Questioni di Economia e Finanza

(Occasional Papers)

How does multinational production affect
the measurement of competitiveness?

by Stefano Federico

Questioni di Economia e Finanza

(Occasional papers)

How does multinational production affect
the measurement of competitiveness?

by Stefano Federico

The series Occasional Papers *presents studies and documents on issues pertaining to the institutional tasks of the Bank of Italy and the Eurosystem. The* Occasional Papers *appear alongside the* Working Papers *series which are specifically aimed at providing original contributions to economic research.*

The Occasional Papers *include studies conducted within the Bank of Italy, sometimes in cooperation with the Eurosystem or other institutions. The views expressed in the studies are those of the authors and do not involve the responsibility of the institutions to which they belong.*

The series is available online at www.bancaditalia.it .

HOW DOES MULTINATIONAL PRODUCTION AFFECT THE MEASUREMENT OF COMPETITIVENESS?

by Stefano Federico*

Abstract

This work assembles a unique bilateral dataset on multinational production in the manufacturing sector, in which value added and factor incomes are broken down by location country and by ultimate owner country. Using this dataset, which covers 44 countries over the years 2004-11, we compute measures of production capabilities in which value added is allocated across countries not according to the location of the activity but according to the nationality of the firms or of the factors involved in production (Baldwin and Kimura 1998). These indicators based on the ownership of production are then compared with standard geography-based indicators. This framework is also applied to the analysis of the two modes of supply of foreign markets (exports and FDI) using a common metric based on value added (domestic value added in exports versus value added of foreign affiliates). Overall, the evidence suggests that there are significant differences between geography-based and ownership-based measures, proving that, in an increasingly integrated global economy, ownership matters for the measurement of competitiveness.

Contents

---

* Bank of Italy, Economics, Statistics and Research Department.

1 Introduction[1]

In the case of multinational companies, the geographical location of production does not coincide with the ownership of production. The global growth of multinational groups is therefore heightening the separation between measures of activity based on location (domestic or geography-based indicators) and measures based on the nationality of firms or of factors involved in production (national or ownership-based indicators). Standard measures of competitiveness based on exports or income generated in the production of tradable goods might be heavily affected by the strategies of multinational companies; for instance, they might not adequately capture the effects of a dominant presence of foreign affiliates in certain countries or of a sudden expansion of activities abroad by domestic investors.

The lack of detailed bilateral datasets on foreign affiliates' activity has thus far prevented a thorough analysis of how multinational production affects the measurement of the competitiveness of a nation's companies in an increasingly integrated global economy. This paper attempts to fill the gap. It starts by assembling a unique bilateral dataset in which value added and factor incomes are simultaneously broken down by country of location and by firms' ultimate owner country. The dataset, which covers 44 countries over the years 2004-11, is built using a combination of statistics on foreign affiliates from international sources, national sources, commercial firm-level databases and various estimation procedures.

Using this innovative dataset, the work puts forwards new measures of production capabilities of the manufacturing sector, in which value added is allocated across countries not according to the location of the activity but according to the nationality of the firms or of the factors involved in production. The first measure corresponds to the value added generated at home or abroad by domestically-owned firms, which is an indication of the capabilities of the home country's geographically mobile factors (capital, management, production techniques and designs) combined with various countries' immobile factors. The second measure corresponds to the value added generated by national factors (labor at home and domestically-owned capital at home and abroad). We argue that these new indicators, which take into account of the ownership structure of multinational groups, capture important aspects of the competitiveness of a country's firms or factors of production and could be used to supplement standard indicators based on the location of the activity.

This framework is also used to analyse the choice between exports and foreign direct investment (FDI) as alternative modes to serve foreign markets. The problem of finding a common metric for a proper comparison between exports and the activity of foreign affiliates can be solved with an approach based on value added, in which we compare the domestic value added in exports and the value added of foreign affiliates.

This work builds on the seminal contribution of Baldwin and Kimura (1998) and related work on ownership-based measures of competitiveness (Kimura and Baldwin 1998, Lipsey, Blomstrom and Ramstetter 1998 and Ando and Kimura 2005). Our study has the same motivation as this literature, i.e. the increasing importance of multinational activity and the focus on value added as a nonduplicative measure that allows for a proper comparison of production capabilities and of the alternative modes of supply of foreign markets.[2] With respect to this literature, which focuses exclusively on two countries (the United States and Japan), our main contribution concerns a much larger set of countries, allowing the first systematic comparative analysis at the global level.

Our work is also related to the wide literature on foreign direct investment (for a recent survey see Antras and Yeaple 2014). While rich and detailed datasets on the activity of multinational companies are available for selected countries, cross-country research has been hampered by the lack of bilateral datasets on multinational production at the global level. The use of FDI data, which are available on a cross-country basis in the balance of payments statistics, has several limitations. As they capture financial flows and stocks, these data cannot be easily compared with production or exports data. Moreover, the frequent use of special purpose entities, pass-through vehicles and holding companies strongly influence the country and industry distribution of FDI, providing a poor approximation to country and industry distribution of the actual production activity of multinationals (Lipsey 2007). A few recent papers have assembled bilateral datasets on multinational production (Fukui and Lakatos 2012, Ramondo 2014, Ramondo, Rodriguez-Clares and Tintelnot 2013, Alviarez 2014), although generally with a more limited set of variables and a smaller time span than those considered in this work.

A related line of research is the rapidly growing literature on global value chains (GVC; Johnson and Noguera 2012, Johnson 2014, Koopman, Wang and Wei 2014). We take into account a major lesson from these studies, discarding gross measures such as exports or sales in favour of a non-duplicative measure such as value added. This is particularly important in the case of the activity of foreign affiliates, which tend to have a relatively low degree of vertical integration: we estimate that the value added of foreign affiliates is only 22 per cent of their total sales, reflecting the large amount of inputs that foreign affiliates acquire from the multinational group or from independent suppliers. Unfortunately existing data sources provide very limited evidence on foreign affiliates' trade flows and basically no evidence on the destination and use of affiliates' output, preventing us from fully integrating multinational production in the analysis of global value chains. However, we indirectly contribute to this literature in two ways: first, we compare the domestic value added in exports with the value added of foreign affiliates, using value added as a common metric to evaluate the relative importance of the modes of supply of foreign markets; second, we show that measuring value added on an ownership basis rather than a location basis has a significant impact on countries' relative competitiveness, providing an important qualification to existing measures of GVC incomes on a location basis (Timmer, Los, Stehrer and de Vries 2013).

The rest of the paper is organized as follows. Section 2 describes the data sources and the methodology. Section 3 describes the ownership-based measures of production

---

[2]Along this line of reasoning, Greenaway, Lloyd and Milner (2001) also argue in favor of the value added by factors owned by residents as the ideal approach to avoid any double counting in the context of international production.

capabilities. Section 4 presents the comparison between exports and the activity of foreign affiliates on a value added basis. Section 5 concludes.

2   Data

2.1   Bilateral dataset on foreign affiliates

We assemble a detailed bilateral dataset on the activity of foreign affiliates for 44 countries (which cover more than 90 per cent of world value added in the manufacturing sector) and a 'Rest of the world' aggregate. The bilateral nature of the dataset refers to the availability of a simultaneous breakdown by location of activity and by ultimate owner country (e.g. value added of U.S.-owned companies in Brazil). The set of countries includes 25 EU countries (the only exceptions are Cyprus, Malta and Croatia), Switzerland, Russia, Turkey, 4 countries in the Americas (United States, Canada, Mexico and Brazil), 11 countries in Asia (China, Hong Kong, Korea, India, Indonesia, Japan, Malaysia, Philippines, Singapore, Taiwan, Thailand) and Australia.

The time span of our final dataset covers the years 2004-11. In principle, we collect foreign affiliates' statistics from 1995, but we do not report results for the first decade due to serious concerns about data gaps and breaks in the time series, which usually reflect profound changes in the definition of foreign affiliates or in the statistical methodology.

We consider only foreign affiliates operating in the manufacturing sector.[3] This reflects various issues, including less data availability for foreign affiliates in agriculture, mining and services sectors, the greater relevance of tax havens - which do not typically report foreign affiliates' statistics - as a location of foreign affiliates in the service sector, and the large heterogeneity within the service sector, which makes the use of imputation methods (in order to recover detailed aggregates from sales or employment data) more controversial. The exclusion of non-manufacturing affiliates from our analysis, although dictated by data constraints, carries with it potentially significant limitations: the structure of multinational groups specialized in the production of manufacturing goods often includes several non-manufacturing foreign affiliates, which perform specialized business functions such as R&D, financial services, and cash pooling.[4]

For each country pair (location country and ultimate owner country) we consider the following variables: sales; number of employed persons; value added (on a gross basis); labor compensation (wages and social benefits); capital compensation (gross operating surplus).

---

[3]The dataset does not include information on sub-sectors within the manufacturing sector (e.g. textiles, machinery, transport equipment, etc.). Although in principle the datasets provided by Eurostat, OECD and national sources include data at the sub-sector level, in practice many cells at this level are flagged as confidential by reporting countries and therefore are not available.

[4]An additional concern relates to transfer pricing practices, through which multinational groups allocate their profits in favour of foreign affiliates located in tax havens; these affiliates would typically be non-manufacturing companies, such as holdings or financial services companies. The implications of transfer pricing are discussed in Section 2.2.

2.2 Sources and methods

Data on multinational production is based on the statistics of foreign affiliates (FATS) reported by Eurostat, OECD and national sources. Inward FATS data describe the overall activity of foreign affiliates resident in the reporting economy. Outward FATS data report instead the activity abroad of affiliates controlled by ultimate owners resident in the reporting economy. We combine inward and outward FATS data in order to maximize the available information on each country pair, with a preference for inward data. The reason is that inward data on foreign-owned firms are usually compiled from the same sources as data for the rest of the economy and are therefore very comparable with the latter (Lipsey, Blomstrom and Ramstetter 1998).[5] This can be seen, for example, in Eurostat regulations, which require countries to report a considerably longer list of variables for inward FATS statistics than for outward FATS ones. An exception is made for countries with a long tradition of high-quality outward FATS statistics (United States and Japan). Data on foreign affiliates generally include only majority-owned affiliates and are broken down by country of ultimate controlling institutional unit.

For a number of country pairs no information was available on some or all of the variables in foreign affiliates' statistics. This usually reflects the following issues: first, a few countries do not report statistics on foreign affiliates, while some countries report statistics on foreign affiliates only for selected partners; second, outward statistics often include information on employment and sales but not on value added and factor incomes; and third, figures for specific country-pairs might be considered confidential by the reporting country. When only a subset of the variables is missing for a given country pair, we impute them using various estimation methods (e.g. applying interpolation or extrapolation methods or using standard ratios - value added per employed person, wages per employed person, etc. - from other countries' foreign affiliates in the same location country). If none of the variables is available for a given country pair, we estimate the main aggregates from Bureau van Dijk's Orbis, the world's largest commercial firm-level database.[6] We extract information on firms' sales, employment and ultimate owner company and use it to estimate the level of sales and employment for the foreign affiliates of a given country pair. We then estimate the remaining variables following the same imputation methods as above. The remaining country pairs for which no foreign affiliate was found in Orbis were assumed to have zero or negligible levels of foreign affiliates' activity.

For countries that report inward FATS statistics, we take the overall level of foreign affiliates operating in a country as given and impose that the sum across all countries (including the 'Rest of the world' aggregate) is equal to the total reported by the location country. We run consistency checks with country totals derived from outward FATS statistics to ensure that our estimates are broadly in line with data reported from the controlling country.[7] For further consistency checks, we compute the share

---

[5]For instance, in most European Union countries inward FATS data are compiled on the basis of the structural business statistics survey (Eurostat 2012).

[6]The Orbis database has been used by several papers, see for instance Cravino and Levchenko (2014).

[7]Overall, FDI and FATS data are affected to a much smaller extent by the 'under-reporting' that characterizes other financial assets such as portfolio securities or deposits. This is shown, for instance, by the comparison of FDI assets and liabilities at the world level, which do not show the huge asymmetry found for portfolio assets. There are, however, significant asymmetries at the bilateral level, the most

of foreign affiliates in domestic activity using data on each country's activity in the entire manufacturing sector drawn from the WIOD Socio-economic Accounts (Timmer 2012), OECD, Eurostat and national sources.

Table 1 shows that 79 per cent of foreign affiliates' global sales in our database is derived from FATS statistics in 2011, while the remaining 21 per cent is derived either from Orbis or from estimation methods. For employment, value added and factor incomes the share accounted for by FATS is around 60 per cent.[8] Their reasonably good coverage statistics, despite the fact that some of the countries included in the sample do not report FATS data, reflects the high concentration of the activity of foreign affiliates, especially on the outward side: 5 controlling countries (U.S., Japan, Germany, U.K. and France) account for 62 per cent of global sales by foreign affiliates. The relative importance of the different data sources varies significantly across countries: for foreign affiliates controlled by the U.S, Germany, Japan, France and Italy, FATS statistics account for 85-95 per cent of sales, while their coverage is much lower for several Asian economies (see Table A1 and Table A2).

Before moving to the presentation of the results, two methodological considerations are in order. First, the figures should be taken as rough estimates, with potentially significant errors, especially for country pairs with limited availability of foreign affiliates' statistics in official sources. Even for countries with data available in official sources, there might be statistical issues, such as those relating to the identification of the ultimate owner country and to the sector classification of the affiliate. In general, the coverage of FATS data is larger for the main advanced economies and for the majority of EU countries, while it tends to be lower for emerging Asian economies.

Second, the value added of foreign affiliates might well be influenced by transfer pricing strategies aiming to minimize the tax burden for the multinational group as a whole. The increasing importance of intangible inputs (patents, trademarks, company logos, processes, etc.), which might be allocated to affiliates on the basis of tax accounting considerations, raises the issue of the extent to which the allocation of value added in a multinational company accurately reflects the actual distribution of inputs (Lipsey 2008, Rassier and Koncz-Bruner 2013). While we are not able to assess how pervasive such strategies are, this issue should certainly be borne in mind when interpreting our results. On the other hand, assembling a bilateral dataset on value added might also help to point out the existence of outliers (e.g. foreign affiliates with extremely high ratios of value added on sales) that might be related to very favourable tax conditions.

2.3   Aggregate evidence

We estimate that in 2011 (the last year for which data are available) the total sales of foreign affiliates in the manufacturing sector amounted to USD 9.3 trillion, with a value added of USD 2.0 trillion and 26.8 million people employed (Table 2). Foreign affiliates account for 21 per cent of sales and 18 per cent of value added in the global manufacturing sector, even if they account for less than 7 per cent of employment.[9] The

---

significant of which are mentioned in the Appendix.

[8]The robustness of our estimates for the value added of foreign affiliates (for the country pairs for which official data on value added does not exist) is discussed in the Appendix.

[9]Our figures are in line with Alviarez (2014), who estimates that foreign affiliates' sales account for 24 per cent of sales of manufactures in a sample of 35 reporting countries. The discrepancy might reflect the

fact that foreign affiliates' share in terms of value added is larger than their share in terms of employment is consistent with the widely documented productivity premia of foreign affiliates relative to domestic companies. This productivity advantage might be related to industry composition effects as well as within-industry differences in capital intensity, labour force composition, managerial ability and available technology.[10]

The share of manufacturing employment in foreign affiliates is extremely high (between 30 and 50 per cent) in some Central and Eastern European countries (Slovakia, Czech Republic and Hungary), Belgium, Sweden and a few very small countries (Table 3, columns A and B). Foreign affiliates controlled by a given country account for a significant portion of the manufacturing activity in selected countries. For instance, 21 per cent of manufacturing employment in Ireland belongs to U.S.-owned affiliates, which account for an even larger share in terms of value added.[11] U.S.-owned affiliates also account for 12 per cent of manufacturing employment in Canada, while German-owned affiliates contribute to 13 per cent of manufacturing employment in the Czech Republic and more than 10 per cent in Austria and Hungary.

There is also significant heterogeneity on the outward side, i.e. when we compare the activity of foreign affiliates with that in the controlling country (Table 3, columns C and D). For France, the U.S. and the U.K the level of employment in foreign affiliates operating abroad is between 50 and 65 per cent of their domestic employment, while it amounts to 35-40 per cent for Germany and Japan and only 15 per cent for Italy. This is in line with the evidence suggesting that outward FDI is mostly concentrated among large advanced economies, reflecting the global reach of large multinational groups based in those countries. This is also consistent with the list of the world's top 100 non-financial

---

fact that our sample includes a larger set of countries, including a few Asian economies with a relatively low incidence of foreign affiliates. Furthermore, our figures are based on world totals (not totals for the sample of countries) at the denominator. In other terms, the denominator includes the 'Rest of the World' aggregate, for which, by construction, we assume away intra-FDI activity (i.e. foreign affiliates owned by countries in the 'Rest of the World' and located in other countries of the 'Rest of the World'). A comparison can also be made with the UNCTAD (2014) estimate, which refers, however, to all sectors of the economy: total sales of foreign affiliates in all sectors amount USD 24.2 trillion, with a value added of USD 6.3 trillion and 83.0 million people employed. The manufacturing sector therefore seems to account for approximately a third of global value added of foreign affiliates in all sectors.

[10]The productivity advantage of foreign affiliates is sizeable according to the available official statistics. Among the 30 countries that report data on inward FATS activity, foreign affiliates are 50 per cent more productive than domestic companies in terms of value added per worker in the median country; they also record a 30 per cent premium in terms of wages per worker. The productivity advantage becomes larger in our full sample of countries, with foreign affiliates being 100 per cent more productive than domestic companies and their wages per worker 50 per cent higher. This follows our estimation procedure, which builds on the median ratio of value added to sales of the subset of foreign affiliates located in a given country for which value added data are available. If this subset of foreign affiliates tends to be more productive than the other foreign affiliates located in the same country, our procedure might overestimate the productivity advantage of foreign affiliates. It should be observed anyway that, although the literature on productivity premia of foreign affiliates provides a wide range of estimates, recent evidence seems to point to it being between 60 and 90 per cent after controlling for industry composition effects (Waldkirch 2014), which is broadly consistent with our estimates.

[11]The difference between the value added share and the employment share of foreign affiliates can be quite large (between 20 and 45 percentage points) in a few cases (Brazil, Hungary, Ireland, Poland, Singapore and Thailand). This does not depend on our estimation procedures, since for all these countries except Brazil data on total inward activity is available and has been imposed as a constraint in our estimates.

multinational corporations ranked by foreign assets (UNCTAD, 2014), which shows a predominance of companies headquartered in the 5 largest advanced economies.

Among other EU countries, the ratio is even higher in the Netherlands, Sweden and Ireland (80-95 per cent), relatively high in Austria and Belgium (35-45 per cent) and much lower in economies such as Greece, Portugal and Spain (3-7 per cent). The vast majority of developing and emerging countries record a very low, and often negligible, share of employment in foreign affiliates operating abroad in their domestic employment.[12] This is consistent with the evidence reported in the literature on FDI pointing to a strong correlation between outward FDI activity and GDP per capita.

Note that these figures underestimate the propensity to engage in international production of domestically-owned companies, since the denominator includes domestic activities of foreign-owned companies.[13] It should also be remarked that the figures include the activities of non-multinational domestically-owned companies in the denominator and therefore they underestimate to an even larger extent the actual propensity of domestically-owned multinational companies to engage in international production.

To illustrate the information available in our dataset, Table 4 contains a snapshot of the largest 20 country pairs in terms of value added. There is a prevalence of advanced countries among these pairs, with all controlling countries being advanced and location countries also being mostly advanced countries (13 out of 20). The largest country pair regards the activity of U.K.-owned affiliates in the U.S., with value added amounting to USD 68 billion in 2011. It is followed by U.S.-owned affiliates in Canada and by Japanese-owned affiliates in China, with value added amounting to USD 63 and 45 billion, respectively.

There is significant variation in terms of value added per employed person, ranging from USD 33 thousand for Japanese-owned affiliates in China to USD 670 thousand for U.S.-owned affiliates in Ireland. Relative productivity (where the value added per employed person of foreign affiliates operating in the location country is divided by the value added per employed person in the entire manufacturing sector of the location country) is also quite heterogeneous, although almost always above one, in line with the evidence of productivity premia for foreign affiliates. There is also significant variation in terms of the ratio of value added to sales (from about 20 per cent for foreign affiliates in China and Mexico to values above 35 per cent for Swiss-owned affiliates in the U.S. and U.S.-owned affiliates in Ireland). The average ratio of value added to sales of foreign affiliates is usually lower than that of the domestically-owned firms operating in the same location country; this might be taken as evidence of a lower vertical integration for foreign affiliates, although there could be other explanations.[14]

---

[12]For China, the extremely low level of outward foreign affiliates may be related to the use of pass-through companies located in Hong Kong, which might be erroneously reported as ultimate companies in FATS or Orbis data. The main reason, however, is the combination of a low propensity to produce abroad, at least in the manufacturing sector, and the huge size of the Chinese manufacturing sector. Even if we suppose that all affiliates of Hong Kong-owned companies are ultimately owned by Chinese companies, the value added generated abroad would only be just 1.5 per cent of the value added generated in China.

[13]The use of the same denominator as the one for the inward ratios is motivated by the need to facilitate comparisons between outward and inward ratios.

[14]Other explanations include: a) foreign affiliates that, together with their primary manufacturing activity, also perform secondary activities as wholesale traders; b) a low level of profitability (especially

Capital compensation as a share of value added (defined as gross operating profits, thus including capital depreciation allowances, business taxes and interest) also shows significant heterogeneity, with low values for foreign affiliates operating in some advanced markets (e.g. U.S.-owned affiliates in Japan) and high values for U.S.-owned affiliates in Ireland and for Japanese-owned affiliates in India. The capital share of foreign affiliates is often higher than the capital share of domestically-owned firms in a given location country, especially in developing or emerging markets; this suggests the ability of multinational companies to extract a higher share of value added, combining proprietary technology, know-how, management skills and brands with low-wage labour.

3 Ownership-based measures of production capabilities

3.1 Definitions

This section shows how the breakdown by firms' ultimate owner country allows us to aggregate value added with a view to computing ownership-based indicators of a country's competitiveness. Note that by competitiveness we refer to production capabilities in the manufacturing sector; data limitations prevent us from considering the service sector, either as a final good or as an input in the production of manufacturing goods.

The standard 'domestic' value added (or location-based value added) corresponds to the value added generated in a given country. It can be defined as the sum of the value added generated in country i by domestically-owned firms (i.e. firms headquartered in the same country) and of the value added generated in country i by foreign-owned firms:

$$VA_i^{location} = VA_{i,i} + \sum_{j \neq i} VA_{i,j} \tag{1}$$

where the first subscript indicates the location country and the second subscript indicates the controlling country.

Following Baldwin and Kimura (1998) and Lipsey, Blomstrom and Ramstetter (1998), value added can be allocated not only according to the location of activity but also according to the nationality of firms. This measure corresponds to the global value added of domestically-owned firms of country i, which can be defined as the sum of the value added generated across the world by firms whose ultimate owner is headquartered in country i:

$$VA_i^{firms} = VA_{i,i} + \sum_{j \neq i} VA_{j,i} \tag{2}$$

This measure reflects the global capabilities of domestically-owned firms, that is the capabilities of the mobile factors controlled by the country's firms (capital, management and production techniques), combined with various other countries' immobile factors (Lipsey, Blomstrom and Ramstetter 1998). It is different from domestic or location-based

---

if competition is strong or if foreign affiliates are in their initial stages of activity); and c) transfer pricing strategies (Baldwin and Kimura 1998).

value added, which instead reflects the combination of the country's immobile factor (labour) with various other countries' mobile factors (domestically-owned capital and foreign-owned capital). The two indicators serve different purposes. While the location-based measure refers to the value added that is generated in a given country, the ownership-based indicator offers a broader perspective of the global reach of firms headquartered in a given country.

Value added can also be aggregated according to the nationality of the factors involved in production (labour and capital). This global value added generated by national factors can be obtained as the sum of labour compensation at home, capital compensation in domestically-owned firms and capital compensation abroad in foreign affiliates controlled by domestically-owned firms. This measure corresponds to the sum of the value added by factors owned by residents, or in other terms the gross incomes accruing to domestic factors:

$$VA_i^{factors} = VA_{i,i} + \sum_{j \neq i} LAB_{i,j} + \sum_{j \neq i} CAP_{j,i} \tag{3}$$

Note that these are gross incomes, which may differ significantly from net incomes (i.e. the profits that multinationals actually earn from their foreign activities after taxation) owing to the effects of consumption of fixed capital and taxation.[15]

3.2 Main results

How do ownership-based measures differ from geography-based measures? Figure 1 provides a first answer to this question for the 15 largest economies in terms of value added in the manufacturing sector in 2011. It reports the percentage difference between value added by nationality of firm (or factors) and value added by location of activity for each of the 15 countries.

The value added by nationality of firm (blue histograms) is significantly larger than the value added by location for France and the U.K. (about 25 per cent), Japan (15 per cent) and the U.S. and Germany (10 per cent). This suggests the value added generated in the outward activity is considerably larger than the value added generated by the inward activity in these countries. There are significant differences in terms of the geographical distribution of foreign affiliates. These patterns usually reflect a combination of factors, including market size, language, colonial links, distance or other location advantages.[16] For instance, the value added of U.S.-owned affiliates is substantial in the other large Anglo-Saxon countries (Canada and the U.K.), but also in Germany, Ireland and the 'Rest of the world', while Japanese-owned affiliates tend to be mainly concentrated in other Asian economies (China, Thailand and Indonesia). The presence of U.K.-owned affiliates

---

[15]It can be debated whether, in the context of our nationality-based approach, the consumption of fixed capital in foreign-owned firms should be considered part of the income of the controlling country or of the location country. Although the latter would be more consistent with the practice of national accounts, we choose the former solution because capital compensation data are only available on a gross basis. To correct for the consumption of fixed capital we would have to estimate depreciation rates for capital used by foreign affiliates, on which no systematic evidence exists.

[16]The propensity to invest abroad might also be related to conditions in the home country (i.e. labour costs, regulatory environment, small market size). Disentangling the determinants of multinational activity using this dataset is left for further research.

is especially strong in the U.S. and in the 'Rest of the world', presumably reflecting language and colonial history. For French-owned affiliates, the most important location countries include all the other large EU countries, but also the U.S. and Brazil, while German-owned affiliates are relatively more concentrated in extra-EU countries (U.S., Brazil, China and the 'Rest of the world').

The value added by nationality of firm is instead very similar to domestic value added in the case of Italy. The value added generated abroad by Italian-owned affiliates (especially in the U.S., Brazil and in large EU countries) is offset by an approximately similar amount of value added generated in Italy by foreign-owned companies (with U.S. and large EU economies as the main controlling countries). For almost all the other economies considered in Figure 1 the value added based on the firm nationality is smaller than the domestic value added (7 per cent for China, 15-20 per cent for Mexico, Spain, Indonesia and Canada and almost 30 per cent for Brazil).

Considering the full set of countries, value added by nationality of firms tends to be smaller than domestic value added (as indicated by the ratio of the two indicators reported in the last column of Table 5) in Central and Eastern European countries, emerging and developing countries (which are typically FDI recipients, reflecting the need for foreign capital and technologies) but also in a few selected euro-area countries with high levels of inward FDI (e.g. Belgium and Ireland, where fiscal and proximity advantages might play a role). The difference is extremely large (with value added by nationality of firms about 50-55 per cent less than value added by location) in countries such as Hungary, Czech Republic and Thailand. Conversely, it is much larger than domestic value added in countries such as the Netherlands and Switzerland (about 75 and 90 per cent, respectively) and in small countries such as Luxembourg and Hong Kong.

Looking at Figure 1, the percentage difference with respect to the domestic value added becomes smaller if we allocate value added by nationality of factors (equation (3), red histograms in the Figure) instead of nationality of firms. This is to be expected since the nationality of factors includes all the labour income in inward foreign affiliates and differs from the location of activity only regarding the difference between capital income in foreign affiliates and capital income in outward foreign affiliates. Nonetheless, differences remain significant, around 10-15 per cent for the largest advanced economies and between -10 and -15 per cent for some of the largest emerging economies.

A remarkably different picture emerges when we consider the change in the global market share between 2004 and 2011 according to the different measures (Figure 2 and Table 6). For instance, France records a 39 per cent decline in its world market share in terms of value added by location, but only a 24 percentage point decline in terms of value added by nationality of firm. The U.K. and Japan show a similar trend, with their market share falling by 42 and 29 per cent respectively in terms of location value added but only 34 and 24 per cent using nationality of firm. These patterns mostly reflect the expansion of French-owned affiliates in emerging countries and in Germany, of U.K.-owned affiliates in the U.S. and of Japanese-owned affiliates in Asia. In Italy the picture is also relatively more favorable picture in terms of nationality of firm (-29 per cent) than in terms of location (-32 per cent), reflecting the significant increase in the value added of Italian-owned affiliates after Chrysler's acquisition by Fiat.

There are instead only minor differences between market shares in terms of value added by nationality of firm and value added by location for countries such as the U.S., Germany

and Spain. A caveat to this analysis is that value added data are at current prices and market exchange rates. The results might therefore be influenced by differences in inflation rates. Unfortunately, a constant-price analysis is not feasible due to the unavailability of data on foreign affiliates' deflators.[17]

4 Exports and foreign affiliates' activity on a value added basis

4.1 Definitions

An approach based on value added proves also to be very useful for a joint analysis of the two modes of supply of foreign markets: cross-border exports and production in foreign affiliates. Comparing exports with FDI flows or FDI income creates an apples-and-oranges problem, because exports are a measure of gross sales while FDI flows and FDI income are indicators of financial flows and factor incomes. A comparison between exports and sales of foreign affiliates is also flawed, because they are both measures of gross output in which a given value added may be counted twice or more; this happens, for instance, when exports from one country to another country are used by foreign affiliates in the latter country as inputs to their production.

Following Baldwin and Kimura (1998), a proper analysis of the two modes of supply of foreign markets can instead be made on a value added basis, where the value added of foreign affiliates is related to the domestic value added in exports. The former captures the mode of supply of foreign markets via production by foreign affiliates, while the latter captures the mode of supply via cross-border exports. In both cases the use of a value added metrics allows duplications to be avoided (i.e. counting the same value added twice), which arise when working with gross measures. Defining VAX_i as the domestic value added in exports from country i to the rest of the world[18] and $VAFA_i$ as the value added of foreign affiliates with country i as ultimate owner (i.e. all firms in the rest of the world that are ultimately owned by country i), the sum of the two terms (Y_i) represents the total amount of value added generated by country i (either directly via exports or indirectly via its own foreign affiliates) to serve foreign markets:

$$Y_i = VAX_i + VAFA_i \tag{4}$$

Note that by considering the total value added of foreign affiliates we are implicitly making the strong assumption that the value added of foreign affiliates is entirely activated by foreign demand. This assumption is necessary because, apart from a few countries, there is no systematic evidence on the destination of the output of foreign affiliates.

---

[17]Alternatively, one could make the assumption that, in a given location country, the growth rate of value added deflators for foreign affiliates is the same as the growth rate of value added deflator for the entire manufacturing sector of the location country. Although this assumption might be problematic, given the evidence pointing to specific differences between intra-firm trade pricing practices and arm's-length trade pricing practices (Neiman, 2010), it might be worth exploring its implications for the results.

[18]I am grateful to Alberto Felettigh and Giacomo Oddo for sharing their data on value added in exports of manufacturing products for 38 countries included in the WIOD database and for the world total. Specifically, we use the GDP in exports (items (1)-(5) of the decomposition in Koopman et al. 2014). For simplicity, we use the term 'value added in exports' (VAX).

Existing data for selected countries suggest that only a small share of the output of foreign affiliates is sold back to the home country, at least for the manufacturing sector as a whole (10-15 per cent for the U.S., Japan and Italy, although there is wide heterogeneity across sectors and across countries of location of foreign affiliates).[19]

Another methodological consideration is in order. Ideally, with detailed information on the export activity of foreign affiliates, it would be useful to introduce a distinction between exports of domestically-owned firms in country i and exports of foreign-owned firms in country i. Using the same notation as in the previous section with the first subscript for the country of location and the second subscript for the controlling country, this can be expressed as follows:

$$Y_i = VAX_i + VAFA_i = VAX_{i,i} + \sum_{j \neq i} VAX_{i,j} + VAFA_i \tag{5}$$

An ownership-based measure of the two modes of supply of foreign markets by domestically-owned firms would include only the first and the third term, excluding the second term (which corresponds to the domestic value added in exports of foreign-owned firms in country i). However, the distinction between exports of domestically-owned and foreign-owned firms goes beyond data availability for our sample of countries, with only a few exceptions. As a consequence, in the next subsection we report results based on the definition of supply of foreign markets as the sum of domestic value added in exports of country i (including foreign-owned firms) and the value added of foreign affiliates, as in equation 4.[20]

4.2 Main results

Figure 3 shows the difference between world market shares in terms of the overall value added to serve foreign markets and world market shares in terms of value added in exports only. As before, the results are reported for the 15 largest countries in terms of manufacturing value added by location in 2011. As shown in the figure, including the value added of foreign affiliates would increase the world market share of the U.S. and of the U.K. by approximately 30 per cent with respect to considering only the share in terms of value added in exports. The world market share of France and Japan would also increase after considering the activity of foreign affiliates, although to a smaller extent (10 per cent). With the exception of Germany, whose market share would remain almost unchanged with the inclusion of the value added of foreign affiliates, each of the remaining 10 countries would see their market share decrease (between 7-8 per cent for Canada, Italy and Korea, 12-14 per cent for India and Spain and 15-20 per cent for the

---

[19]Considering the manufacturing sector, the share of output of foreign affiliates amounts to 8 per cent in the United States and 12 per cent in Italy according to national sources, while for Japan Baldwin and Okubo (2012) report a 14 per cent share.

[20]Note that the inclusion of value added in exports of foreign-owned firms in our measure of the total value added to serve foreign markets leads to a duplication at the world level (but not at the country level). For instance, the value added in exports of U.S.-owned firms in Italy is counted twice (both in Italy's Y_i as part of the value added in Italian exports and in the U.S.'s Y_i as part of the value added of U.S. foreign affiliates). The denominator at the world level, which is the sum of the world value added in exports and the world value added of foreign affiliates, includes the same duplication, which ensures that all countries' market shares add up to 100.

remaining countries).

Considering the full set of countries (Table 7), Netherlands, Finland, Sweden and Ireland would record a significantly larger market share (between 15 and 30 per cent), while several Central and Eastern European countries and emerging markets would record a 15-20 per cent lower market share after the inclusion of the value added of foreign affiliates.

Including the value added of foreign affiliates among the modes of supply of foreign markets also matters for cross-country comparisons of the change in world market shares in recent years. This is shown in Figure 4, which reports the percentage change in world market shares of exports and of the sum of exports and foreign affiliates' activity (in value added terms) for the 15 largest countries over the years 2004-11 (data for the full set of countries are reported in Table 8). Japan is the country with a striking difference between the decrease in its world market share of value added in exports (-23 per cent) and the decrease in its world market share of the sum of value added in exports and value added of foreign affiliates (-13 per cent). This reflects the very large increase in the value added of Japanese-owned companies in China, Thailand and Indonesia.

Among the G7 countries, France, the United Kingdom and Italy also record a more favourable performance after including the value added of foreign affiliates. For Italy, this reflects to a large extent the acquisition of Chrysler by Fiat, which has significantly increased the value added of Italian-owned affiliates. The expansion of value added of affiliates in the U.S. also explains the more favourable performance of the U.K. on the measure that includes international production, while France benefits instead from an increase in the value added of its foreign affiliates mainly in Brazil, China and Germany. Among the other large economies reported in Figure 4, the differences between the two world market shares tend instead to be smaller.

Overall, this analysis suggests that including the value added of foreign affiliates has a significant impact on the relative performance of countries on world markets. While we are not arguing that an indicator that includes the value added of foreign affiliates is strictly preferable to indicators based on exports or value added in exports, we believe nonetheless that building measures of competitiveness that take the activity of foreign affiliates into account contributes to a more complete understanding of the performance of firms in the global economy.

5   Concluding remarks

This paper is the first to assemble a detailed bilateral dataset on multinational production, in which value added and factor incomes are broken down by location of activity and by ultimate owner country. Our motivation lies in the increasing relevance of multinational companies at the global level, which creates a growing disconnect between the location of production and the ownership of production.

We use this newly developed dataset to compute a set of ownership-based measures of competitiveness in the production of tradable goods, in which manufacturing value added is allocated across countries not according to the location of the activity but according to the nationality of the firm or on the nationality of the factors involved in production. The dataset is also applied to the analysis of the two modes of supply of foreign markets

(exports and production in foreign affiliates), using a common metric based on value added.

We find that there are marked differences between geography-based and ownership-based measures of competitiveness, which reflect the strong heterogeneity in terms of outward and inward activity of foreign affiliates. There are significant differences even within the group of main advanced economies, which have typically been among the largest investor countries in terms of FDI. For instance, value added by nationality of firms is 25 per cent larger than value added by location of activity in France and the U.K., compared with 15 per cent in Japan and 10 per cent in the U.S. and Germany; for Italy there is no significant difference between the two measures, reflecting the roughly similar size of outward activity (value added generated abroad by Italian-owned affiliates) and inward activity (value added generated in Italy by foreign-owned companies).

Considering the value added of foreign affiliates among the modes of supply of foreign markets also matters for cross-country comparisons of world market shares. In level terms, the increase in market share after the inclusion of the value added of foreign affiliates is particularly pronounced for the U.K. and the U.S. (30 per cent) and for France and Japan (10 per cent), while Germany's market share remains almost unchanged and Italy's market share becomes slightly smaller (reflecting the lower propensity to invest abroad compared with exporting). Taking into account the activity of foreign affiliates also matters for an analysis of the various countries' recent performance on international markets. In particular, over the years 2004-11 the performance of Japan, the U.K. and, to a smaller extent, France and Italy turns out to have been more favourable after including the value added of foreign affiliates, while the performance of Germany and the U.S. appears only slightly affected.

The use of ownership-based indicators in the economic analysis does not imply that we have to discard geography-based measures, which - as already noted by Baldwin and Kimura (1998) - remain the appropriate measures 'for most public policy and research issues'. But taking into account the ownership of production is necessary for several purposes, ranging from the analysis of the competitiveness of a country's firms and factors of production to monetary policy analysis (since foreign affiliates may react differently from domestic firms to a monetary policy impulse), from taxation (given that multinationals may apply transfer pricing strategies in order to minimize their tax burden) to trade negotiations (which focus on market access and have to consider the different modes of cross-border supply). It therefore seems reasonable to argue, again in line with Baldwin and Kimura (1998), that 'ownership as well as geography matters for economic behavior'.

This work is a first step towards a better understanding of the role of multinational companies on a comparative basis for a large set of countries. Our figures should be taken as rough estimates, especially for country pairs with a limited availability of foreign affiliates data in official sources. A logical next step would be to extend the analysis to the natural resources and services sectors. This would require a greater use of imputation techniques, owing to the reduced availability of data for sectors other than manufacturing. The relation between multinational production and trade flows also deserves further investigation in order to shed light on multinational firms' role in global value chains. This research agenda would benefit greatly from an improvement in available statistics on the activity of foreign affiliates.

References

Vanessa Alviarez (2014), Multinational Production and Comparative Advantage, mimeo.

Mitsuyo Ando and Fukunari Kimura (2005), The Formation of International Production and Distribution Networks in East Asia, in Takatoshi Ito and Andrew K. Rose (eds.), International Trade in East Asia, NBER-East Asia Seminar on Economics, Volume 14, University of Chicago Press.

Pol Antras and Stephen R. Yeaple (2014), Multinational Firms and the Structure of International Trade, in Handbook of International Economics, vol. 4, pp. 55-130.

Richard Baldwin and Toshihiro Okubo (2012), Networked FDI: Sales and Sourcing Patterns of Japanese Foreign Affiliates, NBER Working Paper Series, no. 18083, May.

Robert E. Baldwin and Fukunari Kimura (1998), Measuring U.S. International Goods and Services Transactions, in Robert E. Baldwin, Robert E. Lipsey and J. David Richards (eds.), Geography and Ownership as Bases for Economic Accounting, University of Chicago Press.

Javier Cravino and Andrei A. Levchenko (2014), Multinational Firms and International Business Cycle Transmission, mimeo.

Eurostat (2012), Foreign Affiliates Statistics (FATS) Recommendations Manual, Luxembourg.

Tani Fukui and Csilla Lakatos (2012), A Global Database of Foreign Affiliate Sales, GTAP Research Memoranda 4009, Center for Global Trade Analysis, Department of Agricultural Economics, Purdue University.

David Greenaway, Peter Lloyd, Chris Milner (2001), New concepts and measures of the globalisation of production, Economics Letters, vol. 73, pp. 57-63.

Robert C. Johnson and Guillermo Noguera (2012), Accounting for Intermediates. Production Sharing and Trade in Value Added, Journal of International Economics, vol. 86, no. 2.

Robert C. Johnson (2014), Five Facts about Value-Added Exports and Implications for Macroeconomics and Trade Research, Journal of Economic Perspectives, vol. 28, no. 2, pp. 119-142.

Fukunari Kimura and Robert E. Baldwin (1998), Application of a Nationality-Adjusted Net Sales and Value-Added Framework: The Case of Japan, in Robert E. Baldwin, Robert E. Lipsey and J. David Richards (eds.), Geography and Ownership as Bases for Economic Accounting, University of Chicago Press.

Robert Koopman, Zhi Wang and Shang-Jin Wei (2014), Tracing Value-Added and Double Counting in Gross Exports, American Economic Review, vol. 104, no. 2, pp. 459-494.

Robert E. Lipsey (2007), Defining and Measuring the Location of FDI Output, NBER Working Paper Series, no. 12996, March.

Robert E. Lipsey (2008), Measuring the Location of Production in a World of Intangible Productive Assets, FDI and Intrafirm Trade, NBER Working Paper Series, no. 14121, June.

Robert E. Lipsey, Magnus Blomstrom and Eric D. Ramstetter (1998), Internationalized Production in World Output, in Robert E. Baldwin, Robert E. Lipsey and J. David Richards (eds.), Geography and Ownership as Bases for Economic Accounting, University of Chicago Press.

Brent Neiman (2010), Stickiness, synchronization, and passthrough in intrafirm trade prices, Journal of Monetary Economics, Elsevier, vol. 57(3), pp. 295-308, April.

Natalia Ramondo (2014), A Quantitative Approach to Multinational Production, Journal of International Economics, Volume 93, No. 1, pp. 108-122, May.

Natalia Ramondo, Andres Rodriguez-Clare and Felix Tintelnot (2013), Multinational Production Data Set, mimeo.

Dylan Rassier and Jennifer Koncz-Bruner (2013), A Formulary Approach for Attributing Measured Output to Foreign Affiliates of U.S. Parents, prepared for the Conference on "Measuring the Effects of Globalization", Washington DC, February 28 - 1 March.

Marcel P. Timmer (ed.) (2012), The World Input-Output Database (WIOD): Contents, Sources and Methods, WIOD Working Paper Number 10, downloadable at http://www.wiod.org/publications/papers/wiod10.pdf.

Marcel P. Timmer, Bart Los, Robert Stehrer and Gaaitzen J. de Vries (2013), Fragmentation, incomes and jobs: an analysis of European competitiveness, Economic Policy, Volume 28, Issue 76, pages 613-661.

Unctad (2014), World Investment Report, Geneva.

Andreas Waldkirch (2014), Foreign Ownership and Firm Productivity: Evidence from a Large Sample of Countries, mimeo.

Figure 1: **How does value added by nationality of firm (or factors) differ from value added by location of activity? (percentage differences)**
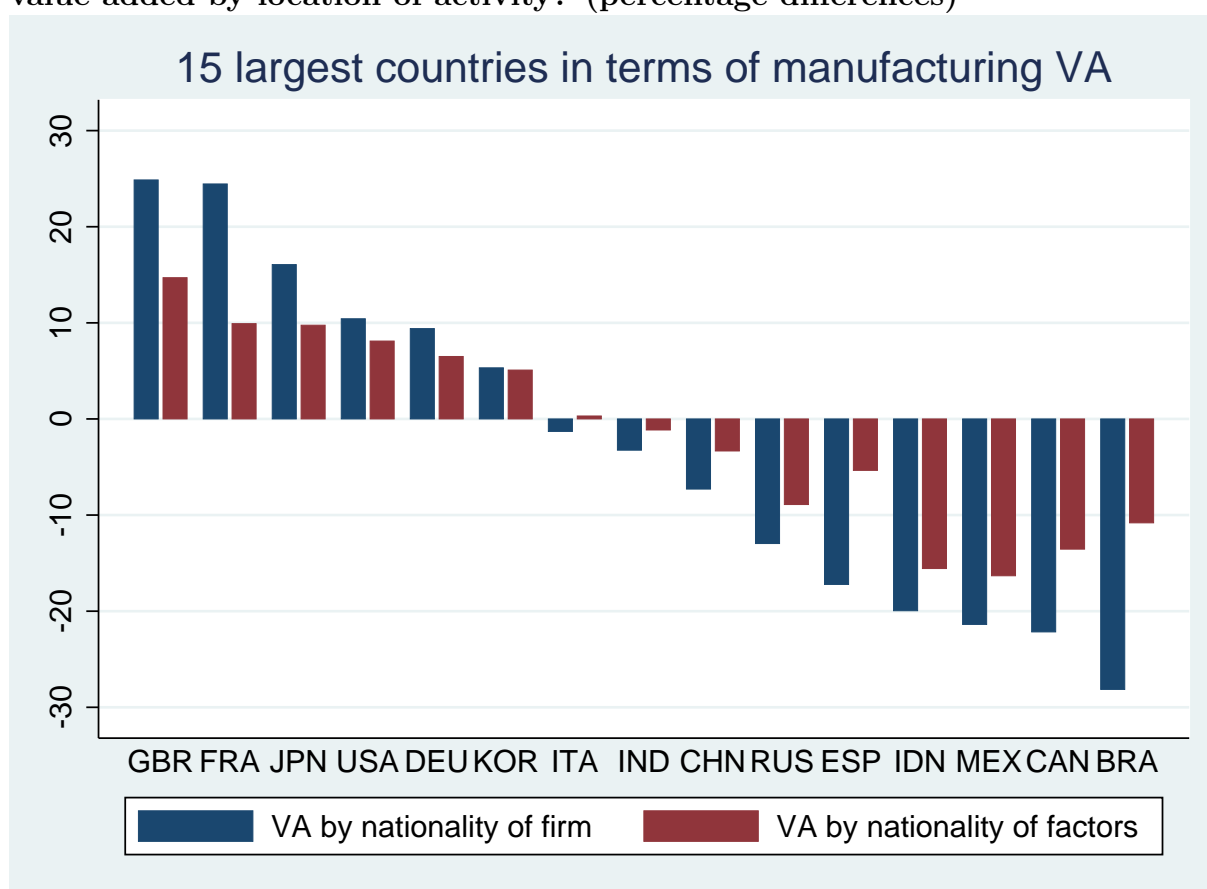
Source: Author's estimates. The histograms represent the percentage difference between value added by nationality of firm (or factors involved in production) and value added by location of activity for each country's manufacturing sector in 2011. For instance, for the U.K. the value added by nationality of firm is about 25 per cent larger than the value added by location of activity, while the value added by nationality of factors is 15 per cent larger than the value added by location of activity. The graph includes the 15 largest countries in terms of manufacturing value added by location of activity. Value added is measured at current prices and exchange rates.

Figure 2: **Comparing changes in world market shares of value added by location, by nationality of firm and by nationality of factors: 2004-11 (percentage changes)**
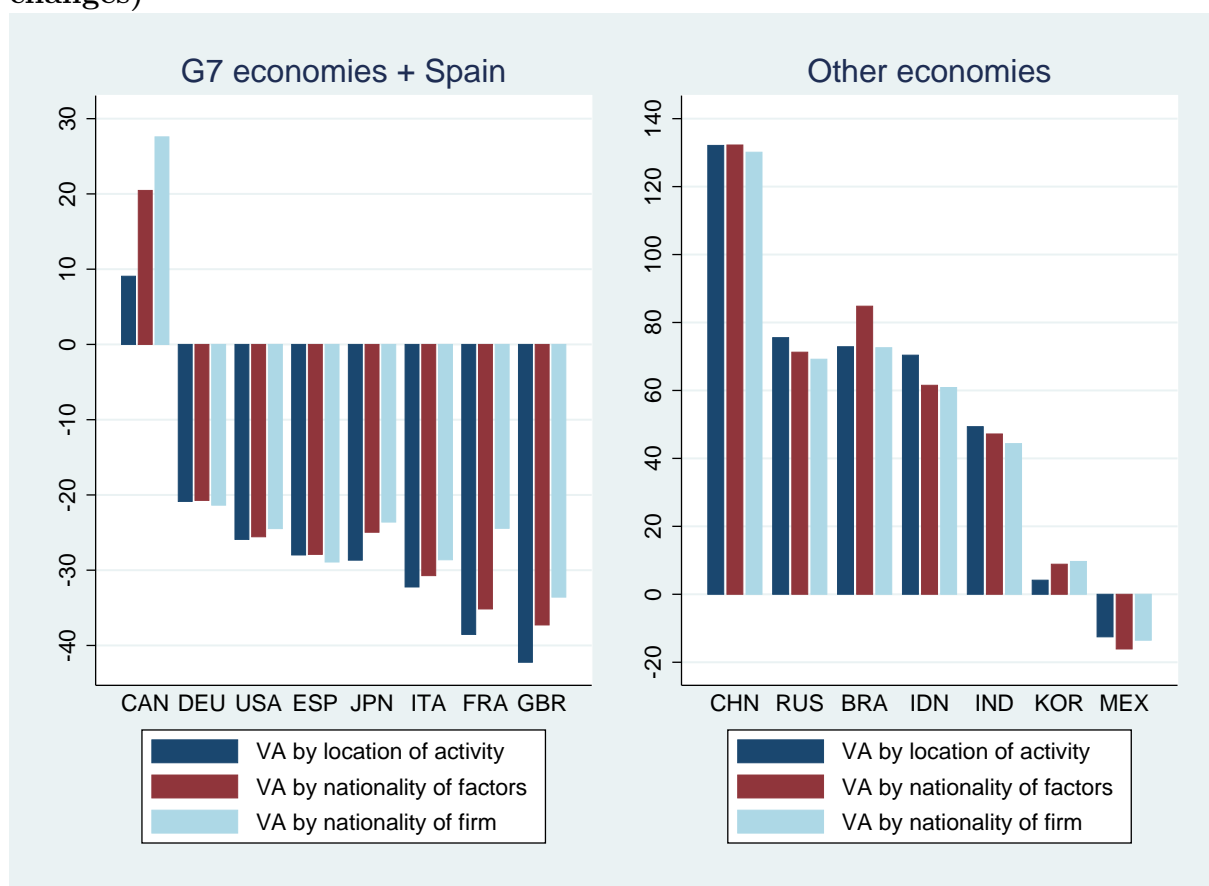
Source: Author's estimates. The histograms represent the percentage change in world market shares over the years 2004-11 according to value added by location of activity, by nationality of firm and by nationality of factors involved in production for each country's manufacturing sector. For instance, Canada records approximately a 10 per cent increase in its world market share in terms of value added by location of activity, a 20 per cent increase in its share in terms of value added by nationality of factors and a 27 per cent increase in its share in terms of value added by nationality of firm. The graph includes the 15 largest countries in terms of manufacturing value added by location of activity. Value added is measured at current prices and exchange rates.

Figure 3: **What happens to world market shares of exports if we include the value added of foreign affiliates? (percentage differences)**
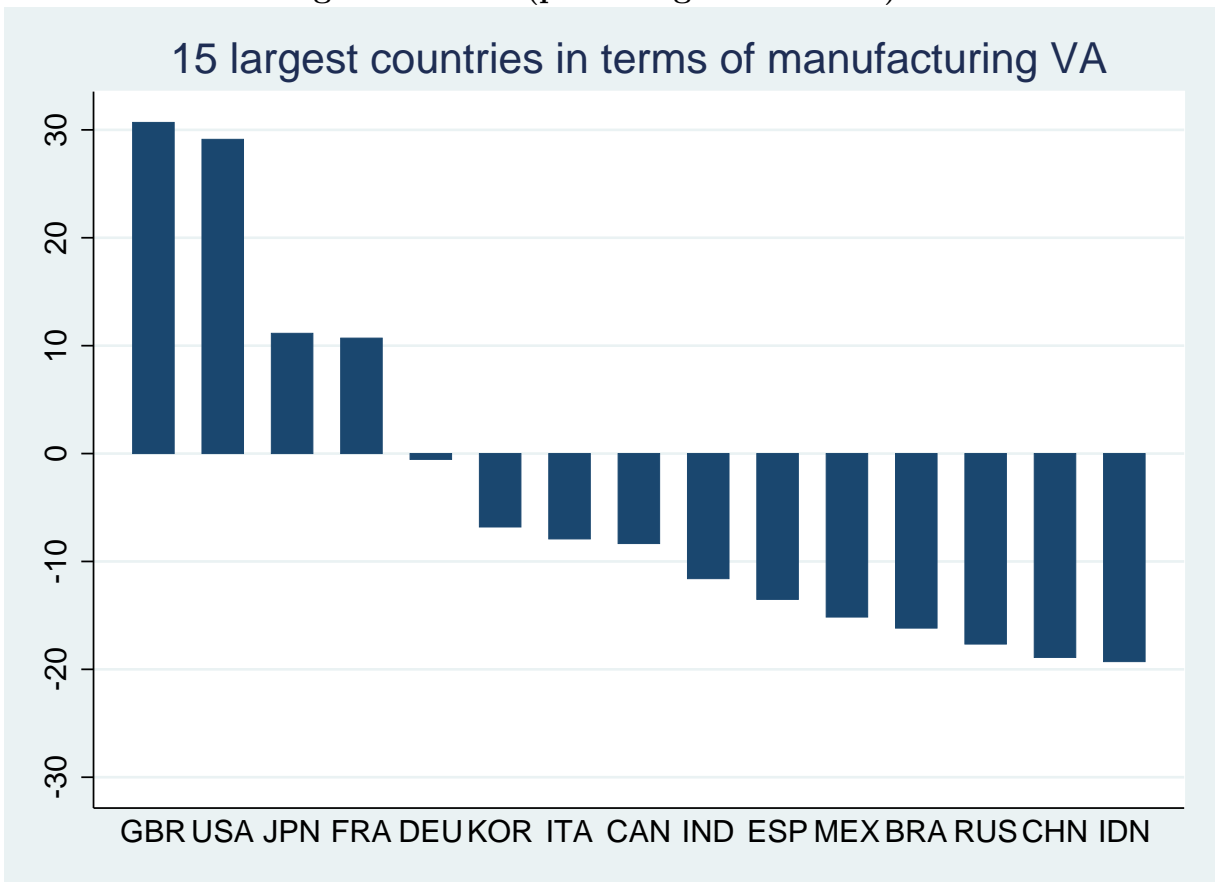
Source: Author's estimates. The histograms represent the percentage difference between each country's world market share in terms of the overall value added to serve foreign markets (sum of value added in exports and value added of foreign affiliates) and the country's world market share in terms of value added in exports. For instance, for the U.K. the world market share in terms of the overall value added to serve foreign markets is 30 per cent larger than its share in terms of value added in exports. Value added in exports and value added of foreign affiliates refer to the manufacturing sector in 2011. The graph includes the 15 largest countries in terms of manufacturing value added by location of activity. Value added in exports and value added of foreign affiliates are measured at current prices and exchange rates.

Figure 4: **Comparing changes in world market shares in terms of exports and foreign affiliates' activity on a value added basis: 2004-11 (percentage changes)**
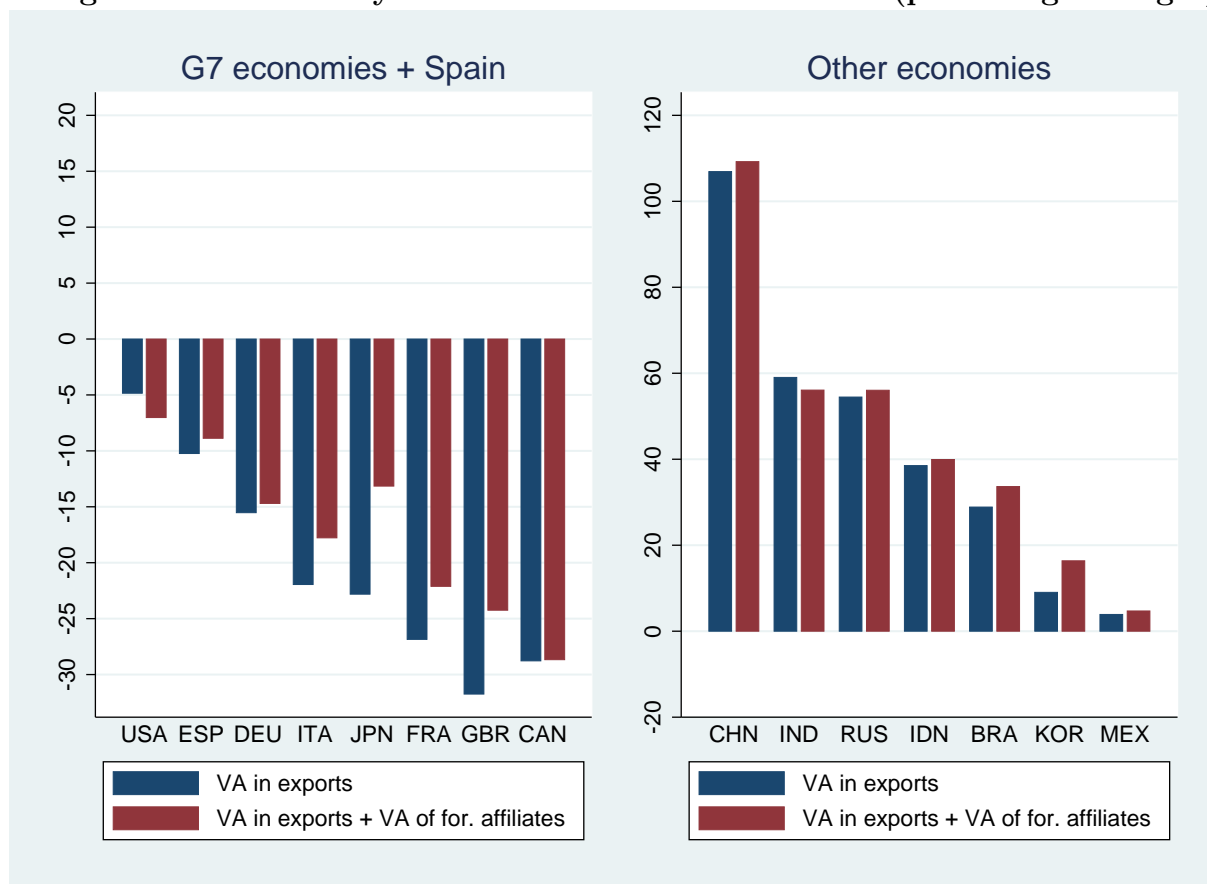
Source: Author's estimates. The histograms represent the percentage change in world market shares over the years 2004-2011 according to value added in exports and to the sum of value added in exports and value added of foreign affiliates. For instance, Japan records a 23 per cent decrease in its world market share in terms of value added in exports and a 13 per cent decrease in terms of the sum of the overall value added to serve foreign markets (VA in exports + VA of foreign affiliates). The graph includes the 15 largest countries in terms of manufacturing value added by location of activity in 2011. Value added is measured at current prices and exchange rates.

Table 1: **Share of activity of foreign affiliates for which FATS data is available (percentage shares)**

Year	Sales	Empl	VA	LAB	CAP
2004	78	55	59	60	55
2005	78	55	58	58	54
2006	75	56	61	62	56
2007	77	60	63	63	58
2008	75	58	62	63	60
2009	79	63	59	65	53
2010	77	60	59	62	54
2011	79	62	59	62	55

Source: Author's estimates. The table reports the percentage share of global activity of foreign affiliates - measured by the 5 variables in the columns - for which FATS data is available in a given year. For instance, FATS data account for 79 per cent of global sales of foreign affiliates in 2011; the remaining 21 per cent is estimated either using imputation methods (using FATS data for other variables for the same country pair and applying interpolation or extrapolation methods or using standard ratios from other countries' foreign affiliates in the same location country) or Orbis data. The variables are the following: sales; number of employed persons; gross value added; labour compensation (wages and social benefits); capital compensation (gross operating surplus).

Table 2: **Global activity of foreign affiliates (USD billion, thousand persons and percentage shares)**

Year	Sales	%	Empl	%	VA	%	LAB	%	CAP	%
2004	5334	22.9	23383	6.7	1252	18.2	648	17.1	604	19.4
2005	5878	22.7	24080	6.7	1338	18.1	691	17.4	647	18.9
2006	6700	23.1	24600	6.7	1520	19.0	758	17.9	762	20.3
2007	7662	22.8	25439	6.7	1785	19.8	861	18.3	925	21.4
2008	8580	22.6	26071	6.8	1892	19.4	944	18.4	948	20.4
2009	7166	21.4	25437	6.7	1636	18.4	853	18.5	783	18.2
2010	8171	21.1	26335	6.6	1900	18.8	915	18.5	985	19.2
2011	9346	21.2	26754	6.7	2045	17.9	1013	18.3	1033	17.6

Source: Author's estimates. The table reports estimates of the global activity of foreign affiliates in the manufacturing sector and its share of the global manufacturing sector. The variables are the following: sales; number of employed persons; gross value added; labour compensation (wages and social benefits); capital compensation (gross operating surplus). Sales, value added, labour compensation and capital compensation in USD billion at current prices and exchange rates. Number of people employed in thousand persons.

Table 3: **Ratio of inward and outward activity of foreign affiliates to domestic activity: 2011 levels (manufacturing sector)**

Country	Inward		Outward	
	VA	Empl	VA	Empl
	(A)	(B)	(C)	(D)
CHN	0.08	0.03	0.00	0.00
USA	0.18	0.16	0.29	0.52
JPN	0.04	0.02	0.20	0.41
DEU	0.20	0.16	0.30	0.37
ITA	0.16	0.09	0.15	0.14
BRA	0.30	0.10	0.02	0.01
KOR	0.10	0.04	0.15	0.16
CAN	0.33	0.21	0.11	0.14
RUS	0.14	0.06	0.01	0.01
IND	0.09	0.01	0.06	0.00
GBR	0.41	0.24	0.66	0.66
FRA	0.30	0.24	0.54	0.58
MEX	0.25	0.10	0.04	0.01
IDN	0.20	0.05	0.00	0.00
ESP	0.25	0.17	0.07	0.07
TUR	0.17	0.04	0.01	0.01
AUS	0.43	0.25	0.05	0.08
THA	0.56	0.11	0.01	0.00
NLD	0.32	0.23	1.06	0.94
TWN	0.12	0.04	0.19	0.16
CHE	0.38	0.20	1.29	1.54
POL	0.43	0.23	0.02	0.01
SWE	0.40	0.36	0.59	0.81
MYS	0.32	0.29	0.02	0.02
AUT	0.36	0.26	0.29	0.45
BEL	0.45	0.40	0.38	0.36
IRL	0.72	0.32	0.41	0.97
SGP	0.73	0.40	0.28	1.18
CZE	0.53	0.37	0.01	0.01
PHL	0.19	0.10	0.01	0.00
FIN	0.22	0.17	0.63	0.73
ROM	0.25	0.25	0.00	0.00
DNK	0.29	0.28	0.43	0.72
HUN	0.56	0.36	0.06	0.03
GRC	0.19	0.05	0.05	0.06
PRT	0.21	0.14	0.05	0.03
SVK	0.50	0.48	0.03	0.03
SVN	0.27	0.22	0.06	0.11
BGR	0.35	0.20	0.00	0.00
LTU	0.26	0.24	0.03	0.04
HKG	0.25	0.20	4.48	5.65
LUX	0.53	0.51	6.87	9.92
EST	0.53	0.35	0.04	0.05
LVA	0.31	0.28	0.03	0.04

Source: Author's estimates. Column A reports the ratio of value added of inward foreign affiliates to domestic value added (i.e. value added by location of activity). Column B reports the ratio of employment of inward foreign affiliates to domestic employment. Column C reports the ratio of value added of outward foreign affiliates to domestic value added. Column D reports the ratio of employment of outward foreign affiliates to domestic employment. Data for the manufacturing sector in 2011. Value added is at current prices and exchange rates. Countries are ranked in terms of manufacturing value added by location of activity in 2011. Figures for the Rest of the world are not reported in the table.

Table 4: **Snapshot of largest country pairs in terms of value added of foreign affiliates (USD billion, thousands of persons and ratios; manufacturing sector)**

Ctrl	Loc	VA	Sales	Empl	VA/Emp	Rel VA/Emp	VA/Sales	Cap/VA
GBR	USA	68	271	235	289	1.99	0.25	0.59
USA	CAN	63	281	287	220	2.02	0.22	0.64
JPN	CHN	45	239	1382	33	2.06	0.19	0.40
DEU	USA	44	199	257	171	1.17	0.22	0.38
USA	GBR	41	193	268	153	1.95	0.21	0.58
USA	DEU	38	175	322	119	1.19	0.22	0.35
CHE	USA	36	106	154	232	1.60	0.34	0.48
JPN	THA	35	112	374	94	4.72	0.31	0.63
USA	IRL	35	99	52	670	3.14	0.35	0.85
JPN	USA	35	195	297	117	0.80	0.18	0.37
USA	BRA	29	128	316	93	3.32	0.23	0.58
NLD	USA	29	200	104	277	1.90	0.14	0.55
FRA	USA	27	102	170	162	1.11	0.27	0.39
USA	CHN	26	129	574	46	2.91	0.20	0.69
KOR	CHN	24	126	452	53	3.33	0.19	0.63
USA	FRA	23	110	178	129	1.41	0.21	0.33
USA	MEX	21	110	534	40	1.76	0.19	0.58
CHE	DEU	21	83	180	118	1.18	0.26	0.40
USA	JPN	20	127	63	311	2.43	0.16	0.16
JPN	IDN	19	60	304	61	4.55	0.31	0.80

Source: Author's estimates. The table reports selected statistics on the activity of foreign affiliates for the largest 20 country pairs, ranked in terms of value added in 2011 for the manufacturing sector (Ctrl is the controlling country, Loc is the location country). Number of people employed in thousand persons. Sales and value added in USD billion at current prices and exchange rates. Value added per employed person in USD thousands.

Table 5: **World market shares of value added by location of activity, by nationality of factors and by nationality of firm: 2011 levels (percentage shares and ratios; manufacturing sector)**

Country	Location (A)	Factors (B)	Firms (C)	Ratio B/A	Ratio C/A
CHN	21.05	20.35	19.51	0.97	0.93
USA	16.22	17.54	17.92	1.08	1.10
JPN	9.57	10.51	11.11	1.10	1.16
DEU	6.45	6.87	7.06	1.07	1.09
ITA	2.88	2.89	2.84	1.00	0.99
BRA	2.75	2.45	1.98	0.89	0.72
KOR	2.75	2.89	2.89	1.05	1.05
CAN	2.36	2.04	1.84	0.86	0.78
RUS	2.29	2.09	1.99	0.91	0.87
IND	2.28	2.25	2.21	0.99	0.97
GBR	2.26	2.60	2.83	1.15	1.25
FRA	2.25	2.47	2.80	1.10	1.24
MEX	1.73	1.45	1.36	0.84	0.79
IDN	1.69	1.42	1.35	0.84	0.80
ESP	1.60	1.51	1.32	0.95	0.83
TUR	1.10	0.96	0.92	0.88	0.84
AUS	1.04	0.83	0.64	0.80	0.61
THA	0.95	0.60	0.43	0.64	0.45
NLD	0.93	1.32	1.61	1.42	1.73
TWN	0.89	0.90	0.95	1.01	1.07
CHE	0.77	1.05	1.47	1.36	1.91
POL	0.71	0.54	0.42	0.76	0.59
SWE	0.70	0.77	0.83	1.11	1.19
MYS	0.62	0.47	0.43	0.75	0.70
AUT	0.61	0.60	0.57	0.98	0.93
BEL	0.59	0.63	0.55	1.07	0.93
IRL	0.47	0.27	0.33	0.57	0.70
SGP	0.46	0.26	0.25	0.56	0.55
CZE	0.43	0.32	0.21	0.75	0.49
PHL	0.41	0.37	0.34	0.88	0.81
FIN	0.37	0.43	0.52	1.17	1.41
ROM	0.35	0.31	0.27	0.88	0.75
DNK	0.29	0.31	0.33	1.07	1.13
HUN	0.27	0.19	0.14	0.71	0.50
GRC	0.25	0.22	0.21	0.90	0.86
PRT	0.24	0.23	0.20	0.92	0.83
SVK	0.15	0.12	0.08	0.79	0.52
SVN	0.08	0.07	0.06	0.92	0.80
BGR	0.07	0.05	0.04	0.79	0.65
LTU	0.06	0.05	0.04	0.86	0.77
HKG	0.04	0.10	0.21	2.61	5.23
LUX	0.03	0.10	0.23	3.31	7.34
EST	0.02	0.02	0.01	0.75	0.52
LVA	0.02	0.02	0.02	0.85	0.72

Source: Author's estimates. The table reports each country's world market share of value added by location of activity (column A), by nationality of factors (column B), by nationality of firm (column C). Market shares are based on value added at current prices and exchange rates in the manufacturing sector in 2011. Countries are ranked by world market share on location-based value added. Figures for the Rest of the world are not reported in the table.

Table 6: **World market shares of value added by location of activity, by nationality of factors and by nationality of firm: 2004-11 changes (percentage points and percentage changes; manufacturing sector)**

Country	Absolute changes			Percentage changes		
	Location	Factors	Firms	Location	Factors	Firms
CHN	11.98	11.59	11.03	132.1	132.2	130.1
USA	-5.67	-6.02	-5.80	-25.9	-25.6	-24.5
JPN	-3.85	-3.49	-3.43	-28.7	-25.0	-23.6
DEU	-1.70	-1.80	-1.92	-20.9	-20.7	-21.4
ITA	-1.37	-1.28	-1.14	-32.2	-30.7	-28.6
BRA	1.16	1.13	0.83	72.9	84.8	72.6
KOR	0.11	0.23	0.25	4.2	8.9	9.7
CAN	0.20	0.35	0.40	9.1	20.5	27.6
RUS	0.99	0.87	0.81	75.5	71.3	69.2
IND	0.75	0.72	0.68	49.3	47.2	44.4
GBR	-1.65	-1.54	-1.43	-42.2	-37.3	-33.6
FRA	-1.41	-1.34	-0.90	-38.5	-35.2	-24.4
MEX	-0.25	-0.28	-0.21	-12.5	-16.1	-13.5
IDN	0.70	0.54	0.51	70.4	61.5	60.9
ESP	-0.62	-0.59	-0.54	-28.0	-27.9	-28.9
TUR	0.13	0.16	0.14	13.7	19.4	18.3
AUS	0.01	-0.03	-0.06	1.0	-3.0	-9.1
THA	0.21	0.13	0.09	27.9	28.0	28.2
NLD	-0.20	-0.18	-0.34	-17.5	-12.2	-17.4
TWN	-0.25	-0.24	-0.19	-21.7	-21.1	-16.9
CHE	-0.17	-0.19	-0.22	-18.2	-15.6	-13.2
POL	0.09	0.07	0.04	14.3	15.8	9.4
SWE	-0.22	-0.14	-0.11	-24.4	-15.6	-11.8
MYS	0.08	0.05	0.05	15.9	13.4	13.7
AUT	-0.12	-0.08	-0.03	-16.2	-11.2	-5.7
BEL	-0.23	-0.17	-0.11	-28.3	-21.0	-16.1
IRL	-0.15	-0.05	-0.01	-23.8	-16.1	-2.7
SGP	0.03	-0.03	0.04	6.7	-9.3	18.9
CZE	0.04	0.04	0.01	11.5	14.3	4.5
PHL	0.10	0.10	0.10	30.7	35.4	39.5
FIN	-0.20	-0.22	-0.20	-34.8	-34.1	-28.2
ROM	0.12	0.11	0.09	51.9	55.1	54.9
DNK	-0.15	-0.15	-0.17	-34.7	-33.2	-34.9
HUN	-0.01	-0.00	0.00	-4.3	-0.8	0.6
GRC	-0.03	-0.02	-0.02	-11.9	-9.9	-7.6
PRT	-0.10	-0.09	-0.07	-28.7	-27.5	-26.7
SVK	0.02	0.01	0.00	14.7	10.4	2.1
SVN	-0.03	-0.03	-0.02	-29.1	-28.0	-29.4
BGR	0.01	0.01	0.01	26.6	29.3	32.7
LTU	-0.01	-0.01	-0.01	-10.8	-10.1	-11.0
HKG	-0.05	-0.00	0.05	-54.5	-2.6	31.9
LUX	-0.01	0.02	-0.02	-29.1	28.6	-7.7
EST	-0.00	-0.00	-0.00	-9.7	-17.8	-21.8
LVA	-0.00	-0.00	-0.00	-5.5	-6.8	-8.9

Source: Author's estimates. The table reports each country's change in world market share over the years 2004-11 in terms of value added by location of activity, by nationality of factors and by nationality of firm. Market shares are based on value added at current prices and exchange rates in the manufacturing sector. Countries are ranked by world market share on location-based value added. Figures for the Rest of the world are not reported in the table.

Table 7: **World market shares of exports and foreign affiliates' activity on a value added basis: 2011 levels (percentage shares; manufacturing sector)**

Country	VAX+VAFA (A)	VAX (B)	%Diff A/B
USA	13.35	10.34	29.1
CHN	12.64	15.58	-18.9
DEU	10.98	11.04	-0.5
JPN	7.41	6.66	11.1
FRA	4.83	4.36	10.7
GBR	4.20	3.21	30.7
ITA	3.71	4.03	-7.9
KOR	3.30	3.54	-6.8
NLD	2.72	2.06	32.1
CAN	2.35	2.57	-8.3
ESP	1.87	2.16	-13.5
IND	1.74	1.96	-11.6
TWN	1.67	1.85	-9.6
MEX	1.47	1.74	-15.2
BRA	1.47	1.75	-16.2
SWE	1.46	1.26	15.7
BEL	1.36	1.38	-1.9
RUS	1.14	1.39	-17.7
POL	1.03	1.26	-18.3
AUT	1.02	1.03	-0.4
IDN	1.01	1.25	-19.3
TUR	0.92	1.13	-18.5
IRL	0.75	0.67	11.9
FIN	0.73	0.60	22.3
AUS	0.67	0.76	-12.2
DNK	0.66	0.65	1.0
CZE	0.62	0.76	-18.5
HUN	0.38	0.45	-15.6
LUX	0.28	0.06	356.4
PRT	0.26	0.31	-15.2
SVK	0.26	0.32	-18.0
ROM	0.22	0.27	-19.2
SVN	0.12	0.14	-15.7
GRC	0.08	0.09	-5.4
BGR	0.08	0.09	-19.1
LTU	0.06	0.07	-17.2
EST	0.04	0.05	-17.2
LVA	0.03	0.03	-17.1

Source: Author's estimates. The table reports each country's world market share in 2011 in terms of the sum of value added in exports and value added of foreign affiliates (VAX+VAFA) and of value added in exports (VAX), and the percentage difference between the two. Market shares refer to the manufacturing sector only. Value added in exports and value added of foreign affiliates are at current prices and exchange rates. Countries are ranked by world market share of the sum of value added in exports and value added of foreign affiliates. Data on domestic value added in exports for Hong Kong, Malaysia, Philippines, Singapore, Switzerland, and Thailand are not available.

Table 8:   **World market shares of exports and foreign affiliates' activity on a value added basis: 2004-11 changes (percentage points and percentage changes; manufacturing sector)**

Country	Absolute changes		Percentage changes	
	VAX+VAFA	VAX	VAX+VAFA	VAX
USA	-1.01	-0.53	-7.0	-4.8
CHN	6.60	8.05	109.2	106.9
DEU	-1.89	-2.03	-14.7	-15.5
JPN	-1.12	-1.97	-13.1	-22.8
FRA	-1.37	-1.60	-22.1	-26.9
GBR	-1.34	-1.49	-24.2	-31.7
ITA	-0.80	-1.13	-17.8	-22.0
KOR	0.46	0.29	16.4	9.0
NLD	-0.56	-0.35	-17.0	-14.3
CAN	-0.94	-1.04	-28.7	-28.8
ESP	-0.18	-0.25	-8.9	-10.2
IND	0.62	0.73	56.1	59.0
TWN	-0.10	-0.23	-5.8	-11.3
MEX	0.07	0.07	4.7	3.9
BRA	0.37	0.39	33.6	28.9
SWE	-0.23	-0.36	-13.6	-22.3
BEL	-0.39	-0.43	-22.2	-23.9
RUS	0.41	0.49	56.1	54.5
POL	0.25	0.29	32.2	29.6
AUT	-0.07	-0.17	-6.3	-13.9
IDN	0.29	0.35	39.9	38.5
TUR	0.12	0.14	15.5	14.0
IRL	-0.24	-0.37	-24.7	-35.9
FIN	-0.24	-0.30	-24.7	-33.2
AUS	-0.14	-0.14	-17.5	-15.3
DNK	-0.19	-0.21	-22.4	-24.0
CZE	0.08	0.10	15.6	14.5
HUN	0.03	0.02	8.3	4.5
LUX	-0.04	-0.02	-12.0	-24.6
PRT	-0.10	-0.13	-27.1	-29.2
SVK	0.04	0.07	17.1	30.4
ROM	0.04	0.05	22.1	20.8
SVN	-0.03	-0.04	-18.6	-20.8
GRC	-0.03	-0.04	-25.6	-30.6
BGR	0.01	0.01	16.5	15.5
LTU	0.01	0.01	10.2	8.3
EST	0.00	0.00	10.3	8.5
LVA	0.00	0.00	9.9	6.4

Source: Author's estimates. The table reports each country's change in world market share over the years 2004-11 in terms of the sum of value added in exports and value added of foreign affiliates (VAX+VAFA) and of value added in exports (VAX). Market shares refer to the manufacturing sector. Value added in exports and value added of foreign affiliates are at current prices and exchange rates. Countries are ranked by world market share on the sum of value added in exports and value added of foreign affiliates. Data on domestic value added in exports for Hong Kong, Malaysia, Philippines, Singapore, Switzerland, and Thailand are not available.

Appendix - Sources and construction of the dataset

This section provides further clarifications on the sources and methodology used to obtain our estimates of bilateral data on the activity of foreign affiliates.

Sources and methods - Data on output, employment, value added, labour compensation and capital compensation in the manufacturing sector over the years 1995-2011 are collected from the following sources: a) WIOD Socio-Economic Accounts for 38 countries (i.e. all countries included in the WIOD database except Cyprus and Malta, which we include in the 'Rest of the World' aggregate); b) Structural Business Statistics published by Eurostat for Switzerland; and c) UN National Accounts and national sources for Hong Kong, Malaysia, Philippines, Singapore and Thailand. We use imputation methods to correct for a few missing values (e.g. breakdown of labor and capital compensation for some countries in the WIOD dataset over the years 2010-11). We estimate 'Rest of the World' aggregates using data on value added in the manufacturing sector from the UN National Accounts and applying imputation methods based on developing countries' ratios for the remaining variables.

We collect statistics on the activity of foreign affiliates from OECD, Eurostat and national sources (both on the inward and on the outward side). We combine inward and outward FATS data in order to maximize the available information on each country pair, with a preference for inward data.

For a number of country pairs no information was available on some or all of the variables in foreign affiliates' statistics. When only a subset of the variables is missing for a given country pair, we impute them using various estimation methods (e.g. applying interpolation or extrapolation methods or using standard ratios - value added per employed person, wages per employed person, etc. - from other countries' foreign affiliates in the same location country).

If none of the variables is available for a given country pair, we estimate the main aggregates from Bureau van Dijk's Orbis, the world's largest commercial firm-level database. We reconstruct backward the controlling country by merging it with Bureau van Dijk's Zephyr database on mergers and acquisitions. We then extract information on firms' sales, employment and ultimate owner company and (after correcting for missing values for given firm-year observations assuming that firms' share of the manufacturing sector of the location country is constant) use it to estimate the level of sales and employment for the foreign affiliates of a given country pair. We then estimate the remaining variables following the same imputation methods as above. The remaining country pairs for which no foreign affiliate was found in Orbis were assumed to have zero or negligible levels of foreign affiliates' activity.

We take the total inward activity reported by each country as given, using data from OECD, Eurostat and national sources for countries that report inward FATS statistics (all except the following countries: Australia, Belgium, Brazil, Canada, China, Greece, India, Indonesia, Korea, Mexico, Philippines, Russia, Switzerland, Taiwan, and Turkey). We then apply a proportional correction method using the inward totals by location country.

Table A1 reports the share of FATS data on the activity of each controlling country's foreign affiliates in 2011. The share of FATS data is relatively high for the majority of advanced countries, while it is very low for most Asian countries, whose affiliates are mainly concentrated in the region and for which data are based on imputations from FATS data for previous years or from Orbis data. Table A2 reports the share of FATS data on the activity of foreign affiliates for each location country in 2011. The coverage tends to be larger for most countries, reflecting the concentration of the activity of foreign affiliates in a relatively small number of investing countries that report complete FATS data.

Asymmetries between inward and (mirror) outward data - We do not impose consistency with outward totals for each controlling country. Table A3 reports the level of total sales

of foreign affiliates according to our estimates and according to the outward statistics reported by the controlling country in 2011 for the 15 countries with the highest level of outward activity for which outward data are available. Differences arise because of the preference assigned by our methodology to inward data, given their generally higher quality and consistency with national accounts and structural business statistics of the location country. As we explain below, a limited number of large asymmetries between inward and (mirror) outward data for country pairs explain the discrepancies.

Sales according to our estimates are significantly higher (more than 15 per cent) than sales according to outward data reported by the controlling countries in the following countries: Belgium, Ireland, Luxembourg, United Kingdom. For Belgium, this largely reflects the activity of Belgian-owned affiliates in the U.S., Germany and France, for which the figures based on inward data reported by those countries are significantly larger than the mirror figures in the outward data reported by Belgium. For Ireland, this largely reflects the activity of Irish-owned affiliates in the U.S., for which the figure based on inward data reported by the U.S. is much larger than the mirror figure in the outward data reported by Ireland. For Luxembourg, this largely reflects the activity of Luxembourg-owned affiliates in Germany, for which the figure based on inward data reported by Luxembourg is much larger than the mirror figure in the outward data reported by Germany. For the U.K., this largely reflects the activity of U.K.-owned affiliates in the U.S. and Germany, for which the figures based on inward data reported by those countries are significantly larger than the mirror figures in the outward data reported by the U.K.; in addition, the U.K. reports a very significant level of outward activity in the 'Rest of the world' aggregate according to Orbis data, which might reflect issues relating to the identification of the actual ultimate owner country.

Sales according to our estimates are significantly smaller (less than 15 per cent) than sales according to outward data reported by the controlling countries in the following countries: Canada, France and Sweden. For Canada, the only available outward figure corresponds to the world total, therefore all data are based on mirror inward data or Orbis data. For France, outward figures tend to be higher than mirror inward figures for many country pairs. For Sweden, this reflects the activity of Swedish-owned affiliates in the U.S., for which the inward data reported by the U.S. are significantly smaller than the outward data reported by Sweden.

Representativeness of Orbis - To check the representativeness of Orbis data, Figure A1 reports the scatterplot of log employment in FATS and log employment in Orbis data at a country-pair level in 2011. Figure A2 report the scatterplot of log sales in FATS and log sales in Orbis data at a country-pair level in 2011. The slope of the regression coefficient for log employment is 0.80 (with a standard error of 0.03), while for log sales it amounts to 0.81 (with a standard error of 0.04). The R-squared is 0.73 for log employment and 0.75 for log sales.

Robustness of estimates of foreign affiliates' value added - The value added for a given country pair is derived from official statistics reported by either the location country or the controlling country. If there are no available data in official statistics, we estimate the value added of a given country pair by applying the median ratio of value added to sales for other countries' foreign affiliates located in the same country. To check the robustness of this assumption, we perform a set of sensitivity estimates using alternative methods based on different values of foreign affiliates' productivity premia relative to domestic companies. Specifically, we make the following alternative assumptions: a) foreign affiliates have the same value added per worker as domestic companies; b) are 50 per cent more productive than domestic companies; c) are 100 per cent more productive; d) have the same productivity as domestic companies in advanced economies and are 50 per cent more productive in developing or emerging economies; e) are 50 per cent more productive in advanced economies and 100 per cent more productive in developing or emerging economies; and f) are 20 per cent more productive in advanced economies and 50

per cent more productive in developing or emerging economies. The difference between the value added by nationality of firm in our baseline estimates and the value added by nationality of firms in the six alternative estimation methods tends to be relatively small (the median difference in absolute terms is around 5 per cent). The ranking of countries according to the ratio of value added by nationality of firm on value added by location tends to be almost unchanged.

Table A1: **Share of activity of foreign affiliates for which FATS data is available by controlling country (percentage shares)**

Ctrl	%World	Sales	Empl	VA	LAB	CAP
USA	26.2	91	63	89	91	88
JPN	10.6	99	99	28	35	21
DEU	10.3	90	80	59	65	52
GBR	8.8	83	41	59	60	59
FRA	6.6	89	82	54	95	68
NLD	6.2	80	77	66	78	55
RoW	4.9	0	0	0	0	0
CHE	4.6	79	62	80	80	80
ITA	2.6	96	94	60	38	36
KOR	2.5	5	2	3	0	0
SWE	2.1	96	93	57	45	34
CAN	1.4	80	72	76	79	72
LUX	1.4	81	65	77	82	67
FIN	1.3	92	94	49	97	35
BEL	1.2	98	93	91	70	34
HKG	1.1	1	1	9	2	3
AUT	1.0	95	91	67	71	61
TWN	1.0	4	1	5	0	0
IRL	0.8	76	70	72	34	7
IND	0.8	10	4	7	0	0
DNK	0.7	69	86	64	52	60
SGP	0.7	11	4	8	0	0
ESP	0.7	88	73	58	58	37
BRA	0.4	92	0	86	0	0
CHN	0.4	28	30	18	22	15
MEX	0.3	0	37	49	0	0
AUS	0.3	69	43	64	20	3
POL	0.2	96	68	70	67	73
RUS	0.2	68	41	41	48	34
HUN	0.2	92	55	12	21	6
PRT	0.1	83	81	64	57	87
GRC	0.1	91	87	59	47	80
THA	0.1	0	0	0	0	0
MYS	0.1	0	0	0	0	0
TUR	0.0	46	45	39	28	54
CZE	0.0	93	94	93	70	36
SVN	0.0	51	28	42	66	9
SVK	0.0	89	83	87	93	75
PHL	0.0	0	0	0	0	0
LTU	0.0	59	35	0	0	0
EST	0.0	95	86	86	83	97
LVA	0.0	95	99	92	90	97
IDN	0.0	0	0	0	0	0
ROM	0.0	93	81	75	90	52
BGR	0.0	1	0	0	0	0

Source: Author's estimates. The first column of the table reports the percentage share of each controlling country of the global sales of foreign affiliates. The remaining columns report the share of available FATS data by controlling country for each variable. For instance, FATS data account for 90 per cent of sales of U.S.-owned affiliates in 2011; the remaining 10 per cent is estimated either using Orbis data or imputation methods (using other aggregate variables for the same country pair and applying standard ratios from other countries' foreign affiliates in the same location country). Rest of the world figures are entirely derived from Orbis. The variables are the following: sales; number of employed persons; gross value added; labour compensation (wages and social benefits); capital compensation (gross operating surplus).

Table A2: **Share of activity of foreign affiliates for which FATS data is available by location country (percentage shares)**

| Loc	%World	Sales	Empl	VA	LAB	CAP
USA	16.1	95	87	95	78	74
CHN	10.2	58	57	14	24	22
DEU	8.3	95	94	93	93	92
RoW	6.3	0	0	0	0	0
GBR	4.7	93	90	89	84	94
CAN	4.3	93	85	70	63	84
BRA	4.1	80	82	31	33	46
FRA	3.9	95	95	95	96	95
ESP	2.7	91	95	89	90	86
BEL	2.6	92	89	89	89	91
ITA	2.6	82	91	80	74	88
SGP	2.5	62	63	41	40	44
JPN	2.4	85	82	50	58	54
NLD	2.2	96	97	94	95	94
MEX	2.2	91	87	43	66	36
THA	2.1	79	77	19	13	23
AUS	1.8	77	86	34	39	35
POL	1.7	81	86	62	86	83
CHE	1.5	68	78	35	39	44
CZE	1.5	89	90	88	90	86
KOR	1.4	58	77	25	32	27
RUS	1.4	61	45	17	28	17
SWE	1.3	89	91	75	82	65
IDN	1.2	70	61	15	10	17
IRL	1.2	98	95	98	97	98
IND	1.2	85	62	20	25	26
MYS	1.2	70	63	25	22	27
AUT	1.0	95	95	94	94	95
HUN	1.0	90	96	89	94	85
TUR	0.7	78	72	33	37	37
SVK	0.7	81	87	64	76	49
TWN	0.6	87	88	36	27	43
ROM	0.6	88	87	63	79	63
PHL	0.4	77	76	27	22	30
DNK	0.4	81	92	81	79	85
FIN	0.4	78	75	36	40	39
PRT	0.3	67	92	61	60	62
BGR	0.2	85	83	81	81	85
HKG	0.2	68	74	24	30	26
LTU	0.2	81	81	63	73	55
GRC	0.1	61	60	50	48	65
LUX	0.1	87	77	67	69	63
SVN	0.1	84	71	79	79	79
EST	0.1	87	81	45	84	42
LVA	0.0	66	89	47	53	48

Source: Author's estimates. The first column of the table reports the percentage share of each location country of the global sales of foreign affiliates. The remaining columns report the share of available FATS data by location country for each variable. For instance, FATS data account for 95 per cent of sales of foreign-owned affiliates in the U.S. in 2011; the remaining 5 per cent is estimated either using Orbis data or imputation methods (using other aggregate variables for the same country pair and applying standard ratios from other countries' foreign affiliates in the same location country). Rest of the world figures are entirely derived from Orbis. The variables are the following: sales; number of employed persons; gross value added; labor compensation (wages and social benefits); capital compensation (gross operating surplus).

Table A3: **Comparison with total sales reported by the controlling country (outward data; USD billion and ratio)**

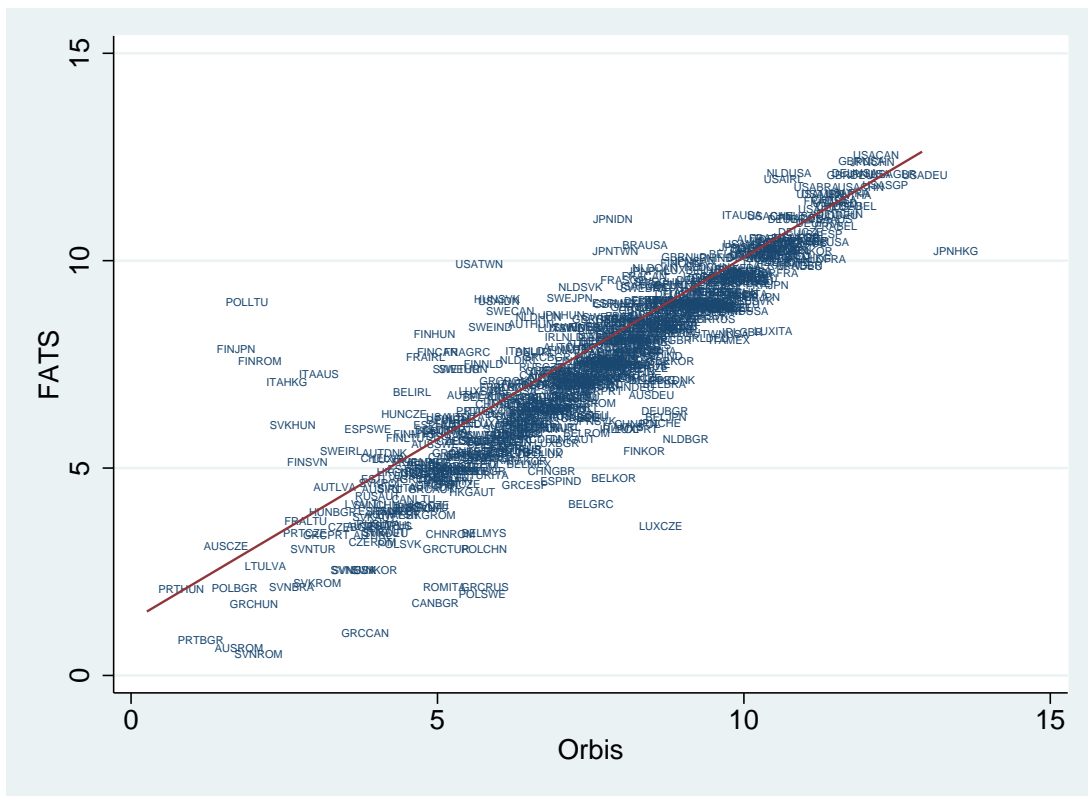| Ctrl	Sales (our estim.)	Sales (outward FATS)	Ratio
USA	2452	2611	0.94
JPN	987	1108	0.89
DEU	958	879	1.09
GBR	824	641	1.29
FRA	616	802	0.77
ITA	243	278	0.87
SWE	195	248	0.79
CAN	132	169	0.78
LUX	128	88	1.44
FIN	122	130	0.94
BEL	110	30	3.70
AUT	97	83	1.16
IRL	79	27	2.94
ESP	63	62	1.02
POL	22	18	1.18

Source: Author's estimates. The table reports each controlling country's total sales according to our estimates (which assign a preference to inward FATS data), according to outward FATS data reported by the controlling country and the ratio between the two. The set of countries includes the 15 countries with the largest total sales of foreign affiliates for which outward FATS totals are available. Data refer to the manufacturing sector in 2011.

Figure A1: **FATS vs. Orbis data: Log employment**
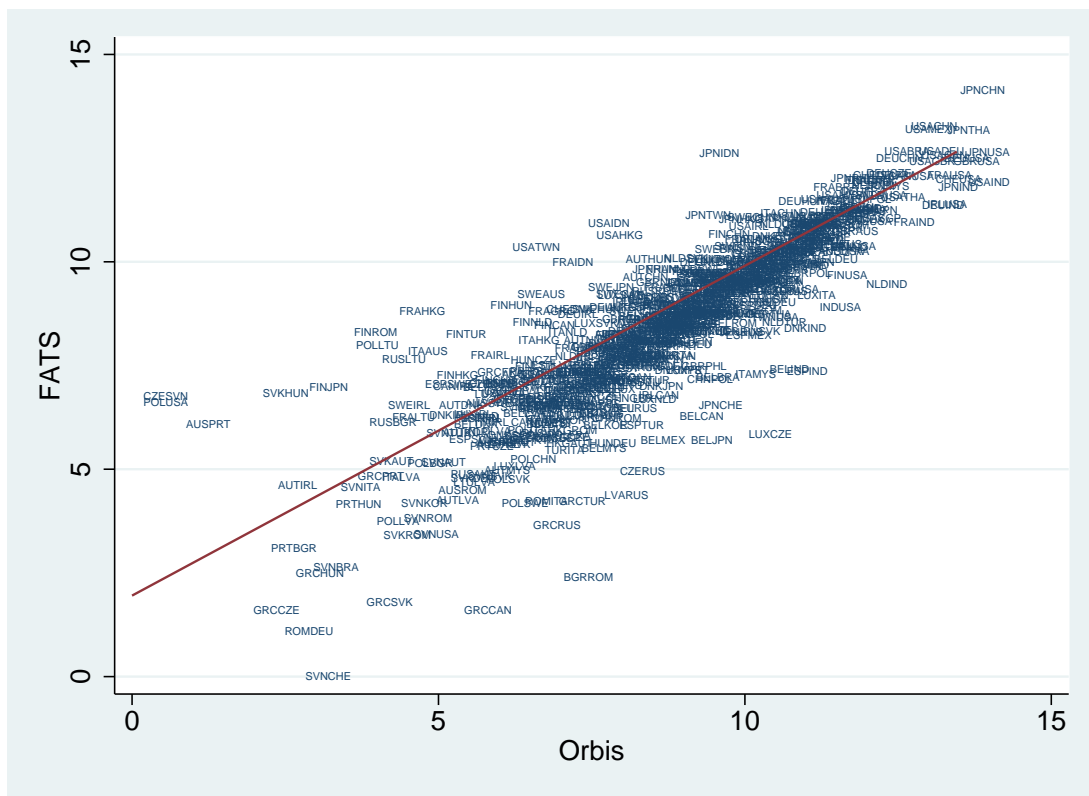
Source: Author's estimates.

Figure A2: **FATS vs. Orbis data: Log sales**

Source: Author's estimates.