

Seller Concentration in Irish Services: Evidence from the Annual Services Inquiry

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Seller Concentration in Irish Services: Evidence from the Annual Services Inquiry

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Abstract

Seller concentration and its interactions on the performance of markets has occupied industrial organisation and competition economists for decades. While there has been much research on concentration in manufacturing markets, few studies have considered concentration in the services sector, which typically accounts for the majority of economic activity in developed countries. This paper presents estimates of the concentration ratio (i.e. the cumulative market share accounted for by the top 5, 20 and 100 firms) in the Irish services sector using publicly available data from the Annual Services Inquiry (ASI). It might be thought that the grouped nature of the ASI data render it impractical to estimate concentration accurately in this context but a technique due to McCloughan and Abounoori (2003), and subsequently applied to grouped data in the British construction sector (McCloughan, 2004) and the Irish manufacturing sector (McCloughan, 2005), facilitates estimation of concentration in Irish services sub-sectors for the first time. While the ASI data are aggregated, and while the analysis suggests that the Irish services sector is characterised by low concentration, the results nevertheless provide some interesting new information, based on adding value to an existing, publicly available data source, on which services sub-sectors are relatively concentrated and on the trend in concentration in recent years.

JEL: L11, L74.

Key words: Concentration, size distribution of firms, services, competition, competitiveness.

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Introduction

The services sector, particularly market services, which comprise internationally-traded and domestically-traded services, is central to the performance of the Irish economy. Approximately two-thirds of all workers in Ireland are employed in services and the sector accounts for about the same proportion to total value added in the Irish economy (Forfás, 2008). The share of gross national product (GNP) accounted for by market services has increased from 25% in 2000 to over 40% in 2007 (Fitzgerald *et al.*, 2008). Since the turn of the century, the services sector has grown rapidly in importance as a link between domestic activity and world trade (*Ibid.*) and Ireland has established itself as one of the world's top exporters of services. In per capita terms, Ireland ranks among the largest exporters of services worldwide and accounts for 2.5-3% of all services exports (Forfás, 2008).

Notwithstanding the risk concerning trade and investment protectionism in the aftermath of the international financial and economic crisis, which has been recognised and is being addressed by the United Nations Conference on Trade and Development (UNCTAD) and the Organisation for Economic Cooperation and Development (OECD),¹ the likelihood is that services will become even more internationally-oriented in the years ahead as services enterprises in different countries face similar incentives to expand. This implies that there are likely to be more opportunities for Irish-based services enterprises, both indigenous and foreign-owned, in the coming years. To take advantage of these opportunities, it will be important that Irish services firms be competitive, in terms of their costs and/or their offerings.

This paper provides new empirical evidence on the structure (specifically seller concentration) of sub-sectors within the Irish services sector using publicly available data

¹ Miroux and Fujita (2009) finds that efforts to stem the risk of investment protectionism, including constraints on inward and outward foreign direct investment (FDI), are generally succeeding (although the authors also note that in some countries there has been a rise in 'covert' protectionism).

from the Central Statistics Office's Annual Services Inquiry (ASI). Generally speaking, while concentration should not be confused with market power and/or competition, the degree of concentration is nonetheless relevant to the assessment of competition and changes in concentration reflect net entry and exit – key features of the competitive process. Lower/higher concentration does not necessarily mean more/less competition or competitiveness within sub-sectors or markets. In Ireland, the relatively high ratio of minimum efficient scale to market size in many sub-sectors may imply a relatively high level of concentration to ensure market performance.

The data enabling estimation of concentration in the ASI are grouped data: firms are grouped into size classes and all that is known about them in each category is their number and aggregate size. It might be thought that estimation of concentration in such circumstances would not be possible.² However, McCloughan and Abounoori (MA) (2003) have developed a general technique for estimating the concentration ratio given such data and it is this technique that we apply in this paper. The MA technique is applied to estimate the concentration ratio among the top five, twenty and one-hundred firms in each services sub-sector for which data are available and the trend in each concentration ratio in sub-sectors is also established.

To the best of our knowledge, this is the first study to provide estimates of concentration in services sub-sectors in Ireland. A number of papers have considered aspects of competition in domestic services sectors and its impact on consumers. For example, Mariuzzo, Walsh and Van Parys (2009) examine the impact of cartelisation on price overcharge in the Irish automobile industry. They jointly estimate demand and costs and highlight the possible returns to price coordination. Focusing on the retail service sector, Whelan and Walsh (1999a) consider price dispersion as an outcome of competition in the Irish grocery market

² For example, Massey and O'Hare (1996) have observed that any assessment of concentration in Ireland "must necessarily be a rather limited one given the absence of any official published data on the level of either aggregate market concentration or market concentration".

and Whelan and Walsh (1999b) consider the impact of the groceries order on the retail services sector in Ireland. On the other hand, studies have been carried out on concentration in Ireland's manufacturing sector. Applying the MA estimator to publicly available data in the CSO Census of Industrial Production during 1991-2001, McCloughan (2005) found that both aggregate and market concentration are relatively high in Ireland, reflecting the comparably small size of the Irish market. McCloughan (2005) also found a significant relationship between the level of market concentration and upper-tail size inequalities in Irish industry, suggesting that it is the top 1 or 2 firms that typically determine the level of concentration in Irish manufacturing; and that the level of concentration in Irish industry does not vary significantly with foreign ownership or export activity. Previous studies on concentration in Irish industry were the Restrictive Practices Commission (RPC) (1975),³ O'Malley (1971) and Linehan (1962). These early studies are consistent with the more recent analysis of McCloughan (2005) in indicating that concentration is high in Irish manufacturing.

Also noteworthy is that in recent years, Forfás and the National Competitiveness Council (NCC) have carried out work on Ireland's services sector, looking at areas such as the skills needs of the sector, which reflect its growing importance to the Irish economy.

The structure of the rest of this paper is as follows. The next section outlines the nature of the ASI grouped data used in this study before we outline the MA method. There then follows two sets of estimation results – firstly in respect of the level of concentration and secondly regarding the recent trend in concentration in Irish services sub-sectors.

³ The Restrictive Practices Commission, which later became the Fair Trade Commission, was a predecessor of the current Competition Authority, which was established in 1991 following the enactment of the Competition Act of that year. The relevant competition legislation today is the Competition Act, 2002 (as amended), which repeals all previous competition and merger control legislation.

Data

The ASI is the official source of data on the services sector in Ireland. The ASI is a sample survey undertaken annually and covers the retail, wholesale, real estate, renting, business and other sub-sectors within the services sectors in Ireland. The scope of the survey covers primarily balance sheet information at the enterprise level, in which an enterprise is defined as the smallest legally independent unit.

The ASI data are provided at the NACE 2-digit level and, in the most disaggregated form of the grouped data, at the NACE 3-digit level. Data on both levels are used in this study. It should also be noted that the ASI data are at the national level and data that would facilitate estimation of regional concentration are not available. This means that the estimates reported here are quite aggregated, both at the service level and geographically. Since some services markets are local or regional in nature, some of the concentration estimates reported in this paper are likely to under-estimate the level of concentration in disaggregated Irish services markets. Nevertheless, the results are interest in adding value to an existing official (publicly available) data source, by identifying those services sub-sectors in the ASI that are *relatively* concentrated or not. The estimates produced here may also provide a source of data for further research – for example, to examine how concentration might affect, if at all, performance data on Irish sub-sectors.

Our analysis of concentration in Irish services sub-sectors is based on two size variables available in the ASI – turnover and the number of persons engaged in the enterprise. For the turnover data, the size classes reported in the ASI are in turnover and also given are the number of enterprises in each size class and the total turnover levels per size class. That is, the ASI provides grouped data on both the ‘original’ and ‘first-moment’ size distributions of enterprises and this enables application of the MA method to estimate the concentration ratio for each sub-sector. Generally speaking, the original size distribution defines the frequency

distribution of enterprises by size while the first-moment size distribution gives the proportion of total size accounted for by firms above a given size. The persons engaged data are presented in the same way. In both the turnover and persons engaged data reported in the ASI, the number of size classes presented is, in the main, four. For some subsectors (where confidentiality concerns are relevant), the number of classes is reduced.⁴

A summary of the structure of the grouped size distribution data reported in the ASI is presented in Figure 1. For both the turnover and persons engaged data, the MA estimator can be applied to estimate the level of concentration among the top 5, 20, 100 etc. firms in each NACE sub-sector. The time period covered by our analysis is generally 2002-2007, although for some sub-sectors limited data availability means a shorter period.

Figure 1: Summary of the Structure of Size Distribution Data in the Publicly Available Annual Services Inquiry (ASI)



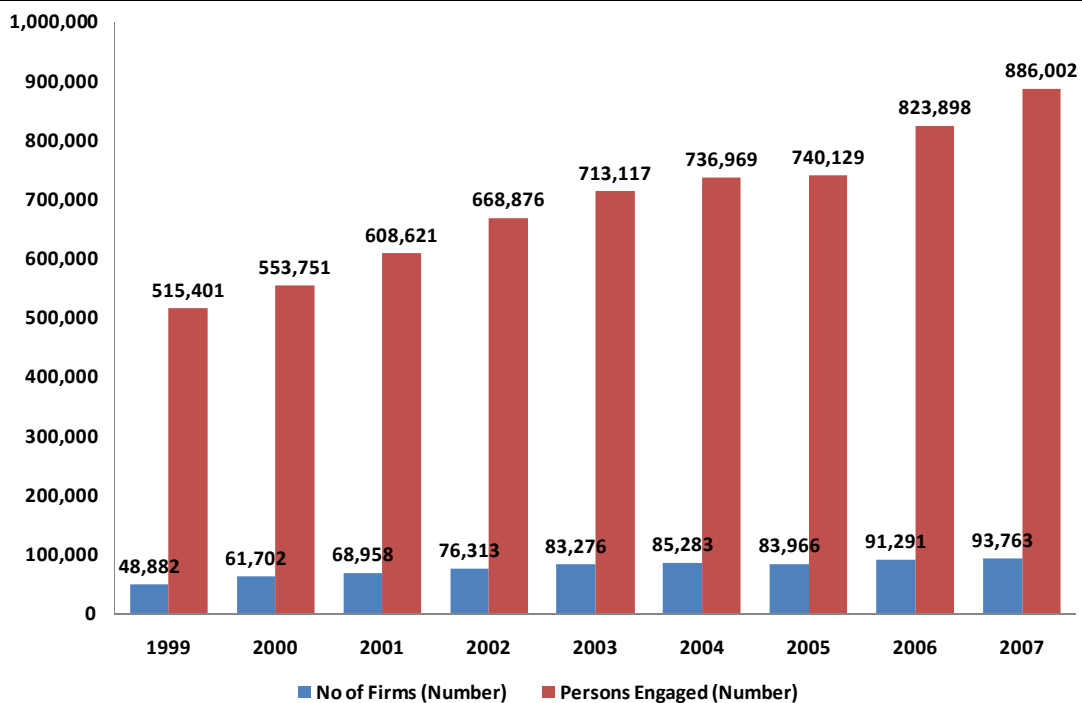
Source: Authors' summary of ASI data structure.

Note: Generally 4 size classes apart from a small number of sub-sectors where confidentiality means fewer than 4 categories.

⁴ The number of size classes in the ASI data does not affect the application of the MA method.

The number of services enterprises in Ireland has increased significantly, from just under 49,000 in 1999 to 94,000 in 2007, representing 94% growth or a compound annual growth rate (CAGR) of 8%. During the same period, the number of persons engaged in these firms increased from 515,000 to nearly 900,000, representing a CAGR of 7%. The annual figures are illustrated in Figure 2 and highlight the significant increase in size of the sector over the period, especially in the number of persons engaged between 2005 and 2007.

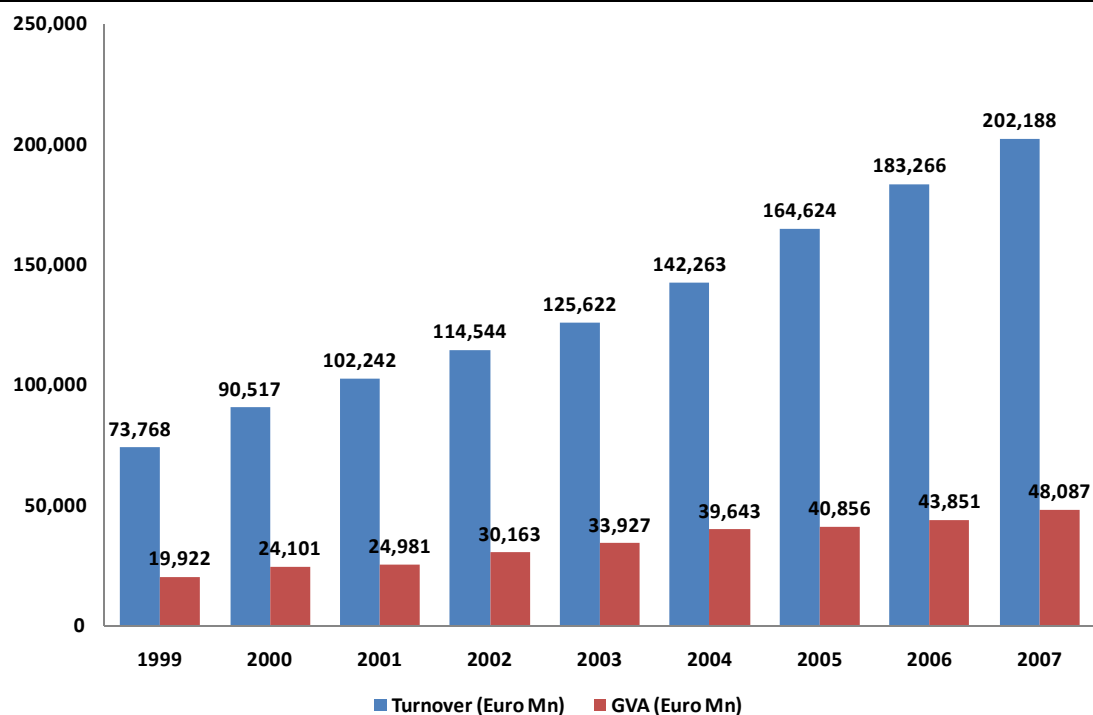
Figure 2: Total Number of Firms and Persons Engaged in Publicly Available Annual Services Inquiry (ASI) Data – 1999 - 2007



Source: CSO Annual Services Inquiry.

Figure 3 outlines the increases in turnover and gross value added (GVA) among these enterprises. Turnover increased from approximately €74 billion to more than €202 billion over the period 1999-2007, implying 13% growth on a CAGR basis. GVA increased from approximately €20bn in 1999 to nearly €50bn euro in 2007, representing a CAGR of 12% during the period.

Figure 3: Turnover and GVA in Publicly Available Annual Services Inquiry (ASI) Data – 1999 - 2007



Source: CSO Annual Services Inquiry.

Both charts above highlight the significant growth that occurred in the services sector during the latter period of the so-called ‘Celtic Tiger’, when unsustainable pressures were building up in the Irish economy, most notably in the property sector. The real estate sub-sector grew especially rapidly during this time, with the number of enterprises increasing by 300% from 2,035 to 8,295 and turnover among these enterprises growing from €14bn to €45bn or by 307%. This sub-sector is currently undergoing a significant process of adjustment, in the wake of the financial and economic crisis that has particularly affected the Irish economy. Two other sub-sectors, which also registered significant growth during 2002-2007, are computers and research and development, and these activities are seen as central to the future competitiveness in the Irish economy.

The McCloughan-Abounoori (MA) Technique

A popular measure of (seller) concentration is the k -firm concentration ratio (Ck), defined as the cumulative share of the k largest firms in a market, where k is usually 5 but need not be limited to this value, depending on the number of firms in the market and the level of concentration. The following provides a summary outline of the McCloughan and Abounoori or MA method and a more detailed discussion, with derivation of the formulae, can be found in McCloughan and Abounoori (2003).

Formally, Ck is defined as follows:

$$(1) \quad Ck = \sum_{i=1}^k s_i$$

where $s_1 \geq s_2 \geq \dots \geq s_k$ denote the market shares of the k largest firms in the market. Ck is a positive index of concentration, with values closer to unity or 100% indicating higher concentration. Market share may generally be measured by turnover, net output, volume or capacity or by employment/persons engaged.

The MA method enables estimation of the concentration ratio given grouped data, specifically where firms are grouped into size classes and all that is known about them in each category is their number and aggregate size. The MA method provides an interval estimator of the concentration ratio, with the actual (but unobserved) concentration ratio (i.e. the value that would be yielded by equation (1) were individual market share data available) generally lying closer to the MA lower estimate than the MA upper estimate. Both the MA lower and upper estimates are based on applying an alternative expression for Ck based on the aforementioned original and first moment size distributions, in which the former defines the frequency distribution of firms by size (i.e. the number or proportion of firms by size) and the latter shows the proportion of market size accounted for by firms above a given size.

Denoting the cumulative distribution function (cdf) of the original size distribution by $F(\cdot)$ and the cdf of the 1-moment size distribution by $F_1(\cdot)$, the alternative expression for Ck shown by McCloughan and Abounoori (2003) is:

$$(2) \quad Ck = 1 - F_1\left(F^{-1}\left(1 - \frac{k}{n}\right)\right)$$

where $F^{-1}(\cdot)$ is the inverse of $F(\cdot)$ and n denotes the total number of firms in the market ($n \geq k$). As outlined by McCloughan and Abounoori (2003), the graph of the function given by (2), with Ck on the ordinate and k/n on the abscissa, is a complementary Lorenz curve, with the curve lying above the equality diagonal rather than below as in the conventional Lorenz curve.⁵ Apart from this feature, the complementary Lorenz curve defined by (2) shares the properties of the standard Lorenz curve and every probability distribution with positive support generates a family of complementary Lorenz curves, whose position depends essentially on the distribution's shape parameter. A special case, highlighted by McCloughan and Abounoori (2003), is the (single-parameter) exponential distribution, which yields a single complementary Lorenz curve, reflecting the fact that the skewness of this exponential distribution is constant at 2.⁶

The challenge in applying equation (2) to grouped data is that the sample $F(\cdot)$ and $F_1(\cdot)$ are discontinuous functions. However, McCloughan and Abounoori (2003) outline an interpolation procedure based on the assumption of a uniform distribution describing the micro size distribution relating to the size class in which the k^{th} largest firm falls. This is a practicable way of applying (2) because, owing to the nature of the grouped data, the precise form of the micro size distribution cannot be observed. All that are given, recall, are the number and aggregate size of the firms of the micro size distribution (and this is the case with

⁵ Which instead plots $F_1(\cdot)$ against $F(\cdot)$.

⁶ The theoretical concept of the 'least skew' size distribution of firms, proposed by Sutton (1998), is equivalent to the single exponential form of (2) derived by McCloughan and Abounoori (2003).

the ASI data under consideration). With the simplifying uniform distribution assumption, McCloughan and Abounoori (2003) show that the sample version of equation (2) for grouped data is:

$$(3) \quad Ck = 1 - \left[F_1(x_{j-1}) + \left\{ \left(1 - \frac{k}{n}\right) - F(x_{j-1}) \right\} \left\{ \frac{F_1(x_j) - F_1(x_{j-1})}{F(x_j) - F(x_{j-1})} \right\} \right]$$

where $F(x_j)$ and $F(x_{j-1})$ denote the original cdf values at the upper values of size classes j and $j-1$, and $F_1(x_j)$ and $F_1(x_{j-1})$ give the corresponding 1-moment cdf values ($j = 1, \dots, J$).

McCloughan and Abounoori (2003) then outline two cases, based on the term $(1 - k/n)$ in (3). First, where $(1 - k/n) = F(x_j)$, (3) simplifies to $Ck = 1 - F_1(x_j)$ and Ck is predicted exactly. That is, equation (3) provides the value of Ck that would be yielded if the ungrouped data underlying the grouped size distribution (which are all that is given) were available so that the researcher could apply equation (1). Intuitively, this case captures the situation in which there is exactly k firms in the size class in which the fifth (k th) largest firm falls.

The second case is where $F(x_{j-1}) < (1 - k/n) < F(x_j)$. This is (much) more likely in practice than the first case. Here, application of equation (3) either predicts concentration exactly, in which case the uniform assumption is correct, or else underestimates concentration. The latter is more likely in practice because the micro size distribution is likely to be characterised by skewness. The less skewed the micro distribution, the more robust will be the uniform assumption and the closer the value yielded by (3) will be to the true (but unobserved) concentration ratio. As shown by McCloughan and Abounoori (2003) using computer simulations, the uniform assumption is likely to be more relevant, and thus equation (3) more accurate, where upper-tail size inequalities (i.e. size differences between the market's top k firms) are less pronounced. Nevertheless, where upper-tail size inequalities are relatively

high, McCloughan and Abounoori (2003) show how to construct an interval estimate of the concentration ratio. This relies on a further case.

This further case is where $F(x_{j-1}) < (1 - k/n) < F(x_j)$ and defines the level of concentration corresponding to $(1 - k/n) = F(x_{j-1})$ (i.e. $Ck = 1 - F_1(x_{j-1})$). This level constitutes the maximum possible value that Ck can take given the grouped data.⁷ This case defines the MA upper estimate.

Summarising, the interval estimator of the concentration ratio derived by McCloughan and Abounoori (2003) is as follows:

$$(4) (Ck_{lower}, Ck_{upper}) = (1 - \left[F_1(x_{j-1}) + \left\{ \left(1 - \frac{k}{n}\right) - F(x_{j-1}) \right\} \left\{ \frac{F_1(x_j) - F_1(x_{j-1})}{F(x_j) - F(x_{j-1})} \right\} \right], 1 - F_1(x_{j-1}))$$

The true, but unobserved, concentration ratio will generally be closer to the lower estimate than to the upper estimate. The shorter the distance between the lower and upper estimates (i.e. the shorter the length of the interval estimate), the more accurate the MA method and where the concentration ratio is predicted exactly, the lower and upper values coincide.⁸ Conversely, the larger the length of the MA interval, the less robust is the uniform interpolation procedure and the greater are upper-tail firm size inequalities.

Thus, the MA method provides useful information about the degree of size inequalities within the top (k) firms as well as about the level of concentration. We report both the MA upper and lower estimates for the NACE 2- and 3-digit markets reported in the ASI. We also report a third value, capturing the feature that the true (but unobserved) value of the concentration ratio is generally expected to be closer to the MA lower value than to the MA upper value.

⁷ The intuition is that we force the micro size distribution (i.e. the size class in which the fifth firm falls) to be completely concentrated.

⁸ To be clear, there are two ways in which the MA method will predict the concentration ratio exactly: one is where the uniform interpolation procedure is correct and the other is where there are exactly 5 firms in the size class in which the fifth largest firm falls.

This third value, which will serve as the ‘point’ estimate of concentration in this paper, is given as the lognormal median of the MA lower and upper estimates.⁹

The Level of Concentration in Irish Services Sub-Sectors

Table 1 shows the results of applying the MA method to the ASI data at the 2-digit level where both the original and 1-moment size distributions of firms are measured by annual turnover. Apart from NACE 60 (land transport; transport via pipelines), all of the data pertain to 2007. Taking first the five-firm concentration ratio (C5), it is evident, but not surprising at this level of aggregation, that the level of concentration is low in Irish services sub-sectors. Nevertheless there is some noteworthy variation in the values of the C5. Taking the point estimates of C5, the share of the five largest enterprises by turnover ranges from 4% in the case NACE 55 (hotels and restaurants) to 31% in NACE 73 (research and development) and the average level of the C5 across the 14 sub-sectors for which data are available is 12%. The average C20 (top twenty-firm concentration ratio) is 24%, with NACE 73 (research and development) having a C20 of 61% and NACE 64 (post and telecommunications) with a C20 of 41%. The average C100 is 46%, with NACE 73 (research and development) having a C20 of 97% and NACE 64 (post and telecommunications) with a C20 of 92%. The MA lower and upper values for the C5 and C20 reveal that upper-tail size inequalities are high in each sub-sector. The same is true for the C100, apart from NACE 73 (research and development) and NACE 64 (post and telecommunications), where the MA lower and upper values are close.

⁹ That is, as $\exp(\mu)$, where μ is the average of the natural logs of the MA lower and upper estimates. Use of the lognormal form reflects the tendency for the true but unobserved concentration ratio to lie close to the MA lower than to the MA upper value.

Table 1: Estimates of the Level of Concentration in Irish Services Sub-Sectors – 2-Digit NACE and Turnover-Based Data

NACE	Principal Activity	Year	C5			C20			C100		
			MA lower	Point	MA Upper	MA lower	Point	MA Upper	MA lower	Point	MA Upper
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	2007	0.5%	6%	82%	2%	13%	82%	10%	29%	82%
51	Wholesale trade and commission trade, except for motor vehicles and motorcycles	2007	0.3%	5%	90%	1%	11%	90%	7%	24%	90%
52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	2007	0.5%	5%	63%	2%	11%	63%	10%	24%	63%
55	Hotels and restaurants	2007	1%	4%	34%	2%	9%	34%	11%	19%	34%
60	Land transport; transport via pipelines	2004	3%	13%	51%	14%	26%	51%	11%	23%	51%
63	Supporting and auxiliary transport activities; activities of travel agencies	2007	2%	13%	84%	8%	25%	84%	39%	57%	84%
64	Post and Telecommunications	2007	4%	21%	96%	17%	41%	96%	87%	92%	96%
70	Real estate activities	2007	1%	5%	37%	2%	9%	37%	11%	20%	37%
71	Renting of machinery and equipment without operator and of personal and household goods	2007	3%	13%	52%	13%	26%	52%	54%	66%	81%
72	Computer and related activities	2007	2%	14%	92%	8%	27%	92%	41%	61%	92%
73	Research and development	2007	12%	31%	80%	47%	61%	80%	96%	97%	98%
74	Other business activities	2007	0.5%	5%	62%	2%	11%	62%	9%	24%	62%
92	Recreational, cultural and sporting activities	2007	4%	16%	59%	18%	32%	59%	61%	72%	84%
93	Other service activities	2007	10%	15%	21%	23%	30%	41%	37%	39%	41%

Source: Analysis of ASI data using the MA (McCloughan-Abounoori) estimator for the concentration ratio given grouped data.

Note: The point estimate of the concentration ratio is the lognormal median of the MA lower and upper estimates (i.e. the exponential of the mean of the natural logs of the MA upper and lower estimates). This measure is used because the true level of the concentration ratio generally lies closer to the MA lower than to the MA upper estimate. The lognormal formulation provides for this.

Table 2 presents the estimates of C5, C20 and C100 also at the 2-digit NACE level but now both the original and 1-moment size distributions are measured by persons engaged. The results are consistent with the previous turnover-based estimates and the average levels of C5 and C20 are low at the 2-digit level of aggregation. As before, NACE 73 (research and development) and NACE 64 (post and telecommunications) are the relatively concentrated sub-sectors with C5 values of 37% and 34% respectively and a common C20 value of 67%. The largest 100 firms account for over 90% of these sub-sectors.

NACE	Principal Activity	Year	C5			C20			C100		
			MA lower	Point	MA Upper	MA lower	Point	MA Upper	MA lower	Point	MA Upper
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	2007	1%	5%	19%	4%	9%	19%	20%	30%	46%
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	2007	1%	6%	44%	3%	11%	44%	14%	25%	44%
52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	2007	1%	5%	49%	2%	11%	49%	12%	24%	49%
55	Hotels and restaurants	2007	0.4%	4%	47%	1%	8%	47%	7%	19%	47%
60	Land transport; transport via pipelines	2004	6%	17%	50%	23%	34%	50%	32%	40%	50%
63	Supporting and auxiliary transport activities; activities of travel agencies	2007	5%	17%	64%	18%	34%	64%	68%	72%	77%
64	Post and Telecommunications	2007	13%	34%	84%	54%	67%	84%	89%	90%	91%
70	Real estate activities	2007	2%	5%	12%	7%	9%	12%	19%	24%	29%
71	Renting of machinery and equipment without operator and of personal and household goods	2007	6%	14%	36%	23%	29%	36%	52%	57%	63%
72	Computer and related activities	2007	2%	11%	55%	9%	22%	55%	46%	50%	55%
73	Research and development	2007	26%	37%	52%	62%	67%	72%	N/A	N/A	N/A
74	Other business activities	2007	1%	6%	51%	2%	11%	51%	12%	25%	51%
92	Recreational, cultural and sporting activities	2007	2%	10%	46%	9%	21%	46%	46%	56%	67%
93	Other service activities	2007	5%	10%	24%	18%	21%	24%	32%	39%	48%

Source: Analysis of ASI data using the MA (McCloughan-Abounoori) estimator for the concentration ratio given grouped data.
Note: The point estimate of the concentration ratio is the lognormal median of the MA lower and upper estimates (i.e. the exponential of the mean of the natural logs of the MA upper and lower estimates). This measure is used because the true level of the concentration ratio generally lies closer to the MA lower than to the MA upper estimate. The lognormal formulation provides for this.

Table 3 reports the turnover-based estimates of the C5, C20 and C100 for 3-digit NACE services sub-sectors. At this lower level of aggregation, it is not surprising to find higher levels of concentration compared to before. The average C5 across the sub-sectors is 26% with the highest estimated C5 occurring in NACE 526 (retail sale via mail order, stalls, markets and non-store retail sales) (44%), followed by NACE 747 (industrial cleaning) (37%), NACE 746 (investigation and security activities) (35%) and NACE 744 (advertising) (31%). On the other hand, the estimated C5 is below average in NACE 524 (retail sale of

clothing, footwear, household items, hardware, and books and newspapers) (7%), NACE 741 (legal activities, accounting, tax, marketing, business and management consulting and management activities of holding companies) (11%), NACE 742 (architectural and engineering activities and related technical consultancy) (18%) and NACE 745 (labour recruitment and provision of personnel) (22%). The average C20 across the sub-sectors is 51% with appreciably high concentration in NACE 526 (retail sale via mail order, stalls, markets and non-store retail sales) (81%), followed by NACE 747 (industrial cleaning) (77%), NACE 746 (investigation and security activities) (69%) and NACE 744 (advertising) (63%), while the C20 remains below average in the professions-related sub-sectors, NACE 741 (legal activities, accounting, tax, marketing, business and management consulting and management activities of holding companies) (23%), NACE 742 (architectural and engineering activities and related technical consultancy) (36%). Apart from NACE 524 (retail sale of clothing, footwear, household items, hardware, and books and newspapers), the estimated C100 exceeds 50% in all sub-sectors and is close to 100% in the most concentrated sectors, namely NACE 526 (retail sale via mail order, stalls, markets and non-store retail sales) (95%), followed by NACE 747 (industrial cleaning) (92%), NACE 746 (investigation and security activities) (93%) and NACE 744 (advertising) (97%).

Table 3: Estimates of the Level of Concentration in Irish Services Sub-Sectors – 3-Digit NACE and Turnover-Based Data

NACE	Principal Activity	Year	C5			C20			C100		
			MA lower	Point	MA Upper	MA lower	Point	MA Upper	MA lower	Point	MA Upper
524	Retail sale of clothing, footwear, household items, hardware, and books and newspapers	2006	1%	7%	53%	4%	14%	53%	18%	31%	53%
526	Retail sale via mail order, stalls, markets and non-store retail sales	2002	29%	44%	69%	79%	81%	83%	94%	95%	97%
741	Legal activities, accounting, tax, marketing, business and management consulting and management activities of holding companies	2002	2%	11%	54%	10%	23%	54%	49%	51%	54%
742	Architectural and engineering activities and related technical consultancy	2002	5%	18%	65%	20%	36%	65%	68%	74%	79%
744	Advertising	2002	12%	31%	80%	50%	63%	80%	94%	97%	99%
745	Labour recruitment and provision of personnel	2002	10%	22%	49%	39%	44%	49%	75%	81%	86%
746	Investigation and security activities	2002	22%	35%	54%	89%	69%	54%	88%	93%	98%
747	Industrial cleaning	2002	19%	37%	70%	71%	77%	84%	89%	92%	95%

Source: Analysis of ASI data using the MA (McCloughan-Abounoori) estimator for the concentration ratio given grouped data.

Note: The point estimate of the concentration ratio is the lognormal median of the MA lower and upper estimates (i.e. the exponential of the mean of the natural logs of the MA upper and lower estimates). This measure is used because the true level of the concentration ratio generally lies closer to the MA lower than to the MA upper estimate. The lognormal formulation provides for this.

The corresponding persons-engaged-based estimates of the C5, C20 and C100 for 3-digit NACE services sub-sectors are reported in Table 4. The average C5, C20 and C100 across the 3-digit sub-sectors are 15%, 31% and 54% respectively, which are not as high as the turnover-based concentration estimates at the 3-digit level (Table 3). The most concentrated sub-sectors by persons engaged are NACE 744 (advertising) (C5=29%), NACE 745 (labour recruitment and provision of personnel) (C5=27%) and NACE (investigation and security activities) (C5=26%). The least concentrated sub-sectors are NACE 524 (Retail sale of clothing, footwear, household items, hardware, and books and newspapers) (C5=7%), NACE 742 (Architectural and engineering activities and related technical consultancy) (C5=7%), NACE 502 (Maintenance and repair of motor vehicles) (C5=8%), NACE 522 (retail sale of food beverages and tobacco) (C5=8%), NACE 501 (sale of motor vehicles) (C5=9%) and

NACE 741 (Legal activities, accounting, tax, marketing, business and management consulting and management activities of holding companies) (C5=9%).

NACE	Principal Activity	Year	C5			C20			C100		
			MA lower	Point	MA Upper	MA lower	Point	MA Upper	MA lower	Point	MA Upper
501	Sale of motor vehicles	2006	3%	9%	31%	11%	18%	31%	39%	50%	63%
502	Maintenance and repair of motor vehicles	2006	9%	8%	7%	13%	14%	14%	N/a	N/a	N/a
505	Retail sale of automotive fuel	2006	6%	11%	21%	22%	33%	49%	44%	47%	49%
521	Retail sale in non-specialised stores	2006	3%	13%	66%	10%	26%	66%	51%	58%	66%
522	Retail sale of food beverages and tobacco	2006	4%	8%	16%	16%	23%	32%	35%	43%	53%
523	Dispensing chemists and retail sale of medical, orthopaedic, cosmetic and toilet goods	2006	11%	19%	32%	33%	37%	40%	46%	55%	67%
524	Retail sale of clothing, footwear, household items, hardware, and books and newspapers	2003	1%	7%	32%	6%	13%	32%	28%	30%	32%
526	Retail sale via mail order, stalls, markets and non-store retail sales	2002	14%	21%	33%	35%	37%	38%	49%	51%	52%
741	Legal activities, accounting, tax, marketing, business and management consulting and management activities of holding companies	2002	2%	9%	37%	8%	18%	37%	38%	43%	49%
742	Architectural and engineering activities and related technical consultancy	2002	1%	7%	52%	4%	14%	52%	18%	31%	52%
744	Advertising	2002	19%	29%	44%	74%	57%	44%	N/a	N/a	N/a
745	Labour recruitment and provision of personnel	2002	10%	27%	74%	39%	53%	74%	88%	89%	91%
746	Investigation and security activities	2002	9%	26%	72%	37%	51%	72%	90%	91%	93%
748	Other business activities n.e.c.	2002	8%	18%	41%	31%	36%	41%	55%	56%	57%

*Source: Analysis of ASI data using the MA (McCloughan-Abounoori) estimator for the concentration ratio given grouped data.
Note: The point estimate of the concentration ratio is the lognormal median of the MA lower and upper estimates (i.e. the exponential of the mean of the natural logs of the MA upper and lower estimates). This measure is used because the true level of the concentration ratio generally lies closer to the MA lower than to the MA upper estimate. The lognormal formulation provides for this.*

Summing up on the estimates of the level of concentration, at the 2-digit level, the most concentrated sub-sectors within the Irish services sector are NACE 73 (research and development) and NACE 64 (post and telecommunications). The C5s by turnover and persons engaged in the former are 31% and 37% respectively; the corresponding figures for

the latter sub-sector are 21% and 34%. High levels of concentration in these sectors are unsurprising given the role played by economies of scale in these activities. The least concentrated or most fragmented sub-sectors at the 2-digit level are NACE 70 (real estate activities) and NACE 55 (hotels and restaurants) with respective C5 estimates of 5% and 5% for each of turnover and persons engaged. At the 3-digit level, the most concentrated sub-sectors are NACE 526 (retail sale via mail order, stalls, markets and non-store retail sales) (C5=44% by turnover, 21% of persons engaged), NACE 746 (investigation and security activities) (C5=35% by turnover, 26% by persons engaged) and NACE 744 (advertising) (C5=31% by turnover, 29% by persons engaged). The least concentrated sub-sectors include NACE 524 (retail sale of clothing, footwear, household items, hardware, and books and newspapers) (C5=7% by turnover and persons engaged), NACE 741 (legal activities, accounting, tax, marketing, business and management consulting and management activities of holding companies) (C5=11% by turnover) and NACE 742 (architectural and engineering activities and related technical consultancy) (C5=7% by persons engaged).

The Trend in Concentration in Irish Services Sub-Sectors

Of additional interest is to consider the change in concentration over time. Table 5 outlines the percentage point changes in the level of concentration in Irish service subsectors at the NACE 2 digit level for turnover based estimates. The period under consideration is, in the main, 2002–2007 but due to data constraints some sectors are reported for different periods. The sectors which had the largest decline in concentration at the C5 level were NACE 64 (post and telecommunications) and NACE 73 (research and development) which each declined by 13 percentage points over the period 2002–2007. At the C20 level, significant declines were recorded in NACE 64 (post and telecommunications), down 25 points, NACE 72 (research and development) as well as NACE 73 (computer and related activities) and NACE 70 (real estate activities). At the C100 level, the largest declines were in the NACE 70

(real estate) and NACE 73 (computer and related activities) sectors. It must be noted that the period under evaluation was different for NACE 72 (research and development) than that for other sectors due to data constraints. The decline in concentration in the NACE 70 (real estate) sector is of particular interest given that the returns to real estate activities were significantly increasing over the period under consideration. This coincided with the well documented construction boom in the Irish economy. In general, the trend outlined by the results highlights falling levels of concentration in the sectors considered.

NACE	Principal Activity	Period	C5	C20	C100
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	02/07	-2	-4	-9
51	Wholesale trade and commission trade, except for motor vehicles and motorcycles	02/07	-1	-3	-6
52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	02/07	-1	-2	-4
55	Hotels and restaurants	02/07	0	0	-1
60	Land transport; transport via pipelines	02/04	-4	-8	-3
63	Supporting and auxiliary transport activities; activities of travel agencies	02/07	-1	-3	-6
64	Post and Telecommunications	02/07	-13	-25	-7
70	Real estate activities	02/07	-7	-14	-39
71	Renting of machinery and equipment without operator and of personal and household goods	02/07	-6	-12	-6
72	Computer and related activities	02/07	-7	-14	-31
73	Research and development	05/07	-13	-17	-1
74	Other business activities	02/07	-2	-5	-11
92	Recreational, cultural and sporting activities	02/07	-6	-12	1
93	Other service activities	02/07	-3	4	-11

*Source: Analysis of ASI data using the MA (McCloughan-Abounoori) estimator for the concentration ratio given grouped data.
Note: The changes in the concentration ratio refer to the changes in the point estimates of the concentration ratio, given as the lognormal median of the MA lower and upper estimates (as described in the preceding tables).*

Table 6 outlines the percentage point changes in concentration for two digit NACE sectors for estimates based on persons engaged grouped data.

Table 6: Percentage Point Change in the Level of Concentration in Irish Services Sub-Sectors – 2-Digit NACE and Persons Engaged-Based Data					
NACE	Principal Activity	Period	C5	C20	C100
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	02/07	-1	-3	-3
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	02/07	-2	-3	-7
52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	02/07	-1	-2	-5
55	Hotels and restaurants	02/07	0	0	-1
60	Land transport; transport via pipelines	02/04	-4	-9	14
63	Supporting and auxiliary transport activities; activities of travel agencies	02/07	-3	-7	-2
64	Post and Telecommunications	02/07	-2	-3	-4
70	Real estate activities	02/07	-3	-8	-4
71	Renting of machinery and equipment without operator and of personal and household goods	02/07	-3	-15	-4
72	Computer and related activities	02/07	-3	-6	-9
73	Research and development	05/07	4	-1	-3
74	Other business activities	02/07	-1	-3	-6
92	Recreational, cultural and sporting activities	02/07	-2	-3	0.3
93	Other service activities	02/07	-1	-1	7

Source: Analysis of ASI data using the MA (McCloughan-Abounoori) estimator for the concentration ratio given grouped data.

Note: The changes in the concentration ratio refer to the changes in the point estimates of the concentration ratio, given as the lognormal median of the MA lower and upper estimates (as described in the preceding tables).

The sectors with the largest fall in concentration at the C5 level were NACE 60 (land transport), down 4 percentage points, and NACE 63 (travel agencies, auxiliary transport), NACE 70 (real estate activities), NACE 72 (computers and related activities) and NACE 71 (rental of machinery), all down 3 points. NACE 71 (rental of machinery) recorded the largest decline in concentration at the C20 level, down 15 points. NACE 60 (land transport) and NACE 70 (real estate activities) also recorded significant declines. Interestingly at the C100 level NACE 60 (land transport) actually increase by 14 points. Again the differing appraisal periods must be noted here. As with the results using the turnover based estimates of

concentration, there is a noticeable overall trend towards lower concentration in Irish services sectors.

Unfortunately, there is a paucity of data facilitating analysis of the change in concentration in Irish services sub-sectors at the 3-digit NACE level based on turnover. However, more data are available when size is measured by persons engaged and the results are reported in Table 7. The largest decline in concentration at the C5 level occurred in NACE 524 (various retail services) which fell 6 percentage points. The falls in C20 and C100 for this sector (during this short period) were also very large at 12 and 28 percentage points respectively. The level of C5 in NACE 505 (retail sale of automotive fuel) declined by 4 points and in NACE 523 (chemists and medical retail) declined by 2 points. Concentration at the C5 level also declined in NACE 501 (Sale of motor vehicles) by 1 point. For two sectors, NACE 521 (retail sale in non-specialised stores) and NACE 522 (retail sale of food and beverages), there is evidence of increasing levels of concentration at the C5, C20 and C100 levels which is counter to the overall trend previously documented.

NACE	Principal Activity	Period	C5	C20	C100
501	Sale of motor vehicles	02/06	-1	-2	-2
505	Retail sale of automotive fuel	03/06	-4	2	-9
521	Retail sale in non-specialised stores	03/06	1	2	4
522	Retail sale of food beverages and tobacco	04/06	2	4	6
523	Dispensing chemists and retail sale of medical, orthopaedic, cosmetic and toilet goods	03/06	-2	0	3
524	Retail sale of clothing, footwear, household items, hardware, and books and newspapers	02/03	-6	-12	-28

Source: Analysis of ASI data using the MA (McCloughan-Abounoori) estimator for the concentration ratio given grouped data.

Note: The changes in the concentration ratio refer to the changes in the point estimates of the concentration ratio, given as the lognormal median of the MA lower and upper estimates (as described in the preceding tables).

Conclusions

With the changing structure of the domestic and international economies, the services sector plays an increasingly important role as a driver of growth and exports in the Irish economy. Given this role, it is important to understand the structure of the sector so as to inform policy in regard to future development.

The results presented in this paper suggest that, while concentration in some sectors such as post and telecommunications and research and development is relatively high, Irish services sub-sectors are characterised by low seller concentration. Our analysis of trends highlights declining levels of concentration in a significant number of services sub-sectors in recent years, including the most concentrated sub-sectors within the services sector, namely research and development, and post and telecommunications.

The results presented here do not suggest that Irish services markets have become more competitive during the 2000s. Concentration is but one aspect of market structure and just one of a number of indicators of competition and it would therefore be misleading to infer that the 'de-concentration' that has accompanied the growth of the Irish services sector in recent years also indicates greater competition. It is possible that in some sectors, higher concentration through expansion of minimum efficient scale or mergers and acquisitions may be necessary to ensure competitiveness and enhanced performance in the coming years. Future research work in this area might consider micro-level data on the flows of entry and exit to and from services markets, which would enhance the overall picture of the level of competition.

References

- Central Statistics Office, Annual Services Inquiry (ASI) reports covering the years 2002-2007.
- Fitz Gerald, J., Bergin, A., Conefrey, T., Diffney, S., Duffy, D., Kearney, I., Lyons, S., Malaguzzi Valeri, L., Mayor, K., Tol, R. (2008) “Medium Term Review: 2008-2015”, *Economic and Social Research Institute*
- Forfás (2008) Forfás Input to the Services Directive Regulatory Impact Assessment, available at: http://www.forfas.ie/media/forfas081215_directive_on_services.pdf
- Linehan, T. P. (1962) ‘The Structure of Irish Industry’, *Journal of the Statistical and Social Inquiry Society of Ireland*, Vol. XX, part V, pp. 220-246.
- Mariuzzo, F., Walsh, P.P. and Van Parys, O. (2009) ‘Estimating the Price Overcharge from Cartelisation of the Irish Automobile Industry’, *Economic and Social Review*, Vol. 40 (No.2), pp. 165-182.
- Massey, P. and O’Hare, P. (1996) *Competition Law and Policy in Ireland*, Dublin, Oaktree Press.
- Miroux, A. and Fujita, M. (2009) *World Investment Report 2009*, UNCTAD, available at http://www.unctad.org/en/docs/wir2009_en.pdf.
- McCloughan, P. (2004) ‘Construction Sector Concentration: Evidence from Britain 1971-1999’, *Construction Management and Economics*, Vol. 22 (No. 9), pp. 979-990.
- McCloughan, P. (2005), ‘What’s been Happening to Concentration in Irish Industry 1991-1999’, *Economic and Social Review*, Vol. 36, pp. 127-156.
- McCloughan, P. and Abounoori, E. (2003) ‘How to Estimate Market Concentration given Grouped Data’, *Applied Economics*, Vol. 35, pp. 973-83.
- O’Malley, P. (1971) *Irish Industry: Structure and Performance*, Dublin: Gill and Macmillan.

Restrictive Practices Commission (1975) 'Report of Studies into Industrial Concentration and Mergers in Ireland, Dublin: Stationery Office.

Sutton, J. (1998) *Technology and Market Structure: Theory and History*, Cambridge, Mass., MIT Press.

Whelan, C. and Walsh, P.P. (1999a) 'Modelling Price Dispersion as an Outcome of Competition in the Irish Grocery Market', *Journal of Industrial Economics*, Vol. XLVII (No. 3), pp. 1-19.

Whelan, C. and Walsh, P.P. (1999b) 'A Rationale for Repealing the 1987 Groceries Order in Ireland', *Economic and Social Review*, Vol. 30 (No. 1), pp. 71-90.