ETLA

ELINKEINOELÄMÄN TUTKIMUSLAITOS
THE RESEARCH INSTITUTE OF THE FINNISH ECONOMY
Lönnrotinkatu 4 B 00120 Helsinki Finland Tel. 358-9-609 900
Telefax 358-9-601 753   World Wide Web: http://www.etla.fi/

Keskusteluaiheita – Discussion papers

No. 1170

Sarianna Lundan* – Juha Tolvanen**

REGIONAL AND GLOBAL PATTERNS OF INTERNATIONALISATION OF FINNISH MNES

*   Maastricht University, The Netherlands, and the Research Institute of the Finnish Economy (ETLA)
** The Research Institute of the Finnish Economy (ETLA)

ABSTRACT: Much of the recent evidence on the internationalisation patterns of Finnish MNEs has come from analyses of the Top 30 firms. This paper uses newly available data from the Orbis database on the foreign affiliates of Finnish MNEs, and compares this to the existing sources of data from the Bank of Finland and Statistics Finland. By utilising firm-level that includes smaller internationalising firms, we are able to get a more comprehensive picture of the international activities Finnish firms. We are also able to present an analytically grounded classification of the different types of internationalising firms in terms of the spread or entropy of their international activities. Such a classification will enable a more fine-grained measure of internationalisation in future studies that examine for example the effects of internationalisation on the home country.

KEYWORDS: Multinational enterprises, internationalisation, entropy.

JEL: D21, D24, F21, F23, M16.

TIIVISTELMÄ: Suomalaisyritysten kansainvälistymistä on viimeaikaisissa tutkimuksissa käsitelty lähinnä suuryrityksiä koskevalla aineistolla. Tämä raportti hyödyntää uutta Orbis tietokantaa, jonka avulla myös pienempien suomalaisyritysten kansainvälistymistä voidaan mitata. Vertaamme ensin Orbiksesta saatavia tietoja Suomen Pankin ja Tilastokeskuksen tietolähteisiin. Raportin toisessa osassa laskemme levinneisyys- tai entropiamittareita, joilla kuvataan yritysten kansainvälisten toimintojen laajuutta ja levinneisyyttä. Näitä mittareita käyttämällä voidaan kansainvälistyneet suomalaisyritykset luokitella neljään ryhmään. Tällä ryhmäjaolla on merkitystä myös tulevan tutkimuksen kannalta, esimerkiksi silloin kun arvioidaan kansainvälistymisen vaikutuksia yritysten kotimaahan.

AVAINSANAT: Monikansalliset yritykset, kansainvälistyminen, entropia.

Contents

1. INTRODUCTION

In the period following the Second World War and extending until the late 1970s, internationalisation for Finnish firms mainly consisted of export-driven growth. From the 1980s onwards, however, Finnish firms began to internationalise their production, and the past decade and a half has seen a considerable increase in their outward foreign direct investment (FDI), which has been fuelled in part by an increase the number and volume of acquisitions of foreign firms (Lovio, 2006). The same period has also seen notable growth in other forms of internationalisation, like strategic alliances, particularly in research and development (R&D), and in contractual outsourcing (Ali-Yrkkö, 2006; Palmberg & Pajarinen, 2005).

As a consequence of these developments, in 2006 the outward investment stock of Finland amounted to €71.3 billion, or 43% of GDP, somewhat ahead of the European average. Investment within the EU-25 accounted for over 78% of the investment stock, and the euro area for nearly 45%. Even higher figures pertain to the ratio of foreign to total employment in large Finnish multinational enterprises (MNEs). This reached an average of 52% for the Top 30 MNEs (measured by total employment) in 2006, and up to 68% for a subset of manufacturing firms (Pajarinen & Ylä-Anttila, 2008).

Although an intuitively appealing way to assess these developments is to compare the growth in the activities performed abroad to those being performed at home, such ratios need to be examined quite carefully to understand what they actually represent. For example, the employment figures just cited incorporate the effects of two very different trends, one being the higher rate of growth of employment in Finnish ownership abroad as compared to the home country, and the other being the concomitant growth in both domestic and foreign outsourcing. As far as the former trend is concerned, the acquisitions of foreign companies have often resulted in very rapid growth of foreign empoyment. However, only in some cases has this growth been the result of activities that have been transferred from the home country to the host country. Instead, in many cases the pattern has been one of simultaneous expansion of employment domestically, but where the rate of growth in foreign employment has exceeded that of domestic employment.

Concerning the latter, the increasing possibilities for contractual outsourcing of various types of intermediate inputs has also had an impact on the relationship between domestic and foreign employment. Such activities now range from simple assembly tasks in textiles and electronics to much more sophisticated forms of manufacturing and business services, and extending to areas like research and development, where contract research has become a larger proportion of the R&D expenditures undertaken by MNEs. At the same time, the evidence at least in the case of Finnish firms indicates, that most of the outsourcing has been to other firms in Finland (Ali-Yrkkö, 2006), involving a redefinition of the core activities of the focal firm, but not involving a change in the location where the activities are performed.

The range of intermediate goods and services that are being traded has increased significantly over past decade, mostly due to advances in information and communication technologies. As value chains are being broken up globally, one would expect that the resulting new division of labour would induce changes in investment and trade in both directions, i.e. involving both outward and inward investment, and exports as well as imports. Thus, with

the increase in the use of outsourcing, it is likely that insourcing will also provide opportunities for some companies to expand their operations domestically.

The evidence of this for the US is quite clear (see e.g. Jensen and Kletzer (2008)), and it also appears to be the case in Finland, where the receipts from other business services performed to firms outside of Finland have grown since the mid 1990s, contributing to a positive balance on the service account. Consequently, the impact of outsourcing (and insourcing) on domestic employment is likely to be quite ambiguous, and while a reduction in the domestic employment of the focal firm will automatically increase its proportion of foreign employment, this does not often reflect a loss of jobs that have been moved overseas in any real sense.

There is thus likely to be a great deal of heterogeneity in what it means for a firm to be international, whether in terms of the modality of internationalisation, i.e. via trade, FDI or alliances, or in terms of the underlying motivation. For some firms this may translate to a need to establish marketing and distribution outlets in foreign markets in order to facilitate sales abroad. For other firms, internationalisation equates to the expansion of productive capacity in locations with a relative cost advantage. Yet for others, it may mean the need to be able to access resources, particularly knowledge intensive resources, that are geographically clustered in a particular location (Dunning & Lundan, 2008b). Consequently, this paper will assess the available evidence on the extent and pattern of foreign operations undertaken by Finnish MNEs, in order to gain a better understanding of the heterogeneity of their international experience.

A quarter century ago, the internalisation economists suggested that foreign investment can best be understood as a response to market failure that is caused by the inability of the firm to exploit its ownership advantages abroad either through arm's length trade or by contractual means such as by licensing (Buckley & Casson, 1976; Dunning, 1988). While this rationale is still widely accepted, the growth in the use of market-based contractual transactions for sourcing various intermediate inputs, including those with high knowledge intensity, has challenged the importance of foreign investment as the only or even primary measure of internationalisation (Dunning & Lundan, 2008b).

Foreign direct investment, defined as cross-border investment with a controlling interest that is financed from the home country, has been the principal means whereby the extent of cross-border activity by firms has been measured in the economic literature. In addition to the growth in contractual outsourcing, since the 1980s, the availability of financing outside of the home country has further reduced the relevance of FDI in the narrow balance of payments definition as a measure of internationalisation. Instead, in this paper we concentrate on the size and geographical distribution of the foreign affiliates of Finnish firms. Our measure thus includes activities that do not always fall under the narrow definition of FDI, since such activities may have been financed from outside of the home country. They do, however, still involve activities where the parent company has sought equity control of the activities of its affiliate.

This paper is structured as follows. The first part introduces our primary source of data, which is the newly available Orbis database covering Finnish parent companies and their

foreign affiliates. We examine the coverage of this database by reference to two other available sources from the Bank of Finland and Statistics Finland. The notable benefit of using the Orbis database is the availability of firm-level data on a much wider range of parent companies than the Top 30 that have been investigated previously. The second part of the paper presents descriptive statistics and different measures of the degree of internationalisation of Finnish firms. The third part of the paper presents a series of entropy measures that are intended to capture the spread of the international activities of the parent firms. The fourth section presents results from a clustering analysis of the parent companies based on their entropy scores, which results in a classification of four types of international firms. The final section discusses the possible applications of the entropy-based types of international firms in further empirical research, particularly in connection with studies that investigate the home country effects of internationalisation.

2. SOURCES AND COVERAGE OF DATA

The data used in this study comes from Orbis, a commercial database maintained by the Dutch company Bureau van Dijk Electronic Publishing, and it includes information on some 30 million companies worldwide. The main benefit of this data source is the ability of the compiling company to collect information from various national sources and to cross-reference such data within the database, so that it becomes possible to track the ownership links between parent companies and their affiliates across borders. Thus for instance, while national statistical sources would typically be concerned with either foreign firms operating in Finland or the totality of Finnish firms' operations abroad, the data provided by Orbis should, at least in principle, allow for Finnish foreign investment in a particular host country like Germany to be measured using both the statistics available from Finland as a home country and those from Germany as a host country.

In reality, of course, there are bound to be limitations to the availability of particular types of data, and the mapping of relationships within the chains of ownership is likely to be far from perfect. Nonetheless, the ability to track the operations of parent companies of a particular nationality, and the availability of relatively detailed information on the activities of their affiliates abroad, is of considerable interest to scholars who wish to study the impact of outward or inward investment on the parent companies, or on the home or host country.

Given that there are likely to be gaps in the Orbis data, we begin by triangulating our data with other existing sources. The only reasonably comprehensive source that is available concerning the foreign affiliates of Finnish MNEs is a database that was maintained by the Bank of Finland during the period of 1996 to 2006. This data was collected alongside the mandatory surveys that were required to compile the balance of payments, and it includes basic information on the sectoral and geographic distribution of the activities of Finnish MNEs abroad in terms of employment and turnover (revenue) of foreign affiliates. Since the sampling frame for the survey comprised companies that had exceeded a threshold of outward FDI, this dataset is likely to under-represent firms with significant foreign operations that have not been financed through FDI.

In 2007 responsibility for the collection of these data was moved to Statistics Finland. So far, Statistics Finland has published data on the numbers of foreign affiliates of Finnish MNEs

abroad by country, as well as on the affiliates of foreign MNEs in Finland, based on the census of all companies active in Finland. They will also begin to collect, on an experimental basis, data on the turnover and employment of foreign affiliates aboard, in line with OECD recommendations. At this point, however, the only comprehensive data on the foreign affiliates of Finnish MNEs comes from the Bank of Finland, which does not make public any information concerning the total number of affiliates abroad, or the distribution of the number of affiliates by sector or by country.

Tables 1 and 2 provide the results of reconciling the Bank of Finland data with that drawn from Orbis. The Bank of Finland data excludes affiliates whose balance sheet totals were less than €8.4 million for 1996–1999 and less than €5 million for 2000–2006. In Orbis, our data is limited to parent firms that have at least 150 employees. All three sources used here include the foreign affiliates of Finnish firms which themselves are affiliates of foreign MNEs. The tables presented here follow the classification by host country and industry sector that was adopted by the Bank of Finland, and all financial figures are expressed in millions of euros. The industrial classification follows NACE Rev. 1.1, which in Orbis was aggregated back from the four digit level to the two digit level. Unfortunately, in order to calculate the sectoral distribution we were forced to use the parent NACE code instead of that of the affiliate, since this was missing in a great number of cases. Again, only the aggregate data is available from the Bank of Finland, and no information on the number of affiliates is available either geographically or by sector.

Looking at Tables 1 and 2, it is apparent that there are substantial differences between the three sources. Since the total figures from the Bank of Finland for 2006 are generally larger than what our data would indicate, proportional differences in the tables are calculated as proportions of the figure indicated by the Bank of Finland data. Thus for example, a figure of .46 for employment indicates that our figure of 205,737 for total employment in foreign affiliates is only 46% of the corresponding figure of 381,764 reported by the Bank of Finland.

Such differences have two main causes. First, some proportion of the difference is likely to be due to the substantial number of missing observations in Orbis. Second, there are likely be underlying differences in the method of data collection and in the comprehensiveness of the coverage of the source(s) used. In light of the evidence presented here, we believe that the discrepancies in the aggregate data are more likely to be caused by missing values within our sample, than differences in the sampling frame.

Of the total of 80 countries in the Orbis data set, no affiliate data was available for 35 countries. However, most of the missing data involved countries with only one or two affiliates, and data was completely missing for only 125 affiliates.[1] To assess the influence of missing observations, we have provided a measure of the proportion of missing observations following the sectoral and geographic classification employed in these tables. This measure con-

---

[1] Countries with more than three affiliates with missing data were Malaysia, South Africa, United Arab Emirates, Cyprus, Indonesia, New Zealand, Slovenia and Uruguay.

sists of the number of affiliates with missing information as a proportion of the total number of affiliates for a specific entry.

Taking these measures into account, it would seem to be the case, that geographical (institutional) rather than sectoral factors seem to account for more of the variation in the number of missing observations. In terms of the three measures of the extent of affiliate activities contained in Orbis, namely assets, turnover and employment, the most comprehensive data is available for assets and turnover, while the data on employment is missing considerably more often. In a subsequent section we will discuss some efforts taken here to try to interpolate some of these missing values. Overall, the Orbis data would seem to follow roughly the same distribution as the figures released by the Bank of Finland. However, this assumes that the missing observations follow the same distribution as those for which data is available. This is by no means a given, as there are cases where the gap is too small (or large) for the number of missing observations, suggesting that the missing values would have to be considerably smaller (or larger) than the average, or that the aggregate total is incorrect.

A relatively minor source of possible discrepancies is introduced by the currency conversions performed in compiling the database, and the fact that although the data in Orbis is cross-sectional, it reflects the latest year available, which ranges from end of year 2004 to 2007. For the majority of cases in the sample (74%) the parent data reflects the year end 2006, for 2% of the subsidiaries the data pertains to year-end 2007, and for 7% and 17% it pertains to 2004 and 2005 respectively. Since the figures in Orbis have been converted to US dollars, these had to be converted back to euros using representative year-end exchange rates from the IMF for 2004-2007.

Visual inspection of the Orbis data aggregated at the parent level revealed a few troubling entries. For the two parent companies of Metos and Ahlstrom, there were duplicate entries with the exact same name, but different figures. In the case of Metos, the duplicate entry contained data for only one affiliate, and this entry was removed. The duplicate entry for Ahlstrom included 13 affiliates, not included among the affiliates under the primary entry, so both entries were retained.[2] For two other companies, namely YIT and Metso, there were several affiliate companies with similar names listed as independent companies, although in fact, these were found to be wholly owned by the parent company. The affiliates were not listed among the affiliates belonging to the parent, however, so they were not being double-counted. Although this has the effect of slightly understating the degree of entropy pertaining to their respective parent companies, such mistakes appeared to have been random, and several other independent former affiliates, such as those originating from Nokia, were correctly listed as spinoffs. There was also a puzzling entry for the Bank of Finland as a corporate parent with an incredibly large figure for affiliate assets, which was dropped from the subsequent analyses.

---

[2] Correcting such mistakes should be possible, but it would require a comprehensive check of all of the parent-affiliate relationships.

3. DESCRIPTIVE STATISTICS

Our sample contains 3,533 foreign affiliates of Finnish MNEs located in 80 countries and belonging to 508 parent companies resident in Finland. The corresponding figure from Statistics Finland for year-end 2006 was 4,356 affiliates in 90 countries, suggesting that the smaller aggregate figures in our sample might be also caused to some extent by the higher cut-off point in terms of parent size for our sample.[3] Table 2 compares the number and geographical distribution of the affiliates in our sample to the data available from Statistics Finland. In terms of the overall number, our sample is 19% smaller, and in terms of the distribution of affiliates by country, this proportion remains within a fairly narrow range. This suggests that while the total number of affiliates is somewhat understated in our data, the distribution of affiliates is close to the real values, which is particularly important for the subsequent analyses, since they concentrate primarily on the geographical distribution of activity.

Of the 2,470 affiliate companies for which ownership data is available in our sample, all are majority-owned, and 88% of these are wholly-owned affiliates. The average Finnish MNE parent has seven foreign affiliates, but this distribution is very highly skewed, as can be seen in Figure 1. Nearly a half, or 245 parents in the sample, are firms with only one foreign affiliate, while the most international firms have in excess of 100 affiliate companies abroad, with a maximum of 144. The total number of countries where affiliates of Finnish MNEs are present is 80, while the average number of countries for a Finnish parent firm is three, and the highest count is 53. Again, Figure 2 shows the extreme skewness of the distribution of the number of host countries per parent company.

The following section will move beyond these simple averages by paying more attention to the distribution of activities at the firm level by calculating so-called entropy measures of international diversification.

4. ENTROPY MEASURE OF INTERNATIONALISATION

There is a long tradition in the literature on business strategy and international business to assess diversification by means of entropy measures that aim to capture both the overall extent of foreign activity, and the degree to which it is spread geographically. This literature dates back to the seminal studies by Rumelt (1974) and Jacquemin and Berry (1979), whose focus was on product diversification. Such studies followed in the wake of conglomerate building in the US in the 1960s and 1970s, and introduced the distinction between related and unrelated diversification, while also extending the concept of entropy to the activities of the firm.

As the internationalisation of firms progressed in the 1980s, scholars also became interested in expanding these concepts to encompass geographical diversification. The simple entropy

---

[3] The number of Finnish affiliates including affiliates' own affiliates from Statistics Finland (in 2006) was 5,962. There is a possibility to extend the data coverage in Orbis to include both smaller parent companies, and the affiliates owned by affiliates to achieve similar coverage.

measure employed here is the similar to that used by Palepu (1985), which itself is derived from the original Jacquemin and Berry (1979) entropy measure. The formula for the entropy measure used here is as follows:

$$\sum_{i=1}^{N} P_i \ln \left(\frac{1}{P_i}\right)$$

$$0 < P_i < 1, \quad \sum_{i=1}^{N} P_i < 1$$

$$P_i - \frac{FA_i}{TA} \text{ or } P_i - \frac{FS_i}{TS} \text{ or } P_i - \frac{FE_i}{TE}$$

where P_i is the ratio of foreign assets (FA) in host country i (where i=1 ... N) to total assets (TA) or foreign sales (FS) to total sales (TS) or foreign employment (FE) to total employment (TE) of the firm. This proportion is multiplied by the natural logarithm of its inverse, and summed over the total number of host countries (N) in which the firm has activities. Appendix I provides some numerical illustrations of this measure.

A small difference between our measure and the entropy measure used in studies incorporating product and geographical diversification (Kim, 1989; Kim, Hwang, & Burgers, 1989; Vachani, 1991) is that here P_i is always greater than zero and less than one, and the sum of all P_i is also less than one. While in the case of product diversification it makes sense to consider the case of a firm with activities in only one segment, in the case of international diversification, the firm has to undertake activities in at least one foreign country in addition to the home country for the measure to be meaningful. Furthermore, while diversification across industry segments should sum up to one across all segments, the home country is qualitatively different from all of the host countries in the context of international diversification. Consequently, our measure excludes the home country activities from the diversification measure.

The benefit of a geographical entropy measure is that it captures the difference between the overall extent of activities that are undertaken outside of the firm's home country, and the distribution of such activities between host countries. Thus the entropy value for a firm that has 90% of its activities outside of the home country, but all of it in just one host country, is lower than that of a firm that has invested 45% in one host country and 45% in another. It is also lower than the entropy value of a firm which has only a half of its activities outside of the home country, but where such activities are evenly distributed between five different host countries. The first case could for instance illustrate the situation of a Canadian firm in the pulp and paper industry that has invested all of its productive capacity in the United States. The latter could for instance be a Finnish company whose foreign activities are divided equally between Sweden, Denmark, Germany, the UK and Russia.

Since the measure is meant to capture both the extent of foreign activity and its distribution between different host countries, calculating an entropy measure when there is only one foreign affiliate produces somewhat counter-intuitive results. Thus for example, a firm that has a ratio of foreign to domestic assets of P_i=250/500=.5 has an entropy score of .35, while another firm with a ratio of P_i=400/500=.8 has an entropy score of .18. While we would gener-

ally consider the latter firm to be more international, the distribution of its stakes between the home and host country is more uneven, and it thus exhibits less entropy. Since parent firms with only one affiliate are nonetheless quite common (nearly a half in our sample), they are included in the analyses that follow.

We calculate total entropy measures for three variables of interest, namely the proportion of foreign assets, foreign turnover and foreign employment. In line with our definition, we have dropped all cases where the proportion of foreign activities to total activities was equal to or greater than one, suggesting erroneous data.[4]

Since the resulting number of missing variables for foreign employment is considerably higher than for the other two measures, we also introduce an alternative employment measure which includes interpolated values. Due to missing or incorrect values, we were able to calculate the simple entropy measures for a maximum of 279 parent companies. The average entropy measure when using assets was .26 and the average when using turnover was .30. The average when using employment was .36, but this measure was available for only 136 parent companies.

The interpolation of missing values for the employment measure was carried out in two ways; by using the existing values for turnover to predict the missing values by industry sector and by host country. Thus, for example, we interpolated the missing values for employment in the chemical industry based on the observed relationship between turnover and employment in the same industry. However, this method is clearly not without its flaws. To the extent that the existing observations happen to be drawn from larger firms in larger host countries, the interpolated values might appear too large in the case of a small host country with missing values. The problem is analogous if interpolation is done by host country. In this case the existing data for a particular host country might be over-representative of sectors where turnover or employment are either higher or lower than average. Using these figures, average entropy for employment was .38 when calculated by host country (211 observations) and .44 when calculated by sector (225 observations). Since the values calculated by host country had a somewhat higher correlation with the original employment measure (.87 as opposed to .77), this measure was adopted in subsequent analyses.

Overall, the three measures of entropy pertaining to the three different measures of foreign activities are closely correlated with each other, with a Cronbach alpha of .97. Figures 3 and 4 show the degree of entropy by the size of the parent, as measured by total parent employment and turnover. To make the figures more readable, both figures exclude three observations where parent employment exceeds 30,000 or turnover exceeds €10 million. A similar pattern was also observed for parent assets, but this was omitted for space considerations. These figures reveal that, contrary to what one might expect, the degree of entropy appears to be quite independent of firm size. This suggests, that there are substantively international MNEs of smaller size in our sample, which warrant further investigation.

---

[4] Such cases were caused by incorrect data for the parent or one or more of the affiliates. In a few cases, a ratio greater than one was caused by partially owned affiliates of a considerable size being counted as wholly owned.

5. REGIONAL ENTROPY

In this section, we proceed to decompose the simple entropy measure to account for the regional groupings of countries. This is in response to the recent debate concerning the extent to which regional rather than global strategies should be seen as the norm for most MNEs (Collinson & Rugman, 2008; Dunning, Fujita, & Yakova, 2007; Osegowitsch & Sammartino, 2008; Rugman & Verbeke, 2007; 2008). Most prominently, Rugman and Verbeke (Rugman, 2001; Rugman & Verbeke, 2004; 2007) have argued based on evidence of the sales of the Top 500 global firms, that only a fraction of them are global in the sense that they would enjoy substantial sales in all three parts of the Triad. They contend, that in reality, most of the largest MNEs appear to be strong only in their home region, or at most in two of the three main regions in the world.

If the world is not 'flat', as suggested by Friedman (2006), but rather lumpy or spiky, there are likely to be notable cross-border barriers that internationalising firms have to overcome if they are to be successful. These 'costs of foreignness' stem from many sources, among them cultural distance, differences in regulation and other institutional features (Dunning & Lundan, 2008a). They are particularly pronounced in the downstream (sales) activities of the firm, and affect the ability of firms to craft products and services that have a global appeal. These downstream activities are also at the centre of the Rugman and Verbeke argument, since they content that the preferences prevalent in the firm's major markets influence corporate strategy to greater extent than decisions related to sourcing.

Following the approach introduced by Jacquemin and Berry (1979) and extended by Kim (1989) and Vachani (1991), the regional entropy measure employed here introduces a second index that takes into account the regional groupings of related countries. Thus, for example, a firm with 50% of its assets abroad evenly divided between 10 different host countries in Europe should have a lower entropy score than an otherwise identical firm with 10 affiliates evenly divided, two of which are in the Americas and eight of which are in different European host countries. It is possible to decompose the simple total geographic diversification (TGD) measure introduced earlier into two components, related geographic diversification (RGD) and unrelated geographic diversification (UGD). Specifically:

$$TGD = \sum_{i=1}^{N} P_i \ln\left(\frac{1}{P_i}\right)$$

$$RGD = \sum_{\alpha=1}^{M} P_\alpha \sum_{i \in \alpha} P_{i\alpha}^\alpha \ln\left(\frac{1}{P_{i\alpha}^\alpha}\right)$$

$$UGD = \sum_{\alpha=1}^{M} P_\alpha \ln\left(\frac{1}{P_\alpha}\right)$$

$$TGD = RGD + UGD$$

$$P_{i\alpha}^\alpha = P_{i\alpha} / P_\alpha$$

$$0 < P_{ia} < 1, \quad \sum_{a=1}^{M} \sum_{i \in a} P_{ia} < 1$$

where P_{ia} is similar in construction to P_i, except that here the ratio represents activities in host country i within region a (where a=1 ... M) as a proportion of the total assets, sales or employment of the firm. Similarly, P_a is the ratio of the foreign assets, sales or employment in region a to the total assets, sales or employment of the firm. P_{ia}^a is then simply the ratio of affiliate assets, sales or employment in a particular host country to the total in that region. The seven regions included in the analysis were the Nordic countries, the old EU-15, the new EU-12, Asia, NAFTA, South America and Other, which were selected based on the pre-existing knowledge of the regional patterns of the internationalization of Finnish firms.

Figure 5a plots regional entropy in relation to total entropy using the asset measure. If regional entropy accounted for all of the firms' entropy, the observations would fall on the 45-degree line. The extent to which observations lie below this line, indicates an increase in the extent of global diversification. These results demonstrate that, perhaps contrary to what might have been expected, between rather than within region entropy accounts for a large proportion of the entropy of Finnish firms. The plots for turnover and employment (omitted here for space considerations) are substantively similar, and confirm that while regional diversification is certainly present in the sample, more global patterns can be observed at both lower and higher overall levels of entropy.

It should be noted, however, that since the maximum potential degree of entropy is dependent on the number of regions included in the analysis, and we have defined three sub-regions for Europe, it is unlikely that many firms in our sample would be diversified within only one region. Nonetheless, due to the number of firms with only one foreign affiliate, for the full sample containing 326 parent firms, the average number of regions they had invested in was 1.77.

In order to test how sensitive our analysis is to the number of regions, we divided the world into four regions following by Rugman and Verbeke (Rugman, 2001; Rugman & Verbeke, 2004; 2007). These four regions consisted of Europe, NAFTA, Asia and Other. Figure 5b shows a plot of regional entropy within the Triad using the asset measure. Our expectation was, that the scores for regional entropy would likely be higher in the Triad-based analysis, and this was the result we obtained. Table 3 compares the results of the 77 parent companies with non-zero regional entropy using the seven original regions, with the 108 parent companies with non-zero entropy using a Triad-based division. Not surprisingly, these results confirm that regional entropy increases as the number of regions is reduced, implying that as a proportion of total entropy, regional entropy is likely to account for a larger share in the Triad-based analysis. Finally, we should also note, that the extent of missing data at the affiliate level suggests that all of our entropy measures are likely to understate the true values in all of the analyses performed here.

6. CLUSTER ANALYSIS

Thus far we have demonstrated that firms differ notably in their patterns of international entropy, and that global rather than regional patterns of internationalisation are the norm for Finnish firms. The final analysis we wish to undertake here is to cluster the parent firms based on their degree of international entropy (TGD) calculated earlier.

Hierarchical cluster analysis in Stata 9.0 was used to perform the analysis. We employed Ward's linkage cluster analysis using the default Euclidean squared distances as the similarity measure. This is one of a group of agglomerative clustering methods that start with the number of clusters equal to the number of observations, and proceeded to aggregate them into a cluster. (By contrast, divisive methods start by forming a single cluster, and then proceed to partition it until no more partitions can be made.) The distance between firms is calculated with respect to three variables of interest, namely the simple entropy measure for foreign assets, turnover and employment.

It should be noted that all clustering procedures are sensitive to the type of clustering and the distance measure used, and the final number of clusters is based on the judgment of the researcher. In this case we were satisfied that four clusters would appear to represent the different types of internationalising firms present in the data. This was confirmed in further analyses that included only the two variables of assets and turnover, and analyses including the original employment variable, although in the latter case, the sample size was substantially reduced. At the same time, the clustering presented here is by no means definitive, but rather it is illustrative of the heterogeneity of internationalising firms, and other groupings, for example into three groups, are also possible.

Descriptive statistics pertaining to these four groups of firms are provided in Table 4. The number of observations is 204, and for this somewhat smaller sample, the overall entropy scores are notably higher than those reported earlier. In addition to the top two groups of highly international firms that have previously received attention in the literature, Group 3 includes a number of smaller MNEs undertaking foreign activities, many of which are global rather than regional. The division of parent companies into these four groups is provided in Table 5.

Furthermore, the table suggests, in line with the argument advanced by Rugman and Verbeke, that the most global MNEs are not only among the largest firms in the sample, but they are also the most regional in terms of the distribution of their activities. This is partly a data issue, as missing values are more likely for the affiliates of smaller MNEs, but it is also a function of size, as the largest MNEs will typically have a presence in multiple markets across one region, whereas smaller MNEs are more likely to have only one or two affiliates in each region.

The final section of this paper will argue that future research might usefully direct attention to comparing these four groups of firms, as it is likely that due to their different patterns of internationalisation, the impact of their foreign activities on their domestic activities is also likely to differ.

7. DISCUSSION AND CONCLUSIONS

The purpose of this paper has been two-fold. On one hand, it has sought to examine the newly available data from Orbis pertaining to the foreign affiliates of Finnish MNEs, and to compare this to the existing sources of data from the Bank of Finland and Statistics Finland. The latter part of the paper has concentrated on calculating different kinds of entropy measures relating to the extent of the foreign activities of Finnish MNEs, and the geographical distribution of these activities. Using these entropy measures, we were able to cluster our sample of Finnish MNEs into four different groups. By utilising firm-level data on the smaller internationalising firms, we were able not only to get a more comprehensive picture of the international activities Finnish firms, but to present an analytically grounded classification of the different types of internationalising firms.

Such a classification allows for future empirical studies focusing on the home country effects of internationalisation to employ a more fine-grained measure of internationalisation than before.[5] Thus for example, while previous research has established a rank order in terms of productivity that typically ranges from foreign multinationals in a particular host country to domestic multinationals to purely domestic firms,[6] our classification allows for comparisons to be made also between the top and bottom group or the top and middle groups of internationalising firms. Another application of this classification could be in the area of the labour market effects of internationalisation. Here existing firm or individual level longitudinal datasets allow researchers to assess the degree to which any observed effects in terms of job tenure, wages or worker satisfaction reflect the experience of internationalisation in general (due to e.g. scale or learning effects), or are common to the types of firms prominent in each cluster.

Indeed, in methodological terms, the identification of groups of MNEs that are not part of the Top 30, but that are nonetheless quite international, might allow for some interesting counterfactual scenarios to be assessed as well. Doing so would require that one is able to construct a group of domestic firms that are in observable ways similar to the internationalising firms, but that have nonetheless remained domestic. Such matching methods are nearly impossible to employ for the Top 30 group of firms, since these tend to be quite unique, particularly in smaller home countries. This is particularly salient in the case of Finland, where one firm (Nokia) has dominated the aggregate statistics by any conceivable measure.

Finally, by using firm-level data on imports and exports, and the proportion of intrafirm trade in such transactions, it should be possible to construct parallel measures to those introduced in this paper, which would complement the picture presented here. Such data could also be used to gauge the actual proportion of so-called 'born global' firms in Finland, which are generally defined as exporting a substantial proportion of their output within a few years of their inception (Gabrielsson & Kirpalani, 2004; Knight & Cavusgil, 2004).

---

[5] For a review of the existing economic literature on home country effects, see Lundan (2007).

[6] See Dunning and Lundan (2008b) for a review of this literature.

We believe that better measures of the degree and extent of the internationalisation of firms should contribute to better studies concerning the home country effects of internationalisation. Internationalisation is not a binary state, where firms are either international or domestic. In addition to the different modalities employed in becoming more international, firms have different motivations for going abroad, and the geographical pattern of international activity is quite different depending on the sector and strategies of the firms involved. No one study is likely to cover all of these contingencies, but empirical studies that employ more fine-grained measures of internationalisation, and that are able at the same time to use more detailed firm or individual level data to measure the effects, are likely to yield significant new insights concerning the home country effects of internationalisation.

REFERENCES

Ali-Yrkkö, J. (2006). *Ulkoistus ja toimintojen siirrot suomesta ulkomaille – katsaus 2000-luvun alun tilanteesta*. Helsinki: The Research Institute of the Finnish Economy (ETLA) Discussion Papers No 1059.

Buckley, P. J., & Casson, M. C. (1976). *The Future of the Multinational Enterprise*. London: Macmillan.

Collinson, S., & Rugman, A. M. (2008). The regional nature of Japanese multinational business. *Journal of International Business Studies, 39*(2), 215-230.

Dunning, J. H. (1988). The eclectic paradigm of international production: A restatement and some possible extensions. *Journal of International Business Studies, 19*(1), 1-31.

Dunning, J. H., Fujita, M., & Yakova, N. (2007). Some macro-data on the regionalisation/globalisation debate: a comment on the Rugman/Verbeke analysis. *Journal of International Business Studies, 38*(1), 177-199.

Dunning, J. H., & Lundan, S. M. (2008a). The MNE as a creator, fashioner and respondent to institutional change. In S. Collinson & G. Morgan (Eds.), *The Multinational Firm*. Oxford: Blackwell Publishers.

Dunning, J. H., & Lundan, S. M. (2008b). *Multinational Enterprises and the Global Economy, Second Edition*. Cheltenham: Edward Elgar.

Friedman, T. L. (2006). The World is Flat: The Globalized World in the Twenty-first Century. London: Penguin.

Gabrielsson, M., & Kirpalani, V. H. M. (2004). Born globals: how to reach new business space rapidly. *International Business Review, 13*(5), 555-571.

Jacquemin, A. P., & Berry, C. H. (1979). Entropy measure of diversification and corporate growth. *The Journal of Industrial Economics, 27*(4), 359-369.

Jensen, J. B., & Kletzer, L. G. (2008). *"Fear" and Offshoring: The Scope and Potential Impact of Imports and Exports of Services*. Washington, DC: Peterson Institute for International Economics.

Kim, W. C. (1989). Developing a global diversification measure. *Management Science, 35*(3), 376-383.

Kim, W. C., Hwang, P., & Burgers, W. P. (1989). Global diversification strategy and corporate profit performance. *Strategic Management Journal, 10*, 45-57.

Knight, G. A., & Cavusgil, S. T. (2004). Innovation organizational capabilities and the born-global firm. *Journal of International Business Studies, 35*(2), 124-141.

Lovio, R. (2006). Sijainti seuraa strategiaa: kokonaiskuva suomalaisten monikansallisten yritysten globaalien karttojen muutoksista 2000 – 2005. Helsinki: The Research Institute of the Finnish Economy (ETLA) Discussion Papers No 1053.

Lundan, S. M. (2007). *The home country effects of internationalisation*. Helsinki: The Research Institute of the Finnish Economy (ETLA) Discussion Papers No 1100.

Osegowitsch, T., & Sammartino, A. (2008). Reassessing (home-)regionalisation. *Journal of International Business Studies, 39*(2), 184-196.

Pajarinen, M., & Ylä-Anttila, P. (2008). *Large corporations in the Finnish economy*. Helsinki: The Research Institute of the Finnish Economy (ETLA) Discussion Papers No 1138.

Palepu, K. (1985). Diversification Strategy, Profit Performance and the Entropy Measure. *Strategic Management Journal, 6*, 239-255.

Palmberg, C., & Pajarinen, M. (2005). Internationalisation through Strategic Alliances--Determinants of Non-equity Alliances of Finnish Firms. *Liiketaloudellinen Aikakauskirja, 54*(4), 489-509.

Rugman, A. M. (2001). *The end of globalization*. London: Random House.

Rugman, A. M., & Verbeke, A. (2004). A perspective on regional and global strategies of multinational enterprises. *Journal of International Business Studies, 35*(1), 3-18.

Rugman, A. M., & Verbeke, A. (2007). Liabilities of regional foreignness and the use of firm-level versus country-level data: a response to Dunning et al. (2007). *Journal of International Business Studies, 38*(1), 200-205.

Rugman, A. M., & Verbeke, A. (2008). The theory and practice of regional strategy: a response to Osegowitsch and Sammartino. *Journal of International Business Studies, 39*(2), 326-332.

Rumelt, R. P. (1974). *Strategy, structure, and economic performance*. Boston, MA: Harvard Business School Press.

Vachani, S. (1991). Distinguishing between related and unrelated international geographic diversification: A comprehensive measure of global diversification. *Journal of International Business Studies*(Second Quarter), 307-322.

APPENDIX 1. EXAMPLES OF ENTROPY CALCULATIONS

Parent company total Finland	Sub 1 Sweden	Sub 2 Norway	Sub 2 Denmark	Sub 4 USA	Sub 5 Canada	Sub 6 China	Simple entropy
1000	900						0.095
1000	450	450					0.719
1000	450			450			0.719
1000	250	250					0.693
1000	350	150					0.652
1000	100	100	100	100	100		1.151
1000	100	100		100	100	100	1.151

APPENDIX 2. FIGURES AND TABLES

Table 1. Distribution of affiliates by sector, millions of euros

	NACE Rev 1.1	Number of affiliates	Affiliate assets	Affiliate turnover	Diff. to BoF data	Proportion missing	Affiliate employment	Diff. to BoF data	Proportion missing
MANUFACTURING	**D**	**2209**	**63110**	**81083**	**0.07**		**135690**	**0.48**	
Forest	20-21	355	21695	23514	**-0.12**	0.43	34915	**0.39**	0.71
Metals and engineering	27-35	951	29392	43887	**0.17**	0.44	65747	**0.54**	0.81
Chemical	23-25	310	4681	4794	**0.31**	0.44	8435	**0.67**	0.78
Other	15-19,22,26,36-37	593	7343	8888	**-0.38**	0.59	26593	**0.26**	0.86
SERVICES	**G,H,I,J,K,L,M,N,O,P,Q**	**1090**	**40387**	**23130**	**0.60**		**54926**	**0.41**	
Trade	G	295	2729	7055	**0.84**	0.33	11855	**0.79**	0.78
Finance and insurance	J	109	30348	8960	**0.09**	0.49	13538	**-0.51**	0.84
Other	H,I,K,L,M,N,O,P,Q	686	7310	7115	**-0.39**	0.44	29533	**-0.06**	0.85
OTHER	**A,B,C,E,F**	**234**	**26178**	**6765**	**-0.12**	0.46	**15121**	**0.43**	0.81
TOTAL		*3533*	*129675*	*110978*	*0.27*		*205737*	*0.46*	

Table 2. Distribution of affiliates by country

	ISO code	**Number of affiliates**	Diff. to SF data	**Affiliate assets**	**Affiliate turnover**	Diff. to BoF data	Proportion missing	**Affiliate em-ployment**	Diff. to BoF data	Proportion missing
Argentina	AR	8	0	0	43		0.50	0		1
Austria	AT	32	0.06	790	1585	0.23	0.34	1451	0.74	0.91
Australia	AU	27	0.33	47	218	0.83	0.93	1113	0.56	0.93
Belgium	BE	44	0.20	8646	1412	-0.10	0.20	2899	-0.17	0.59
Brazil	BR	34	0.11	0	339	0.83	0.74	0	1	1
Canada	CA	61	-0.22	262	2346	-0.18	0.30	0	1	1
Switzerland	CH	29	0.34	0	1095	-0.15	0.66	0	1	1
Chile	CL	12	0.08	0	40	0.77	0.92	0	1	1
China	CN	75	0.33	941	862	0.94	0.89	9747	0.56	0.91
Cyprus	CY	6	-0.20	0	0		1	0		1
Czech Rep.	CZ	26	0.32	164	292	0.34	0.54	1104	0.65	0.69
Germany	DE	265	0.04	6558	18289	-0.06	0.38	10943	0.67	0.91
Denmark	DK	87	0.11	1713	2427	0.16	0.54	6012	0.19	0.74
Estonia	EE	275	0.41	1815	2659	-0.19	0.11	19291	-0.14	0.72
Spain	ES	44	0.20	1273	2316	-0.01	0.25	2153	0.30	0.66
France	FR	115	0.04	5787	4065	0.23	0.21	11087	0.23	0.67
United Kingdom	GB	373	-0.49	22159	13889	-0.98	0.56	23972	-0.75	0.79
Greece	GR	6	0.14	48	69	0.30	0.50	90		0.83
Hong Kong	HK	16	0.47	0	6	1.00	0.94	0	1	1
Hungary	HU	42	0.09	1192	4854	0.03	0.50	7803	0.21	0.86
Indonesia	ID	6	0.60	0	0	1	1	0	1	1
Ireland	IE	20	0.29	318	176	0.58	0.40	298	0.49	0.75
India	IN	14	0.30	114	119	0.96	0.86	0	1	1
Italy	IT	45	0.33	1874	2787	0.07	0.24	5239	0.17	0.62
Japan	JP	23	0.15	77	147	0.77	0.83	34	0.96	0.96
South Korea	KR	6	0.60	559	2070		0.33	1061	0.06	0.33
Lithuania	LT	85	0.43	1728	920	0.24	0.42	5171	0.49	0.76

	ISO code	Number of affiliates	Diff. to SF data	Affiliate assets	Affiliate turnover	Diff. to BoF data	Proportion missing	Affiliate employment	Diff. to BoF data	Proportion missing
Latvia	LV	118	0.31	466	1126	-0.08	0.36	6065	-0.37	0.73
Mexico	MX	29	-0.07	0	23	0.97	0.83	0	1	1
Malaysia	MY	20	0.29	0	0	1	1	0	1	1
Netherlands	NL	222	-0.25	19292	4533	0.04	0.79	11743	0.20	0.82
Norway	NO	159	0.04	3167	3747	0.02	0.27	5735	0.50	0.71
Poland	PL	101	0.22	1124	2155	0.26	0.31	7823	0.35	0.63
Portugal	PT	18	0.18	277	228	0.15	0.39	499	-0.12	0.83
Russia	RU	142	0.60	278	448	0.77	0.84	1316	0.94	0.96
Sweden	SE	471	0.26	47511	26885	0.15	0.27	57563	0.13	0.70
Singapore	SG	30	0.38	216	756	0.30	0.80	878	0.54	0.90
Thailand	TH	16	0.27	46	30	0.98	0.88	784	0.75	0.88
Turkey	TR	6	0.50	144	201	0.80	0.83	0	1	1
United States	US	263	-0.12	288	6664	0.65	0.31	1212	0.97	0.98
South Africa	ZA	14	0.18	0	0	1	1	0	1	1

Table 3. Regional and total entropy (assets)

	Seven regions			Four regions		
	RGD	UGD	TGD	RGD	UGD	TGD
N	77	77	77	108	108	108
mean	0.16	0.36	0.52	0.19	0.25	0.44
min	0.00	0.01	0.01	0.00	0.01	0.01
max	1.18	0.87	1.48	1.29	0.65	1.48
# of regions			3.19			1.85

Table 4. Entropy measures by cluster group

Group		Total entropy (TGD)			Regional entropy (RGD)			Parent size			Regions	Foreign affiliates/Parent total		
		Assets	Turnover	Employment	Assets	Turnover	Employment	Assets	Turnover	Employment	#	Assets	Turnover	Employment
1	N	19	19	19	19	19	19	19	19	19	19	19	19	19
	mean	1.03	1.27	1.08	0.45	0.53	0.37	4283	5204	15292	5.32	0.54	0.60	0.33
	sd	0.22	0.28	0.28	0.29	0.33	0.26	6587	9645	17745	1.53	0.21	0.19	0.18
2	N	29	29	29	24	22	22	29	29	29	29	29	29	28
	mean	0.56	0.56	0.58	0.12	0.14	0.13	934	1660	5284	3.24	0.30	0.29	0.25
	sd	0.12	0.19	0.18	0.10	0.11	0.09	1391	2785	8280	1.64	0.14	0.16	0.16
3	N	91	91	91	21	27	19	91	91	91	91	91	91	67
	mean	0.25	0.30	0.33	0.05	0.07	0.13	212	358	1506	1.70	0.13	0.17	0.20
	sd	0.08	0.11	0.13	0.03	0.06	0.11	435	1008	2815	1.10	0.11	0.15	0.15
4	N	65	65	65	8	9	9	65	65	65	65	65	65	17
	mean	0.09	0.10	0.19	0.01	0.01	0.01	2334	531	2385	1.26	0.03	0.03	0.08
	sd	0.06	0.06	0.13	0.01	0.01	0.02	16261	1023	4202	0.69	0.03	0.03	0.11
	N	204	204	204	72	77	69	204	204	204	204	204	204	131
	mean	0.32	0.36	0.39	0.17	0.20	0.18	1370	1050	3607	2.12	0.16	0.18	0.21
	sd	0.29	0.35	0.30	0.23	0.26	0.20	9449	3474	7880	1.65	0.19	0.20	0.17

Table 5. List of parent companies by group

Group 1

1	AHLSTROM OYJ
2	AMER SPORTS OYJ
3	KEMIRA GROWHOW OYJ
4	KEMIRA OYJ
5	KONE OYJ
6	KONECRANES OYJ
7	KWH-KONCERNEN AB
8	METSÄLIITTO OSUUSKUNTA
9	NOKIA OYJ
10	NOKIAN RENKAAT OYJ
11	ONNINEN OY
12	OY RETTIG AB
13	RAPALA VMC OYJ
14	SANOMA-WSOY OYJ
15	STORA ENSO OYJ
16	TIETOENATOR OYJ
17	UPM-KYMMENE OYJ
18	UPONOR OYJ
19	WIHURI OY

Group 2

1	ASPO OYJ
2	ATRIA YHTYMÄ OYJ
3	CONSOLIS OY AB
4	CRAMO OYJ
5	EFORE OYJ
6	ELCOTEQ SE
7	ENSTO OY
8	EVOX RIFA GROUP OYJ
9	FINNLINES OYJ
10	FOSTER WHEELER ENERGIA OY
11	JOHN NURMINEN OY
12	KEMPPI OY
13	KONE OYJ (OLD)
14	LAROX OYJ
15	METSO OYJ
16	NESTE OIL OYJ
17	OUTOTEC OYJ
18	PONSSE OYJ
19	PRETAX OY
20	RAMIRENT OYJ
21	RAUTARUUKKI OYJ
22	SCANFIL OYJ
23	SUOMINEN YHTYMAE OYJ
24	TAMRO OYJ
25	TELLABS OY
26	THOMESTO OY
27	TIKKURILA COATINGS OY
28	VEHO GROUP OY AB
29	YIT OYJ

Group 3

1	AB ME GROUP OY LTD
2	ADR-HAANPÄÄ OY
3	A-KATSASTUS OY
4	ALMA MEDIA OYJ
5	ALTIA OYJ
6	ASPOCOMP GROUP OYJ
7	BANG & BONSOMER GROUP AB
8	BEAMEX OY AB
9	BELTTON-YHTIÖT OYJ
10	BIRKA LINE ABP
11	BOSKALIS NORDIC OY
12	BRANDT GROUP OY, LTD
13	COMPTEL OYJ
14	CONTAINERSHIPS LTD OY
15	CP KELCO OY
16	ELEKTROBIT OYJ
17	ETTEPLAN OYJ
18	EXEL OYJ
19	FCG INTERNATIONAL OY
20	FENESTRA OY
21	FIBOX OY AB
22	FINNKINO OY
23	GE HEALTHCARE FINLAND OY
24	GEORGIA-PACIFIC NORDIC OY
25	GLASTON SERVICES LTD. OY
26	HAVATOR OY
27	HELKAMA FORSTE OY
28	HK RUOKATALO OY
29	HKSCAN OYJ
30	HONKARAKENNE OYJ
31	IMAGE WEAR OY
32	INCAP OYJ
33	INDOOR GROUP OY
34	INDUTRADE OY
35	JUTRON OY
36	KAUKO-TELKO OY
37	KESKO OYJ
38	KOIVUNEN OY
39	KUUSAKOSKI OY
40	LANNEN TEHTAAT OYJ
41	LASSILA & TIKANOJA OYJ
42	L-FASHION GROUP OY
43	LINDSTRÖM OY
44	MAKRON OY
45	MAXIT OY AB
46	MECKELBORG OY
47	MECONET OY
48	METALLISET OY
49	METOS OY AB
50	MONDO MINERALS OY
51	NORDEA LIFE HOLDING FINLAND AB
52	ORAS OY
53	ORIOLA OY
54	ORIOLA-KD OYJ
55	ORION OYJ (OLD)
56	OTIS OY
57	OVAKO BAR OY AB
58	OVAKO WIRE OY AB
59	OY ESMI AB
60	OY NORCAR-BSB AB
61	OY SCHENKER EAST AB
62	PATRIA OYJ
63	PESMEL OY
64	PIPELIFE FINLAND OY
65	PKC GROUP OYJ
66	POLAR ELECTRO OY
67	RAUTAKIRJA OY
68	SAINT-GOBAIN ISOVER OY
69	SAUNATEC GROUP OY
70	SIEMENS OSAKEYHTIÖ
71	SKANSKA OY
72	SONEPAR FINLAND OY
73	STOCKMANN OYJ ABP

74	SUOMEN MATKATOIMISTO OY		43	POLARTEKNIK PMC OY AB
75	SUORAMARKKINOINTI MEGA OY		44	PRYSMIAN CABLES AND SYSTEMS OY
76	SYSOPEN DIGIA OYJ		45	PUUKESKUS OY
77	TALENTUM OYJ		46	RAHAPAJA OY
78	TALLINK SILJA OY		47	REALIA GROUP OY
79	TAMFELT OYJ ABP		48	SOL PALVELUT OY
80	TEKNOS GROUP OY		49	SONERA CARRIER NETWORKS OY
81	TEKNOS OY		50	SUOMEN KUITULEVY OY
82	TIKKURILA PAINTS OY		51	SUOMEN OSUUSKAUPPOJEN KESKUSKUNTA
83	TOYOTA MOTOR FINLAND OY		52	SUOMEN REHU OY
84	UNITED BROKERS OY		53	SWECO PIC OY
85	UPOFLOOR OY		54	TEKMANNI OY
86	VAASAN & VAASAN OY		55	TIELIIKELAITOS
87	VAISALA OYJ		56	TIIVISTE-GROUP OY
88	VALIO OY		57	TKA-YHTYMÄ OY
89	VIKING LINE ABP		58	TS-YHTYMÄ OY
90	WÜRTH OY		59	UPM-KYMMENE WOOD OY
91	YIT RAKENNUS OY		60	VAPO OY
			61	VEIKKO LAINE OY
			62	VR-YHTYMÄ OY
			63	WALLAC OY
			64	YHTYNEET KUVALEHDET OY
			65	YLIOPISTON APTEEKKI

Group 4

1 ANTTILA OY
2 ARE OY
3 BERNER OSAKEYHTIÖ
4 BONG SUOMI OY
5 DICRO OY
6 DYNEA OY
7 ELISA OYJ
8 FASTEMS OY AB
9 FINLAYSON OY
10 FINNAIR OYJ
11 FINNSTEVE OY AB
12 FUJITSU SERVICES OY
13 GNT HOLDING OY
14 HARJAVALTA OY
15 ICOPAL OY
16 IITTALA OY AB
17 INLOOK OY
18 ISKU INTERIOR OY
19 ISKU TEOLLISUUS OY
20 ITELLA LOGISTICS OY
21 ITELLA OYJ
22 JOT AUTOMATION OY
23 JYKI GROUP OY
24 KERKO SPORT OY
25 KIILTO OY
26 LEMMINKÄINEN OYJ
27 LUMENE OY
28 LUMON OY
29 MANPOWER OY
30 MARIMEKKO OYJ
31 METSO AUTOMATION OY
32 NANSO GROUP OY
33 NCC RAKENNUS OY
34 NORDEA BANK FINLAND PLC
35 NORDIC ALUMINIUM OYJ
36 NORDKALK OYJ ABP
37 OUTOKUMPU STAINLESS OY
38 OY AGA AB
39 OY KARL FAZER AB
40 OY SISU AUTO AB
41 OY SNELLMAN AB
42 PERLOS OYJ

Figure 1. The distribution of number of affiliates per parent
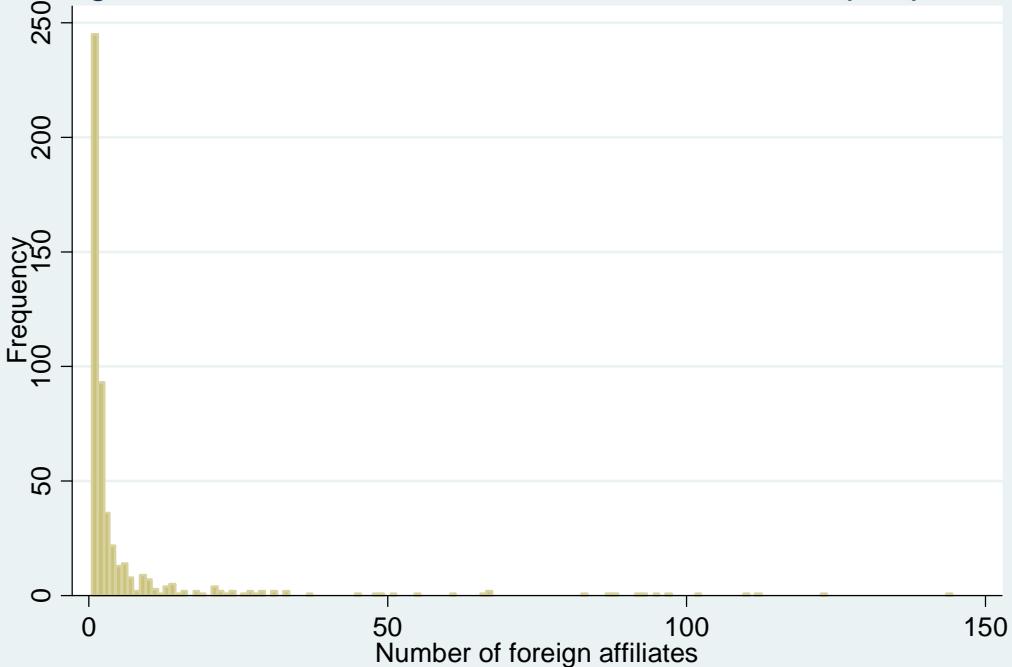
Figure 2. The distribution of number of host countries per parent
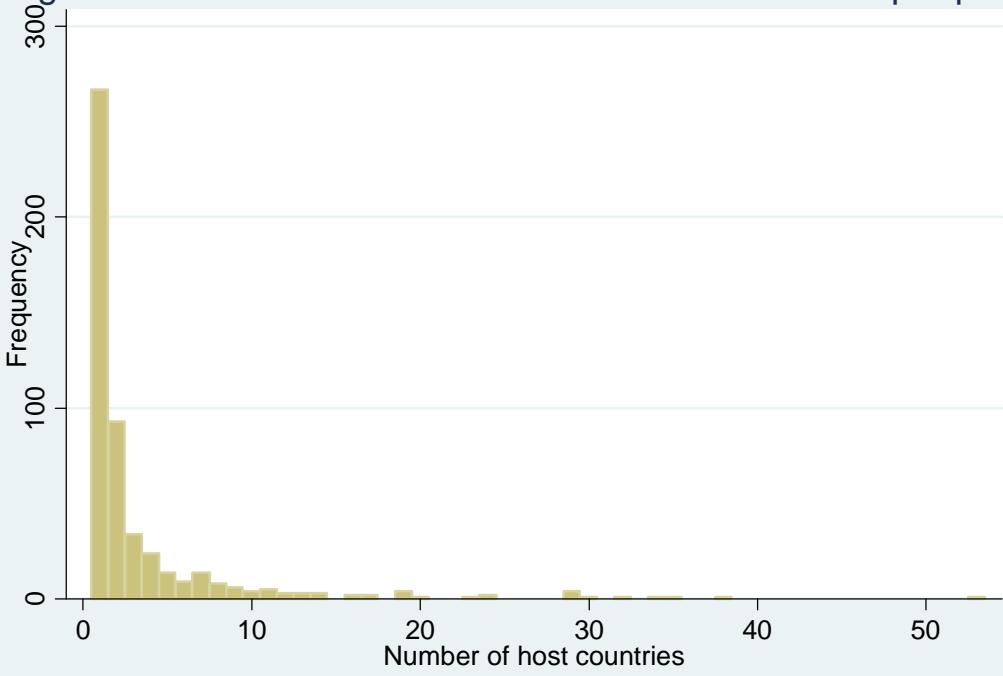
Figure 3. Parent entropy by employment
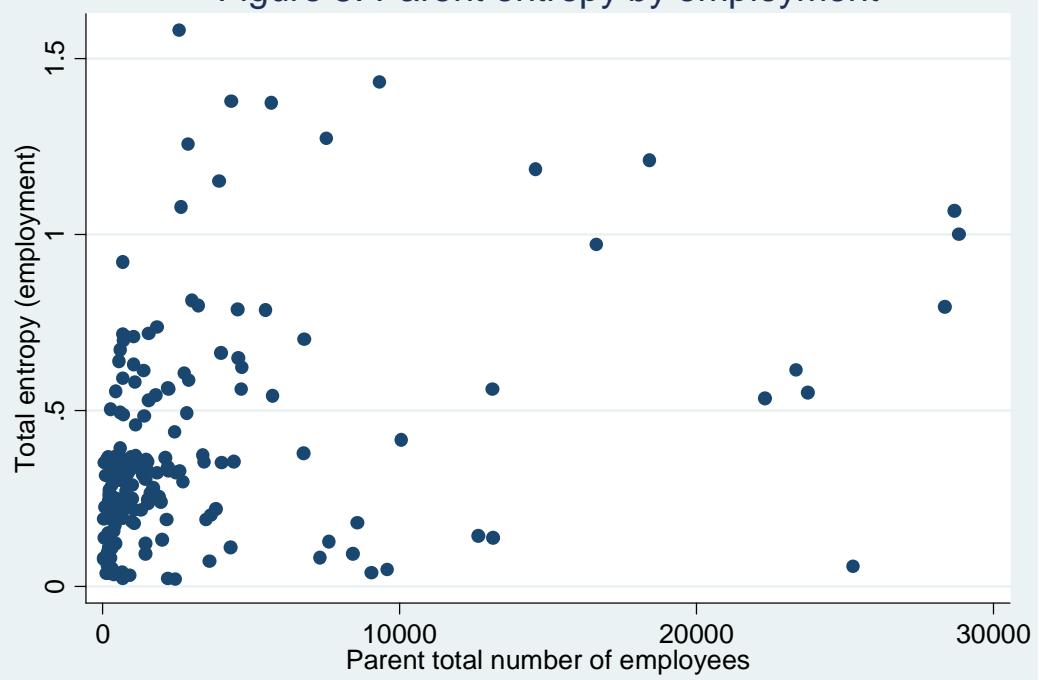
Figure 4. Parent entropy by turnover
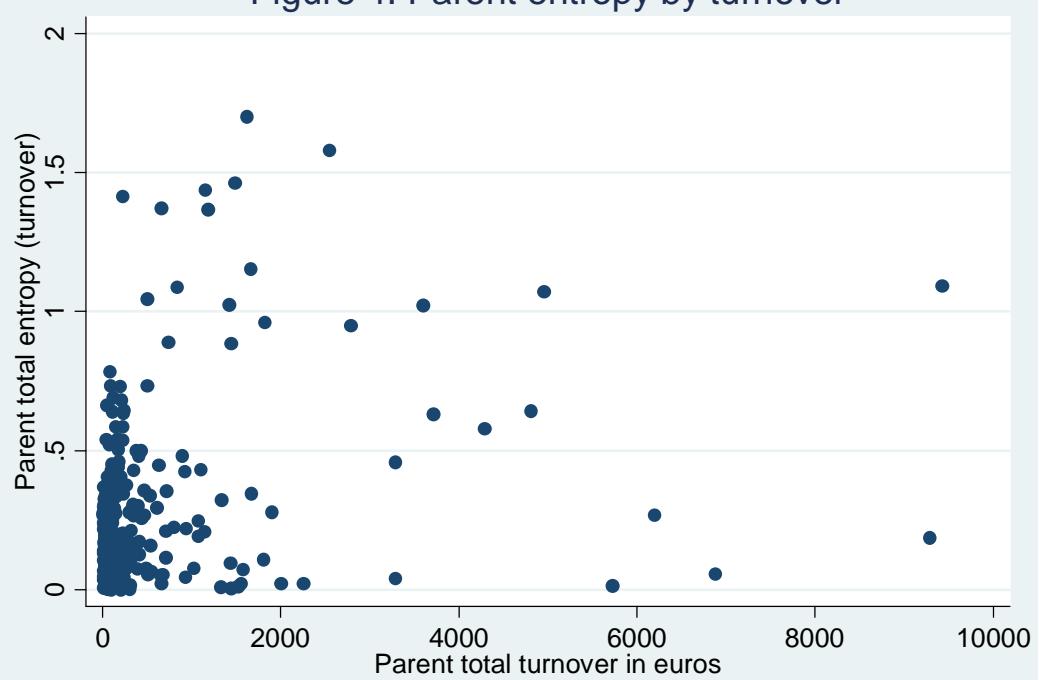
Figure 5a.Total and regional entropy (seven regions)
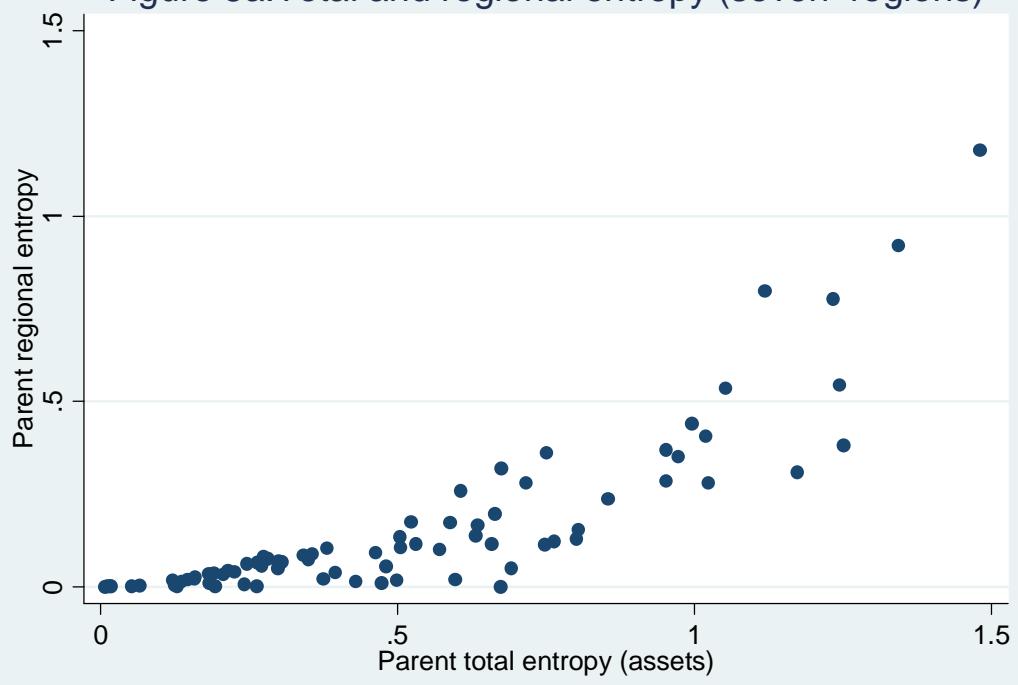
Figure 5b.Total and regional entropy (four regions)