance	-0.329***	-23.76
	Common Language	0.224***	6.55
	Ex Colony	-0.024	-0.75
Country Group Dummies	EU	Reference	
	USA	0.149**	2.22
	OECD-non EU/USA	0.307***	10.02
	Brazil	0.579***	8.15
	China	0.489***	6.73
	India	0.481***	3.91
	Russia	0.690***	7.73
	RoW	0.920***	25.29
Product Dummies	YES		
Year Dummies	YES of which 2011 is	0.144**	2.38
Pseudo-R2		0.175	
Observations		7,193,866	

Robust standard errors in parentheses. \* significant at 10% level. \*\* significant at 5% level. \*\*\* significant at 1% level.

**Table 17: Product Margin Analysis. Poisson QML Estimations**

Covariates		Estimates	T-ratios
Firm Size Bands	1-50	Reference	
	51-100	0.116***	21.92
	101-250	0.296***	47.37
	250+	0.663***	96.71
	Not known	-0.082***	-17.18
Industry Dummies	YES		
Country Controls	GDP	0.063***	23.29
	GDP per capita	0.036***	13.41
	Distance	-0.148***	-28.85
	Common Language	0.120***	12.73
	Ex Colony	0.171***	18.00
Country Group Dummies	EU	Reference	
	USA	-0.476***	-31.84
	OECD-non EU/USA	-0.622***	-62.60
	Brazil	-0.515***	-23.12
	China	-0.397***	-21.28
	India	-0.544***	-28.25
	Russia	-0.453***	-23.44
	RoW	-0.518***	-40.94
Year Dummies	YES of which 2011 is	0.109***	8.23
Pseudo-R2		0.134	
Observations		2,389,550	

Robust standard errors in parentheses. \* significant at 10% level. \*\* significant at 5% level. \*\*\* significant at 1% level.

**Table 18: Country Margin Analysis. Poisson QML Estimations**

Covariates		Estimates	T-ratios
Firm Size Bands	1-50	Reference	
	51-100	0.354***	33.66
	101-250	0.492***	45.03
	250+	0.690***	67.31
	Not known	-0.611***	-84.55
Industry Dummies	YES		
Year Dummies	YES of which 2011 is	0.121***	45.36
Pseudo-R2		0.143	
Observations		466,031	

Robust standard errors in parentheses. \* significant at 10% level. \*\* significant at 5% level. \*\*\* significant at 1% level.

#### 4.8 Predicting future UK exports of goods

One of the key goals of our analysis is to predict the level of UK exports in the future. We limit our analysis to 2017 because of both the availability of GDP forecasts<sup>9</sup> and the fact that a six years window in the future (2011 to 2017) nicely matches the length our estimation period (2005 to 2011). In order to make predictions over the period 2011-2017 we make the following assumptions:

1. What will mainly change between now and 2017 are GDP levels across countries. This will in turn affect GDP and GDP per capita in our estimated models and so the levels of our margins.
2. The speed of globalization, as captured by our time dummies, will be similar over the period 2011-2017 as compared to 2005-2011. Therefore, we can use the estimated values of the 2011 time dummy in our models to predict the impact of globalization on export margins.

Our framework allows us to predict the level of goods exports in 2017 and decompose the change along the country, product and intensive margin. The number of firms is expected instead, as pointed out before, to remain substantially unchanged, as has been observed in the actual data for 2005-2011.

<sup>9</sup> GDP level and per capita data for the year 2017 come from the World Outlook Database provided by the IMF.

Table 19 shows our findings. Our export margins models predict that the value of UK exports of goods will increase from 283,472 million £ in 2011 to 453,207 million £ in 2017, i.e., by almost 60%.

This overall change will materialize through an increase of the number of export destinations per firms of 12.13%, an increase in the number of product exported per firm per destination of 13.56% and an increase of exports of a typical product by a firm in a given destination of 25.35%:  $1.1213 \times 1.1356 \times 1.2535 = 1.60$ .

It should be noted that the value of exports in 2011 shown in our report is somewhat lower than in official statistics. This is because we eliminated some observations for the sake of the model estimation, as well as countries with few firms exporting. When we adjust our prediction to take account of these omissions, our prediction of goods exports level in 2017 goes to 478,188 million £, based on projecting our 60% growth on the value of goods exports reported for 2011 in the official statistics.

**Table 19: Goods Exports Level and Change in Between 2011 and 2017**

Year	Number of Exporting firms	Mean Number of countries	Mean number of products per destination	Average exports per firm-destination-product	Total Exports (th. GBP)
2011	81,085	6.48	2.78	194,274.70	283,472,195
2017	81,085	7.27	3.16	243,520.93	453,207,399
% change	0.00%	12.13%	13.56%	25.35%	59.88%

In terms of the contribution of firms of different sizes to exports growth it is key to understand whether firms of different sizes are differentially affected by GDP growth in the destination country. If not, the contribution in terms of exports growth shares is likely to be the same as the one observed over the period 2005-2011 in Table 15.

This hypothesis has been tested by considering an extended version of the exports growth model developed Behrens et al (2013) and has been overall dismissed.<sup>10</sup> In light of this result Table 20 below shows the contribution to exports growth in between 2011 and 2017 by firms exporting in 2011 (broken down by firm size in 2011) and new exporters.

The key highlights of our results are the following:

<sup>10</sup> More specifically interactions between GDP growth and firm size categories have been added to the exports growth model and their significance has been tested.



For trade in goods most growth (around 55%) will come from firms that are currently not exporting.

Among currently exporting firms the biggest contribution to growth is to be expected from firms with more than 250 employees.

Smaller firms, and in particular those which currently have fewer than 50 employees, will also contribute significantly to export value growth over the period.

**Table 20: Contribution to Exports Growth in between 2011 and 2017 by Firms Exporting in 2011 (Broken Down by Firm Size in 2011) and New Exporters.**

Number of employees in 2011	Contribution to Exports Growth
1-50	6.44%
51-100	4.38%
101-250	3.46%
251+	41.59%
Zero or not known	-10.77%
New Exporters	54.90%
Total	100.00%

#### 4.9 Measuring the cost of custom formalities and paperwork on UK imports

The model we have developed for the analysis reported above can also be used to evaluate the impacts of custom formalities and paperwork on the different margins of UK imports of goods, and to derive estimates of the potential impact on customs revenues which would be likely to result from changes in these customs formalities, so contributing to tax policy making and development which part of one key HMRC function (policy development).

There is a literature in international trade documenting the importance of custom formalities and paperwork on trade volumes. Though, little evidence has so far been provided on the impact of custom formalities and paperwork on the different margins of trade: number of

trading firms, traded products, number of markets and intensive margin. Whether custom formalities affect more the extensive or intensive margins is important to understand the costs and benefits, both static and dynamic, of their reduction, and the consequent likely effects on the flow of customs revenues and on the administrative costs for HMRC.

Suppose, for example, that custom formalities negatively affect the intensive margin only. In such a scenario, reducing them would simply have a static, i.e., once for all positive impact on trade values and, besides the cost cut due to the reduction of paperwork, virtually no change in the administrative burden for HMRC that will still provide custom services to the same exporting firms.

If custom formalities negatively affect also the extensive margin(s) there would be an additional static boost of trade (more firms trading more products to more countries) as well as some positive dynamic effects arising in the medium/long term. In this respect there are indeed a number of papers showing that exporting to one market opens up the door to exporting to other markets: sequential exporting, learning about demand, fixed costs sharing across similar markets.<sup>11</sup> Furthermore, the increase in the extensive margins will call everything else equal for a greater need of custom services by HMRC.

In order to provide a contribution to HMRC functions, and more precisely to tax policy making and development (policy development) outlined above, we have considered an additional regressor in the econometric models (4) to (6): the number of documents necessary to import which is part of the World Development Indicators and is provided by the World Bank for several countries and years.<sup>12</sup> In our analysis we consider UK exports of goods across countries. However, UK exports represent imports for the receiving countries and are then subject to such documents. Therefore, by considering how this additional regressor affects imports of UK goods across countries we can measure the impact of custom formalities and paperwork on the different margins of trade (country, product and intensive). By applying the estimated coefficients on UK imports of goods we ultimately get an estimate of the cost of UK custom formalities and paperwork in terms of foregone imports and related custom duties.

Our estimations indicate that each additional document decreases the intensive margin by roughly 4% and the country margin by roughly 4%. No significant effect is found for the product margin. These figures can be applied to extra-EU trade only and, reversing these estimations to UK imports, we get that the 4 documents currently required to import in the UK (7 documents is the world average with 2 documents for France and 5 for the US) correspond to  $(4+4) \times 4 = 32\%$  less imports from extra-EU countries. From HMRC revenue perspective, considering that collected customs duties in 2011/2012 amount to roughly 3

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<sup>11</sup> See for example Moxnes (2010) and Eaton et al. (2012).

<sup>12</sup> Documents to import are all documents required per shipment by government ministries, customs authorities, port and container terminals, health and technical control agencies, and banks to import goods. Documents renewed annually and not requiring renewal per shipment are excluded.

billion £, eliminating one of such four documents would increase revenues from custom duties by 240 million £.

Three comments are in order:

- First, this figure might well be considered an upper bound to the cost of formalities for UK imports. Nevertheless, its order of magnitude raises an important question about the cost of formalities in terms of foregone trade and custom revenues.
- Second, custom formalities and paperwork represent a compromise between different needs. On the one hand firms may dislike them. On the other hand formalities are needed, besides other things, to ensure tax compliance and the safety for UK consumers.
- Third, there is perhaps room for a policy change involving ways of simplifying the documentation such that the practical burden could be reduced, while still covering the same things.

## 5 International Trade in Services

Disclaimer: This work was based on data from the ITIS dataset, produced by the Office for National Statistics (ONS) and supplied by the Secure Data Service at the UK Data Archive. The data are Crown Copyright and reproduced with the permission of the controller of HMSO and Queen's Printer for Scotland. The use of the data in this work does not imply the endorsement of ONS or the Secure Data Service at the UK Data Archive in relation to the interpretation or analysis of the data. This work uses research datasets which may not exactly reproduce National Statistics aggregates.

In this chapter we first describe the data we have used for analysis of trade in services, and then set out the results of our analysis to address the descriptive research aims of this project.

### 5.1 Data description

The International Trade in Services Survey (ITIS) data is collected by the Office of National Statistics. It contains information on the value of imports and exports of 51 different types of services/products by country of origin and destination.<sup>13</sup> The source of the data is a collection of different survey and administrative sources. This includes the ITIS inquiry, a survey conducted annually, and even quarterly in the case of big firms.

ITIS covers firms with ten or more employees and so, in our analysis, we will be able to speak about these firms only. ITIS's focus is primarily on producer, or intermediate, services, thus excluding consumer services such as travel, passenger transport and higher education. Financial and banking industry, as well as film and television companies, higher education, charities, and most activities within the legal profession are also excluded from the dataset.

As a result, ITIS covers less than half of total UK services trade transactions: for example in 2005, 46% of total UK services exports and 31% of imports as reported in the UK balance of payments (ONS, 2006). However, the ITIS data provides information on 67% of exports and 80% of imports of "other commercial services", its target category, which demonstrate a successful sampling strategy, which is described in Annex I. As the fastest growing category of international trade in services, "other commercial services" are also the object of most of the public discussion about offshoring (e.g. Head et al., 2009).

The ITIS dataset is available to researchers until 2005. It can be matched to another other dataset produced by the ONS, the Annual Respondents Database (ARD) which contains a wealth of information on firms, including industry affiliation and employment.<sup>14</sup> The sampling methodology applied by ONS allows us to derive sampling weights that also rely on data taken from the ARD.

### 5.2 Survey design and resulting sample.

This Section presents descriptive statistics on service exporters for the year 2003 as it is the latest year for which sampling weights are computable. As can be seen in Table 21, from the total of close to 20,000 firms surveyed, the resulting sample of service exporters is 4,619 firms in 2003. Of the 6,559 firms that answered to the survey as being service traders, 231

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<sup>13</sup> Firms are not required to identify the country for transactions of less than £10,000.

<sup>14</sup> The ARD and the ITIS can be accessed by academics following the submission and approval of a project to the UK Secure Data Service. They can also be matched at the firm level because firms share an identifier called the Inter-Departmental Business Register reference number.

only exported to undefined countries, and they are therefore not included in the analysis. Besides, 1,940 firms only reported *importing* services and are by definition not included in the final sample.

The sampling source of the firms included in the final sample determine the weight that should be allocated to each firm, as described in Annex I to which the reader is directed for further details.

**Table 21 : Survey design and resulting sample.**

			2003		
		Surveyed	Answered non-nil	Exported and in sample	no country information
Total sample		19,888	6,559	4,619	231
from which	Signal in ARD since 2000	2,575	1,541	833	24
	Known traders from 2002	10,432	3,678	2,846	126
	High propensity	1,811	595	494	46
	"Mop-ups"	5,070	745	446	35

### 5.3 Exports by destination country

In order to understand future growth of exports, it is crucial to be aware of the sizes of the various service export destinations served by UK firms. As shown in Please note that in this section, we use the term '*unweighted*' to refer to the unweighted sample of respondents to the survey. By contrast we use the term '*weighted*' to refer to a weighted sample which has also been grossed up to provide population estimates. This explains the large difference shown between the number of firms shown in Tables 22 and 23, and throughout this chapter. Specifically, the two totals are:

- Total number of firms in the unweighted sample of survey respondents: 4.619
- Total estimated number of services exporter, weighted: 43,574.

Table 22 where we consider data directly coming from our sample, the first market in terms of value, number of transactions<sup>15</sup> and number of firms is the European Union.

<sup>15</sup> As in the case of goods exports a transaction here is a firm-service product-country combination.

This is confirmed when considering weighted values in Table 23. The United States of America is also an important destination, equivalent to the rest of the OECD taken together. While the number of firms (weighted) and export value to the USA is close to 65% of those to the EU, the number of transactions is only a third. The sources of these variations will be explored further when analysing the margins of exports. These patterns are similar to the importance of these regions for exports of goods.

Of all BRIC countries, India is the most popular destination in number of firms, whilst China represents in 2003 the highest export value of the four, both in the weighted and un-weighted cases.

Finally, it must be noted that a large number of firms export to less important destinations than the OECD and BRIC countries, which in total represents a total transactions value higher than that to the USA alone. Note that there are a number of transactions that will be dropped in the rest of the analysis either because the data does not include their precise country information (columns 4 to 6 of Please note that in this section, we use the term *'unweighted'* to refer to the unweighted sample of respondents to the survey. By contrast we use the term *'weighted'* to refer to a weighted sample which has also been grossed up to provide population estimates. This explains the large difference shown between the number of firms shown in Tables 22 and 23, and throughout this chapter. Specifically, the two totals are:

- Total number of firms in the unweighted sample of survey respondents: 4.619
- Total estimated number of services exporter, weighted: 43,574.

Table 22 and Table 23), or because less than 20 firms exported to a given destination (columns 7 to 9 of Please note that in this section, we use the term *'unweighted'* to refer to the unweighted sample of respondents to the survey. By contrast we use the term *'weighted'* to refer to a weighted sample which has also been grossed up to provide population estimates. This explains the large difference shown between the number of firms shown in Tables 22 and 23, and throughout this chapter. Specifically, the two totals are:

- Total number of firms in the unweighted sample of survey respondents: 4.619
- Total estimated number of services exporter, weighted: 43,574.

Table 22 and Table 23).

Please note that in this section, we use the term *'unweighted'* to refer to the unweighted sample of respondents to the survey. By contrast we use the term *'weighted'* to refer to a weighted sample which has also been grossed up to provide population estimates. This

explains the large difference shown between the number of firms shown in Tables 22 and 23, and throughout this chapter. Specifically, the two totals are:

- Total number of firms in the unweighted sample of survey respondents: 4,619
- Total estimated number of services exporter, weighted: 43,574.

**Table 22: Unweighted exports by destination - 2003**

	Retained sample			Undefined country (only continent)			Small countries (less than 20 firms)		
	Number of firms	Number of transactions	Total transactions value (th GBP)	Number of firms	Number of transactions	Total transactions value (th GBP)	Number of firms	Number of transactions	Total transactions value (th GBP)
EU	3,525	15,568	12,057,097						
USA	2,288	2,693	8,464,526						
OECD-non EU/USA	2,176	6,319	5,447,941						
Brazil	230	251	52,769						
China	329	358	219,769						
India	367	389	121,576						
Russia	303	331	172,714						
RoW	1,860	9,266	6,465,544	2,247	5,887	2,413,220	80	133	19,571
Total	4,619	35,175	33,001,936	2,247	5,887	2,413,220	80	133	19,571

**Table 23: Weighted exports by destination - 2003**

	Retained sample			Undefined country (only continent)			Small countries (less than 20 firms)		
	Number of firms	Number of transactions	Total transactions value (th GBP)	Number of firms	Number of transactions	Total transactions value (th GBP)	Number of firms	Number of transactions	Total transactions value (th GBP)
EU	28,938	77,888	29,106,855						
USA	19,479	24,101	18,345,116						
OECD-non EU/USA	14,609	26,237	11,792,356						
Brazil	667	693	62,130						
China	809	860	313,105						
India	3,066	3,093	241,255						
Russia	631	659	200,331						
RoW	11,642	29,894	20,706,390	106,784	228,000	37,881,108	761	1,158	502,786
Total	43,574	163,426	80,767,539	20,490	50,873	8,254,880	158	211	26,576

#### 5.4 Service type coverage

In order to study the growth of exports, one needs to better understand a second dimension of exports: the service type being exported. The 51 service type/products included in ITIS are grouped for this purpose into eight groups of service categories as shown in Table 24 and Table 25. The most important category is Business services, both in terms of total transactions value and the weighted number of firms. This category includes: Legal services, Accounting and auditing, Management consulting and public relations, Advertising, Market research and polling, Property management, Procurement, Publishing services, Recruitment and training, Operational leasing and Other business services. Other two equally important categories are R&D and Royalties and Technical services. Furthermore, it is important to

note that some of the activity related to the trade of Financial and Insurance services is present in our data. Indeed, firms whose main business is in the Financial and banking industry are excluded from ITIS which does not preclude the presence of some financial and banking activity being reported by firms whose main business is not in that industry.

**Table 24: Unweighted exports by service type category - 2003**

	Retained sample			Undefined country (only continent)			Small countries (less than 20 firms)		
	Number of firms	Number of transactions	Total transactions value (th GBP)	Number of firms	Number of transactions	Total transactions value	Number of firms	Number of transactions	Total transactions value
Business	1,389	7,739	9,103,867	530	1,239	727,847	18	29	5,461
Cultural	56	335	335,429	39	92	19,384	n/a	n/a	n/a
Financial/Insurance	665	3,821	2,969,103	311	708	217,585	21	27	2,702
Other	87	414	1,251,278	48	104	22,952	n/a	n/a	n/a
R&D/Royalties	739	4,279	5,424,518	304	750	54,654	n/a	n/a	n/a
Technical	1,502	11,422	8,345,593	716	1,745	518,113	28	43	6,526
Telecommunication	844	5,186	4,140,917	399	895	774,484	n/a	n/a	n/a
Trade related	256	1,979	1,431,231	149	354	78,201	n/a	n/a	n/a
Total	4,619	35,175	33,001,936	2,247	5,887	2,413,220	80	133	19,571

**Table 25: Weighted exports by service type category - 2003**

	Retained sample			Undefined country (only continent)			Small countries (less than 20 firms)		
	Number of firms	Number of transactions	Total transactions value (th £)	Number of firms	Number of transactions	Total transactions value	Number of firms	Number of transactions	Total transactions value
Business	14,621	55,994	38,349,909	7,467	15,178	4,043,490	61	72	12,401
Cultural	353	991	517,138	1,892	1,973	70,571	n/a	n/a	n/a
Financial/Insurance	5,251	12,124	4,529,130	2,239	3,234	415,374	21	27	2,702
Other	666	1,910	1,422,095	208	396	31,856	n/a	n/a	n/a
R&D/Royalties	6,646	24,216	10,723,034	3,514	7,030	196,949	n/a	n/a	n/a
Technical	9,606	36,598	13,554,456	4,873	11,073	2,102,898	62	77	6,574
Telecommunication	10,094	24,492	9,585,957	5,376	9,975	968,613	n/a	n/a	n/a
Trade related	2,801	7,102	2,085,819	1,189	2,014	425,129	n/a	n/a	n/a
Total	43,574	163,426	80,767,539	20,490	50,873	8,254,880	158	211	26,576

## 5.5 Number of Markets Served and Products Sold

As presented above for the case of exports of goods, this Section provides a first view of the different margins that compose exports of services by focusing on products and markets. The distribution of firms and export values across the number of products and countries exported to is presented for 2003 and, from this point onwards, we do not consider anymore observations with missing information on the export country or with few exporting firms.

### 5.5.1 Number and share of exporting firms (2003)

The following tables show how the distribution of the number of firms is skewed differently to the case of trade in goods. Whether weighted or not, or whether considering the EU as one



market or not, more than 80% of service exporters only export one product (one of the 51 categories in our data), and on average half of these only export to one country (Tables for the weighted number of firms as well as considering the EU as one country can be found in Annex II )

**Table 26: Distribution of service exporters by number of products and export destinations (unweighted)- 2003**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	1,292	510	355	484	1,164	3,805
2	96	89	73	84	208	550
3	15	n/a	n/a	33	67	159
4+	10	n/a	n/a	13	61	105
All	1,413	632	460	614	1,500	4,619

**Table 27: Share of service exporters by number of products and export destinations (unweighted)- 2003**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	28.0%	11.0%	7.7%	10.5%	25.2%	82.4%
2	2.1%	1.9%	1.6%	1.8%	4.5%	11.9%
3	0.3%	n/a	n/a	0.7%	1.5%	3.4%
4+	0.2%	n/a	n/a	0.3%	1.3%	2.3%
All	30.6%	13.7%	10.0%	13.3%	32.5%	100%

**Table 28: Share of service exporters by number of products and export destinations (weighted)- 2003**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	44.7%	16.5%	5.9%	8.8%	13.1%	89.0%
2	1.8%	1.2%	0.5%	0.6%	1.2%	5.3%
3	0.2%	n/a	n/a	4.6%	0.3%	5.3%
4+	0.0%	n/a	n/a	0.1%	0.1%	0.4%
All	46.7%	17.9%	6.5%	14.1%	14.7%	100%

When considering the EU as one country, the distribution is even more strongly skewed as can be seen in Table 29. It confirms the fact that very few firms export more than one type of service. This could in part be due to the limited number of products described (51) in the dataset compared to goods exports. However, in terms of number of countries reached service

and goods trade are fully comparable and our results indicate that service trade typically involves firms selling to fewer countries than good trade. For example, comparing Table 28 with Table 5 one can appreciate that more than 27% of goods exporters reach six or more countries while for service exporters the corresponding figure is 14.7%.

**Table 29: Share of service exporters by number of products and export destinations (weighted – EU as one)- 2003**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	53.1%	16.6%	6.6%	7.4%	5.4%	89.0%
2	2.1%	1.3%	0.8%	0.6%	0.5%	5.3%
3	0.4%	0.3%	0.3%	4.3%	0.1%	5.3%
4+	0.0%	0.0%	0.1%	0.1%	0.1%	0.4%
All	55.6%	18.2%	7.8%	12.3%	6.1%	100%

### 5.5.2 Share of export value

When constructing the same tables for export values rather than the number of firms, it appears that the distribution is skewed towards the top right corner: in the un-weighted results, 43.4% of total export value is done by the 25.2% of firms that export one product to six countries or more. This is also the case when the EU is considered as one country although the distribution is more bipolar in that case, showing the importance of exports that export only one product to the EU alone. By contrasting these Tables with the equivalent Tables for goods trade it immediately appears that service trade is much less concentrated in the hands of multi-product and/or multi-country firms. As already noted it is fair to say that the number of products is not directly comparable between the two sets of Tables. However, the number of countries is and while 53% of service exports (weighted) correspond to firms reaching six countries or more the equivalent figure for trade in goods is a stunning 91.1% (Table 8).

**Table 30: Share of services export value by number of products and export destinations (unweighted)- 2003**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	9.9%	4.2%	2.2%	4.3%	43.4%	64.1%
2	1.4%	1.1%	1.8%	1.1%	9.7%	15.2%
3	0.6%	n/a	n/a	0.2%	4.6%	6.5%
4+	0.2%	n/a	n/a	2.6%	11.2%	14.2%
All	12.1%	6.6%	4.2%	8.3%	68.9%	100%

**Table 31: Share of services export value by number of products and export destinations (weighted)- 2003**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	15.1%	11.3%	2.6%	9.4%	40.5%	78.9%
2	1.2%	0.9%	1.0%	1.7%	5.6%	10.3%
3	0.3%	n/a	n/a	1.5%	2.2%	4.4%
4+	0.1%	n/a	n/a	1.7%	4.6%	6.4%
All	16.6%	12.6%	3.6%	14.2%	52.9%	100%

**Table 32: Share of services export values by number of products and export destinations (weighted – EU as one)- 2003**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	22.8%	11.6%	4.8%	6.1%	33.6%	78.9%
2	1.3%	2.5%	1.2%	0.7%	4.6%	10.3%
3	0.3%	1.3%	0.2%	1.2%	1.3%	4.4%
4+	0.1%	0.1%	2.7%	0.2%	3.4%	6.4%
All	24.5%	15.5%	8.8%	8.2%	43.0%	100%

## 5.6 Margins of export

This Section applies the same decomposition of exports as in Section 4.5 . Weighted results are also presented in separate Tables. Again, different margins are computed across two dimensions: region of export and firm employment (a measure of firm size).

### 5.6.1 Margins by destination

By adopting the same regional classification as in the case of trade in goods, there is a large

variation in the number of firms, mean number of products per destination, mean number of countries and average exports per firm-destination-product. The EU is the largest export market, with the greatest number of exporters, followed by the USA and the rest of the OECD. The lack of reporting thresholds might explain the differences with goods export destinations ranking where the EU didn't have such predominance. However, the EU displays the highest value of total exports as well as the largest extensive margins in terms of products and countries. As in the case of exports of goods, there is a strong variation in margins contributions across destinations. Exports to the USA show high average sales per exporter-country-product, with the EU and OECD intensive margins much lower. Another example is that whilst exports of services to the US are 375% higher than to China, the number of exporting firms is 595% greater. The number of products exported is only 8% higher and the average exports 411% higher in the US than in China. Total exports to China are close to 30% higher than those to India. As is the case for goods exports, it is the intensive margin that is the driver of this difference.

**Table 33: Export margins by region of export destination (unweighted)- 2003**

	Retained sample								
	Number of firms	Total exports value (th GBP)	Average exports per firm (th GBP)	Median exports per firm (th GBP)	Average number of products per firm-destination	Median number of products per firm-destination	Average number of destinations per firm	Median number of destinations per firm	Average exports per firm-destination-product (th GBP)
EU	3,525	12,057,097	3,420	377	1.11	1	3.94	2	784
USA	2,288	8,464,526	3,700	284	1.18	1	1	1	3,143
OECD-non EU/USA	2,176	5,447,941	2,504	214	1.11	1	2.64	2	855
RoW	1,860	6,465,544	3,476	193	1.06	1	4.62	2	707
India	367	121,576	331	52	1.06	1	1	1	313
China	329	219,769	668	68	1.09	1	1	1	614
Russia	303	172,714	570	74	1.09	1	1	1	522
Brazil	230	52,769	229	46	1.09	1	1	1	210
Total	4,619	33,001,936	7,145	658	1.11	1	6.87	3	939

**Table 34: Export margins by region of export destination (weighted)- 2003**

	Retained sample (Weighted)								
	Number of firms	Total exports value (th GBP)	Average exports per firm (th GBP)	Median exports per firm (th GBP)	Average number of products per firm-destination	Median number of products per firm-destination	Average number of destinations per firm	Median number of destinations per firm	Average exports per firm-destination-product (th GBP)
EU	28,938	29,106,855	1,006	68	1.04	1	2.57	2	375
USA	19,479	18,345,116	942	126	1.24	1	1	1	761
OECD-non EU/USA	14,609	11,792,356	807	63	1.04	1	1.72	1	452
RoW	11,642	20,706,390	1,779	199	1.03	1	2.48	1	697
India	3,066	241,255	79	17	1.01	1	1	1	78
China	809	313,105	387	130	1.06	1	1	1	364
Russia	631	200,331	318	37	1.04	1	1	1	304
Brazil	667	62,130	93	16	1.04	1	1	1	90
Total	43,574	80,767,539	1,854	180	1.06	1	3.51	2	499

### 5.6.2 Margins by size

Decomposing total service exports for different size bands of firms reveals a different pattern to that of exports of goods. Small firms (ten to fifty employees) are responsible in the weighted results of Table 36 for a total value of exports that is higher than that of the largest firms (more than 250 employees). Large firms sell more as well as more products to more markets exactly as for goods trade. However, margins' differences are smaller and there are relatively many more small firms exporting services than goods.

**Table 35: Export margins by firm size (unweighted)- 2003**

	Retained sample								
	Number of firms	Total exports value (th GBP)	Average exports per firm (th GBP)	Median exports per firm (th GBP)	Average number of products per firm-destination	Median number of products per firm-destination	Average number of destinations per firm	Median number of destinations per firm	Average exports per firm-destination-product (th GBP)
10-50 employees	1,612	3,960,897	2,457	472	1.07	1	4.73	3	486
51-100 employees	752	2,134,470	2,838	600	1.08	1	6.25	3	419
101-250 employees	844	4,080,172	4,834	697	1.11	1	6.81	3	636
251+ employees	969	19,382,837	20,003	1,343	1.17	1	10.81	4	1,576
Not Known	442	3,443,560	7,791	783	1.12	1	7.24	3	957
Total	4,619	33,001,936	7,145	658	1.11	1	6.87	3	939

**Table 36: Export margins by firm size (weighted)- 2003**

	Retained sample (Weighted)								
	Number of firms	Total exports value (th GBP)	Average exports per firm (th GBP)	Median exports per firm (th GBP)	Average number of products per firm-destination	Median number of products per firm-destination	Average number of destinations per firm	Median number of destinations per firm	Average exports per firm-destination-product (th GBP)
10-50 employees	29,689	28,177,188	949	112	1.03	1	2.57	1	359
51-100 employees	4,260	6,768,731	1,589	400	1.04	1	3.67	2	415
101-250 employees	3,362	11,631,325	3,460	172	1.07	1	6.91	2	469
251+ employees	3,435	20,324,102	5,917	180	1.26	1	6.39	5	736
Not Known	2,828	13,866,192	4,903	120	1.15	1	5.60	2	762
Total	43,574	80,767,539	1,854	180	1.06	1	3.51	2	499

### 5.7 Entry and exit of services exporters

Finally, in order to give a more complete picture of service exporters' dynamics, Table 37 displays (as Table 15 for trade in goods) the short-term growth in services exports between 2003 and 2005 which is further dissected into portion due to stayers, entrants and exiters as well as by firm size in both 2003 and 2005.

There is, compared to trade in goods, less of a dominance of large firms. SMEs are responsible for an important share of both the value of exports of entrants and stayers. Top

exporters remain, however, the large firms and remain so through time. However, contribution to growth is where the most dramatic difference with respect to trade in goods is. Table 37 is not directly comparable to Table 15 because, among others, it refers to a much shorter time frame (two as compared to six years) and because it is based on survey data. However, by looking at the respective contribution of stayers and entrants to service exports growth reveals that the former contribute negatively, i.e., their growth does not compensate for the foregone trade of exiters i.e., without new service exporting firms aggregate service trade would have actually decreased. The contribution of new exporters to total growth is 79.9% of which the majority was attributable to firms with more than 250 employees.

**Table 37: Stayers, entrants and exiters by firm size among service exporters between 2003 and 2005 (unweighted exports – thousand GBP)**

Export values in 2005 by exporter type and firm size in 2003 and 2005 (th GBP)						Export values in 2003 by exporter type and firm size in 2003 (th GBP)			Change in value of exports 2003-2005 (th GBP)		
Number of Employees in 2005						Total exports in 2005			Total exports in 2003	Stayers, Entrants and Exitors	Stayers and Entrants
10-50	51-100	101-250	251+	Not known							
<b>Firms exporting in 2005 but not in 2003: Entrants</b>											
1,428,560	778,760	1,113,950	4,699,598	803,196	8,824,064			0	8,824,064	8,824,064	
<b>Firms exporting in 2003 and in 2005: Stayers</b>							<b>Firms exporting in 2003 but not in 2005: Exitors</b>	<b>Firms exporting in 2003 and in 2005: Stayers</b>			
<b>Number of employees in 2003</b>											
10-50	2,357,626	265,256	n/a	n/a	n/a	2,730,707	1,151,805	2,159,515	3,311,320	-580,613	571,192
51-100	201,601	1,330,783	361,067	n/a	n/a	1,905,341	509,821	1,673,274	2,183,095	-277,754	232,067
101-250	146,439	498,110	3,192,994	610,058	n/a	4,447,601	1,605,061	3,624,129	5,229,190	-781,589	823,472
251+	n/a	n/a	395,573	15,955,060	n/a	16,423,986	2,996,191	16,229,783	19,225,974	-2,801,988	194,203
Not known	n/a	n/a	n/a	n/a	n/a	1,342,234	2,108,369	943,988	3,052,357	-1,710,123	398,246
<b>Total</b>	3,183,420	2,116,483	4,034,738	16,982,922	532,306	26,849,869				-6,152,067	2,219,180
<b>Column Total</b>	4,611,980	2,895,243	5,148,688	21,682,520	1,335,502	35,673,933	8,371,247	24,630,689	33,001,936	2,671,997	11,043,244

## 5.8 Predicting future UK exports of goods

Unfortunately, the availability of service trade data post 2005 has prevented us from estimating the same trade margins models used for trade in goods. Therefore, we are not in the position to provide a strong message on the evolution of service trade in between now and 2017/2020. Nevertheless, we might consider the following educated guess.

On the one hand over the period 2005-2011 trade in services has been growing, on average, at a faster rate than trade in goods. On the other hand the analysis in Section 4 provides us with an estimate of trade in goods growth between 2011 and 2017. If the positive differential between services trade growth and goods trade growth were to remain the same in between 2011 and 2017 as compared to 2005-2011 the level of service exports would then be 386,353 million £ in 2017 summing up to a total of 864,541 million £ worth of exports of goods and services for the UK. Still 3 years to reach one trillion in £ 2020 which might be after all not impossible.

## 6 Conclusions and policy recommendations

This report uses firm-level trade data for the UK to gain a better understanding of how growth in the value of goods and services exports is related to the extensive and intensive margins of trade. It explores in particular how these margins may vary across markets, sectors, and size of exporters. It also considers aggregate trade behaviour across products, markets and time in the context of the UK Government's twin objective of increasing total exports to £1 trillion and the number of exporters by 100,000 by 2020.

A review of the literature was carried out which identified a number of stylized facts about exporter behaviour and characteristics, and about the respective contributions of the extensive and intensive margins of trade to export growth, both in total and across export destination markets. The empirical literature suggests that these stylised facts are typical of export behaviour across many different countries. Our descriptive statistics confirm that the UK export patterns are broadly in line with the stylized facts derived from studies in other countries, although there is less evidence on services than on goods. The main descriptive findings for the UK are:

(1) Exports of goods are highly concentrated among a few large firms, but for services there is much less concentration:

- Large firms (more than 250 employees) are a minority of exporting firms, but responsible for 68% of total trade in goods. They tend to sell many products to many markets. Across all size bands, larger values of export sales are clearly associated with selling more products to many markets.
- The pattern for service exports shows much less concentration, with large firms accounting for only around a quarter of exports by value. There is also a much less clear association between export value and the number of products and markets, with many more firms exporting large values of a single project, and/or to a single-country. More than 80% of UK services exporters export only one product, and half of these export only to one country.

(2) The variation in aggregate exports across destination countries, as well as the dominance of the EU and USA in the case of the UK, is largely due to the extensive margins, rather than to the intensive margin:



- The analysis of UK exports of goods found that the size of the respective contributions of the extensive and intensive margins varies significantly across destination markets. For example, total exports to the US are 340% higher than those to China and the number of exporting firms is 222% greater. But the average number of products exported to the US is only 39% greater and the average exports per firm per product is less than 1% higher when exporting to the US. In contrast, exports to China are 62% higher than those to India but the number of firms exporting to India is higher and the number of products exported only 1.7% greater in China. The difference in aggregate exports is mainly driven by average exports being 62% higher.
- In the case of UK service exports, the same variation in margins contributions across destinations is evident. For example, whilst exports of services to the US are 375% higher than to China, the number of exporting firms is 595% greater. The number of products exported is only 8% higher and the average exports 411% higher in the US than in China.

An econometric model was implemented to investigate the determinants of each of the four margins decomposing total UK exports of goods: the firm, product and country extensive margins and the intensive margin. The analysis shows how these margins vary with size and distance of the destination export market, and are consistent with findings in the literature relating to goods exports from other countries:

- Firms export higher average values to large and nearby countries, and to countries with common language; [table 16]
- The average number of products exported by each exporting firm is also greater for large and nearby countries as well as for ex-colonies and countries with common language. [table 17]

(3) A further stylised fact in the literature is about the dynamics of export growth over time: Over a short time interval (a year or less), changes in aggregate exports are largely driven by changes in the intensive margin. When considering a medium to long time interval (5 to 10 years), however, changes in aggregate exports are mostly driven by changes of the *extensive* margins.

Our descriptive analysis was able to look at dynamics of UK export growth for both goods and services, and concluded that the evidence for the UK is in line with the stylised facts for other countries:

- For goods, the analysis focused on the dynamics of non-EU exports of goods between 2005 and 2011, using HMRC data. The evidence for the UK is in line with the stylised fact for other countries, that changes in aggregate exports are mostly driven by changes in the extensive margin when considering a medium to long time interval. The analysis found that new exporters accounted for 54.9% of exports growth over this period. These entrants were mainly either small and young firms or very large firms. Most of the remaining exports growth can be attributed to existing large exporters that remained so through time.
- In the case of services our analysis focused on total UK services exports for the shorter period 2003-2005, due to data availability. Despite the shorter period, the corresponding contribution of new exporters is actually even higher, at 79.9% of which the majority was attributable to firms with more than 250 employees. This figure is not directly comparable to that for exports of goods given the survey nature of the data for services exports.

A striking finding of this analysis was that the total number of exporting firms scarcely changed at all over the period. This is because the number of firms beginning to export over this period was approximately matched by the number of firms who dropped out of exporting over the period. Specifically, for goods, 2009 there were 82,263 exporters, and in 2011 there were 81,085; 33.4% of those exporting in 2009 had ceased to do so by 2011 and were replaced by new exporters. For services the data availability does not allow us to provide comparable numbers. These findings have important implications for the policy aim to increase export values. They highlight the need for a policy to encourage firms to start exporting, and replace firms that stop exporting.

The evidence on how stable the number of exporting firms is over time also shows that the government's objective of increasing the number of exporters by 100,000 by 2020 is very ambitious.

## Predicting future export growth

Our analysis then used the econometric model of the determinants of the margins of UK goods exports to provide a sophisticated prediction of how future UK exports growth is likely to be driven by the various margins. Since the descriptive analysis had demonstrated that the extensive firm margin for UK exports as a whole has been stable over time for the periods considered, our analysis made the assumption that this would continue to be the case in the future. Our modelling therefore focused on the determinants of changes over time in the product and country extensive margins, and in the intensive margin. Furthermore, we assume stability in factors other than time and GDP growth in destination countries. Our model uses GDP growth forecasts to 2017 available from IMF.

The model shows that a continuing trend of globalisation and current GDP growth forecasts for destination countries would imply an increase of UK goods exports to 478,188 million £ by 2017. We then make the further assumption that the value of UK services exports is likely to grow at least as rapidly over the period as the value of goods. This would suggest growth in the value of total UK exports would achieve around 864,541 million £ by 2017, meaning that £1 trillion by 2020 is perhaps achievable.

Our analysis suggests that achieving this target will require:

- Policies to help ensure that UK firms are able to capture the full potential of high GDP growth markets such as Brazil, China, India and Russia;
- Policies to help ensure a continuing annual influx of new exporters, and to help ensure successful persistence in exporting among more of those who begin to export;
- Policies which focus on large firms as well as on SMEs and new exporters. In addition to the necessity of new exporters, the model also confirms the important contribution to exports growth of large firms with more than 250 employees.

This report provides the most detailed picture of firm-level UK trade currently available and the econometric model it develops allows an optimistic view of exports growth to 2020. Policies that focus not on the total number of exporters but on exploiting the opportunities offered by globalisation and GDP growth in export destinations should enable the achievement of the £1 trillion exports objective.

### **Measuring the cost of custom formalities and paperwork on UK imports**

We then used our model to evaluate the impacts of custom formalities and paperwork on the different margins of UK imports of goods, and to derive estimates of the potential impact on customs revenues and HMRC administrative costs which would be likely to result from changes in the customs formalities. The purpose of this analysis is to benefit the key HMRC function of tax policy development.

Our estimations indicate that each additional document decreases the intensive margin by roughly 4% and the country margin by roughly 4%. No significant effect is found for the product margin. These figures can be applied to extra-EU trade only and, reversing these estimations to UK imports, we get that the 4 documents currently required to import in the UK (7 documents is the world average with 2 documents for France and 5 for the US) correspond to  $(4+4) \times 4 = 32\%$  less imports from extra-EU countries. From HMRC revenue perspective, considering that collected customs duties in 2011/2012 amount to roughly 3 billion £, eliminating one of such four documents would increase revenues from custom duties by 240 million £. Since we find the main effect to be on the intensive margin, the implication of our analysis is that these collection of these additional revenues would not be associated with commensurate increase in administrative costs for HMRC.

While uncovering such sizeable costs in terms of both foregone trade and customs duties our analysis suggests the need for policies involving ways of simplifying the documentation such that the practical burden could be reduced.

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## Annexes

### ANNEX I: ITIS sampling (before 2007)

#### Sample size:

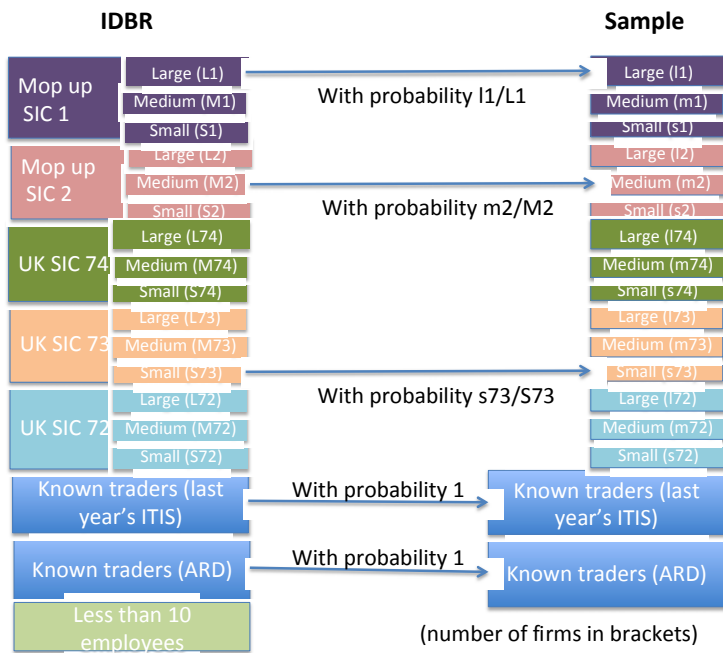
The sample size combining the quarterly and annual survey is close to 20,000 firms. In 2002 the annual survey sampled 20,000 firms by sector and sizeband from the IDBR, approximately split by 9000 for production industries and 11 000 for non-production industries. The quarterly survey samples around 700 (mainly larger) firms.

#### Sample design:

The annual sample is a stratified random sample with the Interdepartmental Business Register as the sample frame. Firms are not surveyed if they have less than 10 employees. Because many firms will not be engaged in international transactions this basic selection is improved with:

1. “Known Traders”: Firms known to feature international trade in services. They will either:
  - a. be in the previous year’s Annual ITIS. These can remain in AITIS or – if they grow large enough – can be transferred to the Quarterly ITIS
  - b. be identified from the ABI. With effect from 2000, four filter questions from the ABI (in ARD) identify the firms that are trading (importing or exporting) in services. All positive responses not already in the annual ITIS sample are added.
2. “High Propensity” traders: Firms in certain industries with a high probability to be trading services are sampled from IDBR (UK SIC 72 to74) This includes mainly consultancy firms in the service sector plus the music industry and computer services. Businesses are sampled from the IDBR selected using stratified random sampling based on UK SIC sectors and a number of employment-defined strata with sampling fractions decreasing in direct proportion to employment size. The employment bands are 10-99, 100-499 and 500+.
3. “Mop ups” industries have been sampled from the IDBR, to ensure full coverage of the economy. Analysis will be carried out at the end of each survey period and “mop up” industries will be rotated with “High Propensity” industries if they are found to have high ITIS values. The sample uses the standard 2-year IDBR rotation feature for annual sample. And the same employment-sector strata are used.

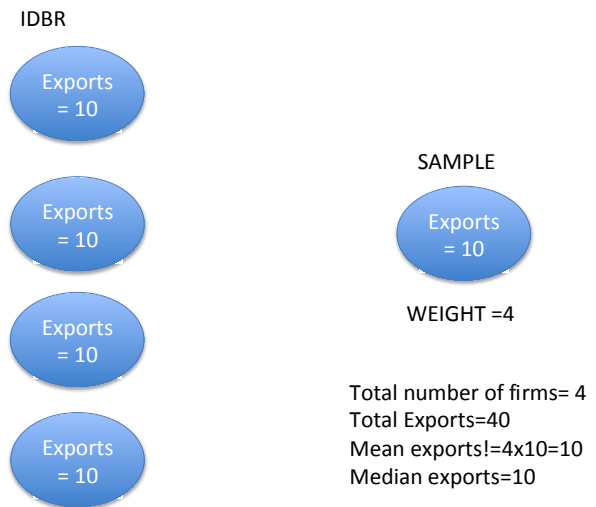
This means that in 2005, the sampling procedure was as illustrated below:



Calculating weights:

This means that to recover overall figures, we need to use weights. See the two examples below:

Weight = 1/probability of being sampled  
 Example: a sector/stratum with 4 firms





IDBR

Exports  
= 10

Exports  
= 0

Exports  
= 10

Exports  
= 0

Exports  
= 10

Exports  
= 10

SAMPLE

Exports  
= 10

Exports  
= 10

Exports  
= 0

WEIGHT =2

Total number of firms=  $3 \times 2 = 6$

Total Exports=  $20 \times 2 = 40$

Mean exports=  $10 \neq 2 \times 10$

## ANNEX II: Additional tables on services exports.

Please note that, as explained in Chapter 5, we use the term ‘*unweighted*’ to refer to the unweighted *sample of respondents* to the survey. By contrast we use the term ‘*weighted*’ to refer to a weighted sample which has also been grossed up to provide *population estimates*. This explains the large difference shown between the number of firms shown in Tables 22 and 23, and throughout this chapter. Specifically, the two totals are:

- Total number of firms in the unweighted sample of survey respondents: 4,619
- Total estimated number of services exporter, weighted: 43,574.

Could you just add percentage versions of the tables for which not currently shown please?

**Table 38: Distribution of service exporters by number of products and export destinations (unweighted and EU as one)- 2003**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	1,610	641	420	425	709	3,805
2	147	125	88	76	114	550
3	37	36	16	34	36	159
4+	18	18	17	16	36	105
All	1,812	820	541	551	895	4,619

**Table 39: Distribution of service exporters by number of products and export destinations (Weighted and EU as one)- 2003**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	23,135	7,221	2,881	3,220	2,344	38,801
2	917	570	351	241	211	2,289
3	171	124	113	1,867	55	2,330
4+	18	18	38	43	37	154
All	24,241	7,933	3,382	5,370	2,647	43,574

**Table 40: Share of service exporters by number of products and export destinations (unweighted – EU as one)- 2003**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	34.9%	13.9%	9.1%	9.2%	15.3%	82.4%
2	3.2%	2.7%	1.9%	1.6%	2.5%	11.9%
3	0.8%	0.8%	0.3%	0.7%	0.8%	3.4%
4+	0.4%	0.4%	0.4%	0.3%	0.8%	2.3%
All	39.2%	17.8%	11.7%	11.9%	19.4%	100%

**Table 41: Share of services export values by number of products and export destinations (unweighted – EU as one)- 2003**

Number of products	Number of Countries					All
	1	2	3	4-5	6+	
1	11.0%	5.9%	4.0%	5.4%	37.7%	64.1%
2	1.6%	2.6%	1.9%	1.2%	7.9%	15.2%
3	0.6%	1.3%	0.2%	1.3%	3.1%	6.5%
4+	0.2%	0.2%	5.1%	0.4%	8.2%	14.2%
All	13.5%	10.0%	11.2%	8.4%	56.9%	100%