S.E.M. AND THE CHANGING STRUCTURE
OF EU MANUFACTURING, 1987-1993

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SEM and the changing structure of EU Manufacturing, 1987-1993

Abstract

This paper reports the initial results from a project designed to track the evolution of industrial and corporate structure of EU manufacturing alongside the ongoing European integration process. At the heart of the work is the construction of an "EU market share matrix" for 1993. This includes estimates of the turnovers of a set of 300 leading manufacturing firms, disaggregated across nearly 100 industries, and then, in turn, across the individual member states. This allows us to estimate the extent of diversification and intra-EU multinationality for each of the firms, and the concentration of producers and measures of geographical concentration for each of the industries. When coupled with a similar matrix for 1987, first reported in Davies, Lyons et al. (1996), this provides a rich and detailed mapping of how these structural dimensions have changed with the final stage (so far as the legislation is concerned) of the European single market programme. In effect, our work provides a complement to the EC's own evaluation (1996) which was derived mainly from published aggregate data on FDI, trade and mergers. In contrast, our work is more micro-based, using company accounts and emphasising industrial structure. Our main "headline" findings are that, on average, (I) concentration has remained stable, (ii) multinationality has increased rapidly - both the intra-EU multinationality of European firms and the inward multinationality of non-EU firms, (iii) diversification has decreased slightly. However, disaggregation in each case reveals an intriguing underlying picture of turbulence, and considerable inter-industry and inter-firm differences. For example, although concentration is stable on average, this hides often considerable turbulence of market shares. Moreover, there are signs that concentration has tended to increase in those industries in which integration has advanced most rapidly over this period. Similarly, although there is only weak evidence of "return to core business" in aggregate, this reflects the balance of opposing developments - increased diversification by many German firms, on the one hand, but de-diversification (and some signs of convergence) by firms from the other member states, on the other hand. Thirdly, preliminary analysis of our results on multinationality shows how they can be used to further our understanding of geographical concentration (or dispersion), and to distinguish between intra- and inter-industry multinationality. Thus, the paper serves two purposes. In addition to broadening our factual understanding of the impact of the SEM, it also sets out a research agenda of topics which deserve further, more disaggregated and analytical, research.

1. Introduction

This paper reports the latest results from an ongoing research programme on the evolution of industrial and corporate structure within European Union (EU) manufacturing[1]. It is a direct follow up to Davies, Lyons et al. (1996, hereafter D&L), which provided a detailed structural mapping for 1987, a year in the immediate run-up to the "1992", Single European Market (SEM). The current paper updates that mapping to 1993 and examines how certain aspects of structure have changed with the introduction of the SEM.

At the heart of the work is a database, referred to as the "EU market share matrix", which is constructed from detailed analysis of company accounts for a targeted set of leading EU manufacturers. This set of firms is designed to include the five leading producers in each of nearly 100 EU manufacturing industries, and we have disaggregated each firm's turnover across all the industries and member states in which it operates. In effect, the matrix is a very compact database (with only about 300 firms) which is, nevertheless, capable of generating estimates of a various key structural variables: **diversification** and **intra-EU multinationality** of the firms, and the **concentration** and **geographical agglomeration** of the industries.

An updating of the 1987 version of this matrix to 1993 therefore provides a set of genuinely new information. For example, whilst statistical authorities in many countries routinely publish industry concentration ratios, there are no official estimates of concentration at the aggregate EU level - either for manufacturing as a whole or for individual industries therein. Similarly, whilst Foreign Direct Investment (FDI) statistics are widely available (but only for broad sectors within manufacturing), little is known, systematically, about how this translates into the production (or turnover) shares of multinational firms within individual industries. Diversification is even less frequently (in fact, virtually never) documented in official statistics.

Thus, one purpose of the paper is to widen our factual understanding of the structure of EU manufacturing, and how it changed over this critical period. In addition, there is a

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[1] Throughout, the EU is defined as EU12: Germany, France, UK, Italy, Holland, Spain, Belgium, Denmark, Greece, Portugal, Ireland and Luxembourg. For most practical purposes, we consolidate Belgium

more analytical theme running through the paper. Prior to 1992, it was argued that the SEM would systematically change the nature of competition, and therefore the structure of industries and firms. This was expected to result from the market widening effect of removing the remaining non-tariff barriers, which would lead to greater realisation of scale economies and, perhaps, a toughening in the competitive regime in individual markets. In a recent ex-post evaluation, the European Commission, has detected a number of major developments, which it attributes to the effects of the single market. However, their evaluation drew largely on official aggregate data for trade, FDI and mergers and acquisitions. Our second objective here is to assess how far ex-ante expectations appear to have been fulfilled, and what impact the broad trends (in FDI, M&A and trade) identified by the EC, have had on the above mentioned structural dimensions. At a fairly trivial level, this is revealed by changes in the broad summary statistics which the matrix generates - the share of the top 100 firms in manufacturing as a whole, the typical level of concentration within industries, the share of firms' turnover sourced from outside their home country etc. Beyond this, however, one might also expect systematic differences between industries and firms, depending, *inter alia*, on how integrated they were already, prior to 1992, and how sensitive they were likely to be to further reductions in trade impediments. Thus, we are interested as much in differences between industries and firms as with changes in the population averages. Given the interim nature of this paper, and the range of topics covered, this inter-industry/firm component of our analysis is inevitably somewhat cursory. However, it is sufficient to uncover a number of suggestive patterns, each deserving deeper analysis. So the current paper also has a research agenda-setting function - raising as many interesting questions as it resolves. These will occupy the next stage of our research.

The paper begins with three scene-setting sections. Section 2 briefly reviews the ex-ante expectations and the EC's early ex-post evaluation of the effects of the SEM; section 3 draws on published aggregate data to provide the statistical background and to define terms. Section 4 derives a classification of industries according to how trade-integrated they were initially, and plots the progress of integration, by industry type, between 1987 and 1993. The remainder of the paper then turns to our own database. Section 5 first describes the basic principles of the EU market share matrix, reports the summary

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and Luxembourg into a single entity.

dimensions of the new 1993 version, and contrasts these with those derived earlier (in D&L) for the 1987 matrix. This provide a simple opening summary of the main changes in structure. Sections 6-9 then delve more deeply, by disaggregation, into the four dimensions mentioned earlier: concentration, diversification, multinationality and geographic agglomeration. The casual reader might choose to turn immediately to section 10, which summarises our main findings and agenda for future research.

2. The effects of SEM on industrial structure: the existing literature

2.1 SEM and ex-ante expectations

In the run-up to "1992", most academic and policy-oriented studies tended to concentrate on the macro- implications, and/or the likely impact on trade flows of continued integration. Viewed from an industrial organisation perspective, the literature was rather limited and confined largely to informal discussions revolving around scale economies and the implications for firm size, and to some extent concentration. Emerson (1988) is illustrative, and is probably the appropriate starting point, since this was, in effect, the "official EC" view (summarising the Cecchini Report on the "Costs of Non-Europe"). He anticipated four main effects, each having implications for the structure of industries and firms:

- direct cost savings due to the elimination of non-tariff barriers, such as fewer customs delays and costs of multiple certification;
- cost savings derived from increased volumes and more efficient location of production,(scale and learning economies and better exploitation of comparative advantage);
- tightening of competitive pressures, reduced prices and increased efficiency as more firms from different member states compete directly in the bigger market place;
- increased competitive pressures generating speedier innovation.

Within the academic literature, most of the rigorous analysis from an IO perspective was due to Venables, with a variety of co-authors - Smith & Venables (1988) is

illustrative[2]. Using an extended-Krugman (1979), trade with monopolistic competition, approach, they modelled the SEM, alternatively, as (I) merely a reduction in trade costs between national markets, or (ii) a complete displacement of segmented national markets by a single aggregate (EU) market (in which price discrimination is "forbidden"). On the basis of simulation exercises, applied to 10 industries across 6 countries, they found that the welfare gains from the former were generally moderate, but could be "dramatic" from the latter. Their main concern was with welfare evaluation, but these models also have implicit predictions for industrial structure. In particular, they suggest that the most dramatic effects are likely in industries in which national market concentration is high and pre-integration behaviour is less competitive (e.g. Cournot, as opposed to Bertrand).

Subsequently, D&L (especially ch.6) focussed more explicitly on the theoretical implications for concentration. They worked within a different framework, suggested by Sutton's (1991) work, which distinguishes between markets for differentiated and homogeneous products, and thus endogenous and exogenous sunk costs. As the fixed and variable costs of exporting within the EU decline, segmented national markets will be increasingly replaced by a larger single market. Prices will fall, especially if there is a toughening in the competitive regime; and high cost producers will exit, leaving survivors who will have typically increased their scale to exploit production scale economies. Within product markets characterised by product differentiation, where first stage competition is conducted through advertising and/or R&D, they argued that the trend towards larger scale would be even stronger. In such markets, enlargement encourages escalation of these sunk costs by the market leaders in pursuit of higher 'vertical' quality, accentuating the scale disadvantage of small firms.

In drawing out the empirical implications for concentration, one must distinguish the appropriate market place. The common implication of the above models is that integration will result in a single European market place which comprises more, and larger, sellers than was previously the case in each of the individual (more or less) segmented national markets. In that sense, *seller* **concentration** in the effective marketplace will be lower. However, this does not mean that recorded concentration levels should be expected to fall - either at the aggregate EU level, or within member states. On the contrary, since

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[2] See also: Smith and Venables (1991), Venables (1990a), Venables (1990b), Baldwin and Venables

concentration is typically measured using data on *production* (regardless of where it is sold), and the implication of the above reasoning is that the number of producers will decline, the expectation must be for increased typical firm size and higher producer concentration - both at the aggregate EU level, and within most, if not all, individual member states. It should be stressed, however, that this would not be a sign of reduced competition. Rather, the reverse is true. Indeed, to the extent that integration also leads to tougher competition (e.g. a switch from Cournot to Bertrand), this will lower margins further, and lead to even greater exit of marginal firms, and increased concentration. Of course, this stylised story is essentially short-run, abstracting from possible second-round effects in which market enlargement encourages entry of new low cost producers. But this is probably appropriate, given the time period covered in this paper.

Turning to the other aspects of structure to be considered here, it is only **geographical concentration** which attracted much attention in the ex-ante literature (e.g. Krugman and Venables, 1996). The implications can be sketched fairly easily from a simple trade perspective. To the extent that, pre-integration, trade is primarily inter-industry, and driven by comparative advantage, reduced impediments to trade should heighten the impact of that comparative advantage, leading to increased specialisation and geographical concentration. If, on the other hand, it is largely intra-industry, resulting from product differentiation, it is not obvious that geographical concentration should necessarily change - one way or the other.

As for the **structure of individual firms***, although it was widely anticipated that the scale of surviving firms would increase, little attention was paid to what this might imply for how firms would choose to distribute that increased scale across geographic and product space (i.e. multinationality and diversification). The one clear exception to this concerns the operations of firms originating from outside the EU, who were expected to increase their inward FDI into the EU. This might be for tariff-jumping motives - a somewhat tenuous argument since the SEM was not designed to raise barriers to extra-EU imports - or because the larger market could now be serviced more cost-effectively from a single location within the EU. On the other hand, the effects on intra-EU FDI (multinational operations by European firms within the EU) were largely ignored in the *ex-*

(1995).

ante literature (but see section 8 below). Similarly, the implications of SEM for the diversification of firms received no attention in the literature, as far as we are aware.

2.2 The EC's ex-post evaluation

Within the last few years, studies have started to appear, attempting to assess various aspects of the actual impact of SEM. Of course, that task is not trivial, not least because it necessarily involves identifying an appropriate counterfactual for a period in which major global changes were underway. The most extensive evaluation is that of the EC itself (1996), based on a large body of commissioned research. Using mainly fairly aggregate EUROSTAT databases, their main findings, of relevance here, are as follows.

- **Intra-EU trade**: the share of intra-EU imports in total manufacturing imports increased from 61% to 68% between 1985 and 1995. This is taken to be strong evidence of an SEM effect. In large part, increased intra-industry trade was the driving force. Broadly speaking, these trends were common to most sectors.

- **Location**: bearing in mind the relative growth in intra-industry trade, they conclude that the SEM has generally not "induced more concentration of EU industry around an industrial core" (1996, pp. 5-6).

- **FDI**: "The SMP (single market programme) impact on FDI seems to have been even more positive than its impact on trade". They report that the EU's share of worldwide inward FDI rose to 44% at the start of the 1990s, compared to 28% in the period 1982-87, and "the ratio of intra-EU trade to FDI has fallen substantially during the period of the SMP, from 240 in 1984-86 to 61 in 1990-92 for manufacturing industries. This was most marked in the food sector" (1996, p. 5).

- **Mergers and Acquisitions (M&A)**: "the EU has witnessed rapid growth in M&A activity. This growth has been particularly strong in cross-border activity, which is one of the main components of the wave of FDI. However, the bulk of M&A operations are still overwhelmingly domestic, indicating that the restructuring has taken place, at least initially, through changes to domestic market structures" (1996, p. 6).

Their evaluation also encompasses concentration and firm size. Indeed, for the

former, they drew in part on a very early and incomplete version of our own database. They concluded that there had been significant increases in concentration in some industries at the EU level, although national concentration had more often than not tended to decrease, with the notable exception of Germany. On firm size, comparisons were largely frustrated by the absence of a consistent or up to date database. Nevertheless, the tentative conclusion is that "after the implementation of the SMP, this structural characteristic of the European manufacturing sector has remained unaltered" (1996, p. 8).

3. Setting the background: two typologies and industry-level data

This section draws on the published industry-level data for production and trade to help set the context for our own work and to introduce some industry typologies which will be useful when considering inter-industry and inter-firm differences.

The time period

As already mentioned, our own analysis is to be based on a comparison between 1987 and 1993. The choice of these two years was dictated by data availability at the start of the project, and, of course, they are quite appropriate for assessing the immediate impact of the SEM ("1992") programme. However, in other ways, they are not as comparable as one would like. In particular, they refer to different stages in the business cycle. As can be seen from published GDP data for the EU as a whole, 1987 was in the middle of a long expansionary period, whereas 1993 was at the bottom of the following recession. Moreover, different member states were clearly at different stages in the cycle - the UK and Ireland were significantly further into the recovery stage by 1993. Exchange rates were also still highly variable over this period; for example, the lira depreciated by 23% between these two years. For these reasons, it must accepted that a number of our estimates and conclusions may be sensitive, at least at the margin, to the particular years chosen for comparison.

The growth in intra-EU trade relative to production

As is clear from the EC's own evaluation, intra-EU trade grew significantly over this period. This is exactly as would be predicted by most IO and trade models of integration of the sort briefly reviewed earlier.

On the other hand, the growth in aggregate EU manufacturing production, 1987-1993 was unexceptional - only 26% in nominal terms over a 6 year period. Since the relevant

inflation rate over this period was about 16-17%[3], this implies an average real growth rate of rather less than 1.5% per annum.

Table 1 combines the data on production and intra-EU trade and reports the averages across 88 different manufacturing industries. (It should be noted that these data relate only to the years 1986-1992 because the trade data are not comparable pre- and post 1992. It also excludes 8 industries in our matrix, for which no trade data are available)[4]. It is clear from the "All Manufacturing" row that intra-EU trade far outstripped production: by 18% in the typical industry. The growing significance of intra-EU trade is also evident when compared to the growth in the size of the market - measured by "apparent consumption" (i.e. taking into account the growth in extra-EU trade). It is obvious from this comparison that goods traded between the member states was accounting for an ever increasing proportion of the typical EU consumer's expenditure. This, too, is entirely consistent with expectations.

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[3] There is a variety of sources that might be used for the rate of increase in the manufacturing price index over this period. A representative example is the deflator for "production prices" for the EU(12), as reported in the Bank of Italy Annual Report: 1993 = 116.62, with base 1987 = 100.

[4] Another general data problem which should be acknowledged here is the quality of the EU production statistics at the industry level. We have had considerable difficulty in obtaining consistent series for all 3 digit industries. In the event, the source we have used is the data published in the "Panorama of EU industry". These data are apparently derived by DEBA, and based on non perfectly harmonized surveys/ censuses conducted by individual member states, and usually confined to enterprises with 20 or more employees.

Table 1 - Growth in production and intra-EU trade, 1987-92[1]

% arithmetic average growth rates

	Production	Apparent consumption	Intra-EU trade[2]	Production net of intra-EU trade
All Manufacturing	31.4	37.0	49.3	25.4
Very sensitive to SEM[3]	40.5	43.6	72.9	34.9
By type of product[4]				
Type 1 (homogenous)	30.1	34.1	45.0	25.6
Type 2 (differentiated)	32.3	39.1	52.3	25.2
of which:				
Type 2A(advertising)	31.7	36.4	51.9	27.9
Type 2R (R&D)	30.9	38.3	51.5	22.6
Type 2AR (advertising & R&D)	37.3	46.4	55.6	28.1

Notes:
1. This, and the following, table are based on 88 industries for the period 1987-92 (not 96 industries 1987-93 as in all other tables). This is because consistent disaggregated trade data are only available for 88 industries, and, even for them, only up to 1992.
2. Since there are minor differences between reported intra-EU imports and exports, intra-EU trade is defined as the average of the two.
3. This set of industries are defined as in the European Economy (1990, p. 24).
4. These categories are defined (D&L) according to whether the industry concerned is typically observed as having high advertising/sales and/or R&D/sales ratios ("high" is defined as at least 1%).

However, there is another side to this coin. Rapid growth in intra-EU trade, coupled with sluggish production, implies that production for domestic consumption (i.e. within member states) must have grown only very slowly: according to our calculations, by only 26% between 1987 and 1992. Bearing in mind that there was a major downturn in production in 1993, this implies that production for domestic consumption grew by little more than 20%, 1987-93, i.e. scarcely more than the prevailing rate of inflation.

In other words, these statistics confirm that, in the typical industry, there was indeed a significant growth in intra-EU trade over this period, confirming the importance of ongoing European integration. But it is also apparent that much of this merely displaced production for domestic consumption within individual member states. Whilst something of a trade-off between the two is also predicted by most models, the virtually zero growth of production for domestic consumption may have had serious consequences for those firms

unwilling or unable to sell outside their home member states. To the extent that firms at the small end of the size distribution typically have a lower export-propensity, this may be important for the size distributions within industries.

Disaggregation according to two typologies

The remainder of Table 1 disaggregates the picture by introducing two alternative typologies of different types of industry. These were first used in D&L, but since both also feature prominently throughout the rest of the paper, a brief definitional digression is necessary.

The first merely identifies that set of industries which the EC themselves anticipated would be most **sensitive to the effects of the SEM.** This anticipation was based on a variety of statistical criteria (e.g. dispersion of prices, public procurement, trade flows etc) and is reported in EC (1990, Table 2.1). Broadly speaking, it is an indicator of which industries were thought to have the highest non-tariff barriers prior to "1992"[5] - 14 industries are so identified.

The second follows D&L by distinguishing **differentiated product** industries from those producing **homogeneous** goods. From a theoretical perspective, this distinction maps closely into the difference between endogenous and exogenous sunk costs in models of industry structure and vertical product differentiation (Sutton, 1991 and D&L, 1996). It also highlights those markets in which proprietary (firm-specific) assets, and therefore multinationality and diversification, are likely to be prominent (Caves, 1996 and D&L, 1996). This distinction is operationalised using data on "typical" industry spends on advertising and R&D: product differentiation is equated with "high" expenditures on advertising and/or R&D. Within the differentiated group, industries are disaggregated further according to the method of differentiation[6].

Returning to Table 1, the averages for growth in production etc. have been calculated

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[5] In fact, the EC also distinguished other sets of industries in which non-tariff barriers were judged as moderate, as opposed to low. We have experimented with a slightly more continuous form of this "variable", but this adds nothing to the visual "explanatory power".

[6] See D&L, pp.26-31 and Appendix 3 for more detail. Broadly speaking, Type 2A includes industries mainly in food, drink and tobacco, Type 2R are industries in engineering, broadly defined, without significant sales to final consumers, and Type 2AR are often consumer durables. It should be noted that we have refined the classification since D&L on the basis of further FTC data (for the US) kindly supplied to us by Mike Scherer. We believe that this has led to a more robust classification, in which a few industries have been switched between types. See Scherer (1998) for a discussion of this matter.

separately for industries according to these two typologies. In general, the same broad tendencies survive this disaggregation. As can be seen, however, the SEM-sensitive industry group is the most obvious exception. On average, they grew more quickly than the others, on all counts, but particularly for intra-EU trade. This is superficially consistent, at least, with the hypothesis that the SEM has stimulated growth by most in those markets where imperfections were initially greatest. Beyond this, there was a tendency for differentiated product industries (Type 2) to exhibit faster growth in intra-EU trade than homogeneous product industries (Type 1), and this is also reflected in faster growth of apparent consumption and production. There are also interesting differences between different types of differentiated industries. Where firms typically compete on the basis of both advertising and R&D (2AR), there appears to have been a tendency for faster growth intra-EU trade. But perhaps the most striking statistic in this part of the table is the very sluggish growth in production for domestic consumption in type 2R industries: in these industries, on average, intra-EU trade was the only source of real growth. It should be stressed, however, that few of these differences are statistically significant, since there is considerable within-group variance[7].

4. A Typology of Trade Integration

The results from Table 1 confirm that there has been a substantial increase in intra-EU trade over this period - by about 50% in the "typical" industry - which far outstrips the growth in apparent consumption and production. Moreover, this pattern appears to be broad based, applying to the different types of industry identified in the typologies. Probably on this basis alone, it is reasonable to conclude that the single market has had a major impact.

Typology of industries by trade integration

Against that backcloth, this section now introduces a third typology, designed to reflect how trade-integrated different industries were in 1987, and to plot the progress of integration in the subsequent six years. The obvious statistical indicator is the relative magnitude of intra-EU trade (INTRA), where: **INTRA is defined as the ratio of intra-EU trade to EU apparent consumption**.

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[7] In fact, throughout this paper, we refrain from reporting t statistics on the differences between sub-sample averages in the tables. This would imply an element of causality/precision which we wish to avoid at this stage in our research. In all cases, the tables are seen as preliminaries, not substitutes for subsequent

In effect, this shows the probability that a randomly selected consumer in a randomly selected member state will choose to purchase a good imported from elsewhere in the EU, as opposed to one produced in his home member state, or from outside the EU. Whilst, there are clearly other dimensions to integration[8] than just intra-EU trade, the advantage of this particular statistic is that it can be derived from sources completely extraneous to our own matrix, thereby avoiding the risk of circularity when exploring, as below, bivariate relationships between integration and the structural indexes derived from the matrix.

We shall distinguish four groups of industry - low, medium-low, medium-high, and high - based on categorical values for INTRA of 10%, 25% and 35%. Inspection of the distribution across industries (figure 1) suggests that 10% and 35% may have the status of "natural breaks" in the distribution.
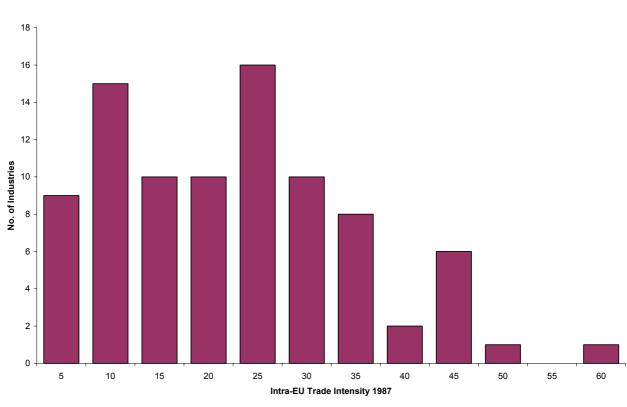
Figure 1

multivariate analysis.

[8] For example, D&L (pp. 122-125) derive an index of integration which is based on the extent of intra-

Inspection of the 23 industries in the "low" group reveals that most of the products concerned come close to being inherently **non-tradeable.** This term applies most easily to: three building materials (clay products, cement and concrete); five sundry metal goods (foundries, forging, metal treatment etc.); three timber industries, four basic foodstuffs (milling, animal feedstuffs, bread and sugar), printing and publishing, and photographic labs. These are typically homogenous products with low value-volume ratios. However, it also includes three highly differentiated daily purchase consumer products - cigarettes, beer and soft drinks - for which licensing is most usually preferred to exporting. The label, "non-tradeable", sits rather less easily for the three remaining industries in this group: railway equipment, electrical wires and cables and pasta. Significantly, all three were amongst the EC's most SEM-sensitive industries.

On the other hand, within the "high" group, intra-EU trade was already very prominent (and perhaps nearing saturation - see below) even before the late 1980s. This group ranges from computers, optical instruments and car parts to footwear, knitstuffs and carpets; it also includes two specialist mechanical engineering activities, paper and textile machinery, and two chemicals, man-made fibres and domestic and office chemicals.

In contrast, the third critical value, 25%, is chosen merely as an obvious focal point, splitting the mass of the middle part of the distribution into two parts - it has no obvious rationale, other than that this value was also used in D&L (which merely defined INTRA in a binary way).

Inter-industry differences in the growth of trade integration

Table 2 explores the subsequent progress of integration, 1987-92, for each of the different types of industry. The first part reveals, albeit very crudely, a tendency for trade integration to have increased most rapidly amongst the two initially-medium trade groups. Indeed, putting aside the "low" group, this pattern is consistent with (a relatively weak) catching-up, or convergence, tendency. As a simple test of this hypothesis, the following regression was estimated, excluding the "low", arguably non-tradeable, group (estimated standard errors in parentheses):

$$\ln(INTRA93) = 0.617 + 0.836 \ln(INTRA87) \qquad R^2 = 0.791$$
$$(0.172) \ (0.053)$$

EU multinationality, as well as trade.

Of course, this equation has only a descriptive status, but it is interesting to note that the regression coefficient on INTRA87 is significantly less than unity - consistent with convergence, and the point estimates imply a "steady state" (equilibrium) of INTRA = 43%. As it happens, this is almost identical to the 1987 mean value for INTRA amongst the "high" group.

There is an important implication of this hypothesis which will be borne in mind when interpreting the tables in the remainder of this paper: the four groups differ, not only in the extent of initial trade intensity, but also in the extent to which integration began to "bite" during this period. In particular, it could be argued that the "high" group may have already largely attained fully-integrated status by 1987. Significantly, only 2 of the 10 industries in this group record a significant increase in INTRA (in both cases, +3%). On the other hand, the integration process may have been now impacting most strongly on the two medium trade-integration groups - it may be these industries in which we should look for most evidence of rapid structural change.

Returning to the "low" group, there appears to have been no catching-up effect. In fact, this is even more clear-cut if one removes two exceptional industries within this group which **did** exhibit significant growth in INTRA (Pasta and Railway Equipment). As already mentioned, these were both identified as SEM-sensitive and probably do not belong in a set of inherently non-tradeable industries. Excluding both, the average growth in INTRA for the remaining 24 industries in this group drops to below 1% - tending to confirm that this set of industries are likely to feature less prominently in the European integration process.

Table 2 - Changing trade integration, 1987-92

	Intra-EU trade intensity[1] 1987	Number of industries	Intra-EU trade intensity (arithmetic averages)		
			1992	1987	1992/87 change
All industries		88	23.15	21.0	+2.15
High	>35%	10	42.3	44.0	-1.7
Medium-high	25-35%	23	32.1	29.7	+2.4
Medium-low	10-25%	32	21.7	18.2	+3.5
Low	<10%	23	7.9	6.2	+1.7
Very sensitive to SEM		14	16.9	14.0	+2.9
By type of product					
Type 1		37	18.1	16.3	+1.8
Type 2		51	26.8	24.4	+2.4
of which:					
Type 2A		16	16.7	15.65	+1.05
Type 2R		26	32.1	28.6	+3.5
Type 2AR		9	29.55	27.9	+2.55

Notes:
[1] *Defined as intra-EU trade as a percentage of apparent consumption. See note 1 in Table 1. See also notes to Table 1*

More briefly, the second part of the table examines differences using the two other typologies. In terms of the sample means, the growth in integration was slightly faster on average amongst the SEM sensitive industries and differentiated product industries. Again, however, there is a marked difference between 2A and 2R - integration being slower and faster respectively than average in these two sub-groups. This tends to reinforce the tendency (discussed in D&L), for Type 2 industries (with the exception of 2A) tend to be more trade integrated than Type 1.

5.   The EU market share matrices

5.1   The underlying concept

We now turn to our own database - the market share matrix. Briefly[9], the basic idea of this matrix is to identify a set of "leading firms", and disaggregate their turnover data, extracted from individual company accounts, using a common industrial classification scheme at a meaningful level of disaggregation (the NACE 3-digit). A firm qualifies as a "leader", if:

- **it is one of the five largest EU producers in at least one manufacturing industry**

For every such firm, the matrix includes:

- **estimates of its EU turnover (sourced from within the EU, measured in ECUs), in each industry in which it operates (not only in those where it is a "leader"), and**
- **disaggregated into the turnovers, in that industry, sourced from production in each member state.**

A three-dimensional matrix built on these principles can provide estimates of various structural dimensions. For any given industry, coupled with published EUROSTAT data on aggregate industry turnover, it identifies the shares of the five largest firms and a number of other non-leading firms who are significant in other industries. This is sufficient to calculate an index of market concentration for that industry. In geographical terms, it also reveals the concentration of production and/or ownership across member states. For any given firm, it reveals the extent of its diversification across industries, and its intra-EU multinationality within industries. At the overall manufacturing sector level, since the matrix will include most large EU manufacturers, it also enables us to estimate aggregate concentration.

One other feature of the matrix is both a strength and a weakness. Because all firms'

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[9] Since the principles, methodology and data sources are similar to those used for the previous 1987

turnovers are disaggregated across a common industrial classification within manufacturing, all inter-firm or inter-industry comparisons are perfectly standardised over a common "terrain". On the other hand, this terrain is 'ring-fenced', and does not include the firms' operations outside of manufacturing or outside of the EU. In principle, it could be extended in both directions; but, in practice, this would add excessively to data collection and manipulation, and has not been attempted.

5.2 The 1993 matrix

The 1993 version of the matrix includes 96 three digit manufacturing industries, as defined in the 1990 NACE classification, and, for all practical purposes, this covers the entire manufacturing sector[10]. The basic dimensions of the matrix are reported in Tables 3 and 4, and Box 1 shows how they can be interpreted to provide an immediate summary of the structural dimensions just described.

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matrix, the reader is referred to D&L (chapter 3).

[10] The only exclusions are a few industries which are, in reality, extractive rather than manufacturing, or which are too heterogeneous and miscellaneous in definition to be meaningfully interpreted as industries (see Table A1); these excluded industries account for only 0.55% of total EU manufacturing production.

Table 3 - Dimensions of the 1993 matrix

	Number	**Sales (ECUs bn.)**	**Share of mfg (%)**
Firms	**294**	**846.4**	**34.25**
Total entries	**1427**		
Leading	**480**	**631.7**	**25.56**
Non-leading	**947**	**214.7**	**8.69**
Total manufacturing		**2470.9**	

Notes: An "entry" is a non-zero cell in the matrix. It is "leading" if amongst the 5 largest in the industry concerned.

Table 4 - Countries of origin of the matrix firms, 1993

Member state	**Firms**		**Turnover**		**% outside home country**
	number	**%**	**bn ECUs**	**%**	
Germany	64	21.8	276.5	32.7	13.9
UK*	51.5	17.5	110.1	13.0	29.2
France*	47.5	16.2	161.4	19.1	31.3
Italy	47	16.0	87.0	10.3	22.8
Belgium/Luxembourg	13	4.4	16.7	2.0	37.7
Holland*	9	3.1	45.6	5.4	59.5
Spain	5	1.7	5.1	0.6	0.3
Other member states	4	1.4	3.4	0.4	15.0
Non-EU	53	18.0	141.6	16.7	100
Total	294	100	846.4	100	37.3

*Note: * Two anglo/dutch firms (Unilever and Royal Dutch Shell) and one anglo/french firm (GEC-Alsthom) have been allocated 50:50 to UK, Holland and France.*

Box 1 Summarising structure from the basic dimensions of the 1993 matrix

Aggregate concentration	294 firms qualify for inclusion as "leading"; they account for 34.3% of total EU manufacturing turnover.
typical market concentration	Within this total turnover, 25.5% points refer to the sum of their leading operations. This is equivalent to the (sales weighted) average five-firm concentration ratio (C5)
diversification	The firms occupy 1427 cells on the matrix. 480 are "leading" entries; thus, the average firm is a leader in (480/294=) 1.63 industries: this is **"leading" diversification** with significant market power. On average, they also operate in a non-leading way in (947/294) = 3.22 industries: **non-leading diversification**. The latter account for 8.7% of aggregate EU manufacturing, i.e. about a quarter of the firms' turnover, indicating a relatively large amount of diversification without 'market power'.
geographical concentration	The four largest member states (Germany, France, UK, Italy) dominate, account for 72% of the firms and 75% of total turnover. In that sense, there is significant geographical concentration (but see section 9)
multinationality	37% of the turnover of matrix firms was produced outside their home countries. This comprises two parts:
non-EU multinationals[11]	17% is due to European subsidiaries of non-EU multinationals - the counterpart in production terms of the *stock of extra-EU inward FDI*.
intra-EU multinationality	The remaining 20% relates to cross-border production of EU firms. It follows that about 25% (statistic not in Table) of the turnover of EU matrix firms is produced outside their home countries. On average, the most multinational firms originate from Benelux, followed by France and the UK, with German firms, on average, lagging some way behind.

5.3   Changes between the 1993 and 1987 matrices

A comparison of the basic dimensions of the 1993 matrix with those of its 1987 counterpart, used in D&L (1996), provides a quick guide to the major structural changes over this period: (Tables 5 and 6)

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[11] Who appear on the matrix by virtue of their *production* within the EU.

Table 5 - Changes in the matrix between 1993 and 1987
(a) aggregate EU figures

	1993	**1987[1]**
Number of industries	96	96
Number of firms	294	291
Share of manufacturing sales (%)	**34.3**	**35.3**
of which:		
leading	25.6	26.2
non-leading	8.7	9.1
Number of entries	**1427**	**1491**
of which:		
leading	*480*	*480*
non-leading	*947*	*1011*
Number of entries per firm	**4.82**	**5.12**
of which:		
leading	*1.63*	*1.65*
non-leading	*3.22*	*3.47*

Notes.[1]For comparability with the 1993 matrix, the 1987 matrix has been revised by deleting four minor industries which were included in the original version, see Table A1, and estimates of 1987 industry size have been adjusted, see footnote 12.

First, note that the number and identities of the industries remain unchanged, by construction[12], but that the number of firms, and their identities may well differ between the two years.

    I: The number of firms remained substantively unchanged - increasing by just

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[12] The 1987 matrix was revised very slightly from the form used in D&L by excluding four very minor industries which have been excluded in the 1993 matrix. Thus, both matrices include the same set of 96 3-digit industries (Table A.1). Another revision, necessary to make the two matrices compatible, is that industry size has been measured using EUROSTAT data which is confined to firms employing more than 20 workers. D&L had adjusted these data to allow for smaller firms, but, because this was impossible this time for the 1993 data, "uncorrected" figures are used here for both years. For this reason, the levels of 1987 concentration reported here tend to be slightly larger than those reported in D&L.

3. However, their aggregate turnover, expressed as a share of total EU manufacturing, declined by 1% point, implying a **relatively minor fall in aggregate concentration**.

II: 0.6% points of this fall is accounted for by the "leading" operations, suggesting a **marginal reduction in the weighted average concentration ratio** within industries.

III: The other 0.4% points of the decline is accounted for by the firms' non-leading operations. This indicates a fall in non-leading diversification, which is confirmed by a simple count of the non-zero cells in the matrix. This falls from 1011 to 947, which is due exclusively to the reduced number of non-leading entries[13]. Bearing in mind the slight increase in firm numbers, there has also been a **very small reduction in leading diversification** (from 1.65 to 1.63 industries per firm), but this is overshadowed by the **somewhat larger reduction in non-leading diversification** (from 3.47 to 3.22).

Table 5 - Changes in the matrix between 1993 and 1987
(b) Breakdowns by Countries of origin

Member state	Total Turnover (bn ECUs/%)			% outside home country		Turnover in home country (bn ECUs)		
	1993	**1987**	**growth**	**1993**	**1987**	**1993**	**1987**	**growth**
Germany	276.5	214.0	+29.2	13.9	11.5	238.1	189.4	+25.7
UK*	110.1	113.3	-2.8	29.2	20.9	78.0	89.6	-12.9
France*	161.4	136.5	+18.2	31.3	20.7	110.9	108.2	+2.5
Italy	87.0	72.1	+20.7	22.8	12.1	67.2	63.4	+6.0
Belgium/Lux	16.7	12.7	+31.5	37.7	24.4	10.4	9.6	+8.3
Holland*	45.6	39.7	+14.9	59.5	51.9	18.5	19.1	-3.2
Spain	5.1	4.1	+24.3	0.3	0	5.1	4.1	+24.3
Others	3.4	0.1	..	15.0	0	2.9	n.a.	n.a.
Non-EU	141.6	98.4	+43.9	100	100	n.a.	n.a.	n.a.
Total	846.4	684.2	+23.7	37.3	29.9	530.7	483.5	+9.8

*Note: * Two anglo/dutch firms (Unilever and Royal Dutch Shell) and one anglo/french firm (GEC-Alsthom) have been allocated 50:50 to UK, Holland and France.*

The major geographical changes are revealed in Table 5b:

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[13] The number of leading entries must be identical, given the same number of industries.

IV: Amongst the four large member states, **only Germany has increased its share**; the share of French and Italian firms declined slightly. The total turnover of UK firms failed to increase, even in nominal terms, and their share has declined significantly.

V: There has been a significant **overall increase in multinationality**: the share of total turnover produced outside home countries increased from 30% to 37%.

VI: The largest part of this increase is accounted for by **non-EU multinationals.** Their turnover increased by 44%, as opposed to 24% for the matrix as a whole. This is a clear manifestation of the surge in extra-EU inward investment during this period.

VII: **Intra-EU multinationality also increased substantially.** The trend towards greater cross-border production is apparent in the firms from all countries, although, interestingly, it is least pronounced amongst German firms.

VIII: Given that the growth in the firms' total turnover has been fairly moderate (24%), in spite of these large increases in their multinationality, this means that there must have been extremely sluggish growth in the scale of their domestic operations. This is confirmed by the last column in table 5(b): only the German firms achieved double figure growth in the nominal value of their domestic turnover. This suggests that **multinational expansion has been largely at the expense of their production**. Recalling the earlier finding - from the trade and production statistics - that intra-EU trade grew at the expense of production for domestic consumption, this reinforces the impression of loosening ties between leading firms and their countries of origin.

Armed with this broad-brush summary, the following sections explore each of these findings in more detail, with particular emphasis on disaggregation.

6.   Concentration

Contrary to expectations then, and in spite of the considerable merger activity over this period, it appears from the evidence of the previous section that concentration did not increase between 1987 and 1993. If anything, there has been a slight fall in both aggregate concentration, and "typical" market concentration within industries. However, this does not necessarily mean that "no change across the board", and we now delve deeper into the matrix to see how far this finding is robust to disaggregation.

6.1 Aggregate concentration

Thus far, we have interpreted the matrix firms' share of total manufacturing turnover as a measure of aggregate concentration. However, this could be misleading because the matrix is not confined to just the very largest firms in absolute terms - it also includes a number of smaller firms who are leaders in small industries. In principle then, a reduced aggregate matrix share might merely reflect a decline in the relative importance of this smaller tail, rather than a substantive change in the relative share of the very largest firms. A more accurate picture, comparing like with like, is provided by focusing exclusively on the aggregate share of the very largest matrix firms. The share of the top 100 firms is the obvious candidate, being the traditional, and most widely used, measure of aggregate concentration in the previous literature (see, for example, Prais, 1976).

In fact (Table 6), a comparison of the aggregate share of the matrix top 100 firms confirms that there has been a decline, albeit little more than marginal, from 29.3 to 28.6%, thereby confirming a slight fall in aggregate concentration[14]. However, the rest of the table reveals that this apparent stability conceals considerable **turbulence within** the top 100. Tracking the fortunes of the top 100, as of 1987, there was only a 78% chance that any top 100 firm would survive (in the top 100) just six years later. Some of the "exit" was due to (9) firms slipping out of the top 100, whilst still remaining on the matrix. To some extent, this source of turbulence *might* be explained merely by differential growth of different sectors within manufacturing. On the other hand, 4 exits were due to acquisition by other firms already in the top 100, and 9 other firms exited the matrix entirely, either because of slow internal growth, acquisition by some other firm, or bankruptcy. A breakdown of the 28 entrants also reveals that more is involved than just a jostling for position amongst a basically stable population: two firms were "created" as the result of divestment or joint venture, and 7 were genuinely new entrants on to the matrix (by virtue of acquisition and/or internal growth). Obviously, these results need to be put into a comparative perspective (i.e compared to other time periods and/or countries). At first glance however, this rate of turbulence, over such a relatively short time period, and amongst the very large European

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[14] The matrix may under-record the share of the "true" top 100, because it may exclude a few medium-large firms who do not qualify under the "leading firms" criterion. However, searches for "missing" firms reveal very few potential candidates - at the worst, the matrix may exclude a few firms just within the top 100 by aggregate size, but with no leading entries. In any event, this is unlikely to affect comparisons of changes

firms, is suggestive of considerable change. Whilst the wave of merger activity, FDI and divestment appears to have left the level of aggregate concentration unchanged on balance, the fates of individual firms within the top 100 have been quite diverse.

Table 6 - Change in Aggregate Concentration: the Matrix Top 100

	1993	1987	
Turnover (% of EU Total Manufacturing)	28.6	29.6	
Firm Numbers			
Survivors in top 100	**78***	**78**	
Exitors		**22**	
of which:			
acquired by another top 100 firm		4	Feldmuhle-Nobel, MBB, Hoesch, Jacobs Suchard
remaining on matrix, but no longer amongst top 100		9	Courtaulds, Tenneco, Reed Els., RHM, Pilkington, Coats Viyella, Alcan All., ACEC, CIR
exited from matrix		9	Seita, CIBA, EFIM, DSM, Grand Met, Avion M.Dassault, BTR, Klockner-Humboldt, Unigate
Entrants	**22**		
of which:			
divestment by a surviving top 100 firm	2		Zeneca, GEC-Alsthom
on 1987 matrix but not in top 100	13		
not previously on the matrix	7		

*Note * Including two firms remaining as separate identifiable entities within the matrix, but now with changed ownership: Salzgitter (Preussag) and Douwe Egberts (Sara Lee).*

between years.

6.2 Market concentration

This raises the obvious question of whether the same sort of turbulence might be at work within individual industries. Also, although we have seen that the "typical" value of C5 (the five firm concentration ratio) remained fairly stable, it is probably more interesting to examine what has happened in those particular industries in which the integration process was most pronounced during this period. In other words, disaggregation is called for - both within industries, and distinguishing between different types of industry.

Inter-industry differences in concentration change

In fact, immediately one examines the change in C5 across individual industries, it is clear that the fairly static weighted mean identified above conceals considerable inter-industry sample variance. The standard deviation of the change in C5 is high, 6.1%, relative to the mean; and in a third of the industries, C5 changed by at least 5 points. In these circumstances, over-reliance on "typical values" is hazardous. As if to underline this comment, a very different picture emerges if we compare the simple arithmetic mean: in contrast to the weighted mean, this actually increased by 1.2% points. Moreover, C5 increased in slightly more than half of all industries (49). The key to this superficially surprising difference between weighted and unweighted means is to be found, as we say, in the large variance across industries. In this case, it is quite possible for weighted and unweighted averages to change in opposite directions[15], and the bottom line conclusion we draw is that, to all intents and purposes, on average, concentration remained largely unchanged, but with considerable variation between the experiences of different industries.

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[15] It is easily shown algebraically that the difference between the changes in the weighted and unweighted means depends on two terms, the first of which is negative if more concentrated industries tend to become relatively smaller, and the second is also negative if larger industries tend to lose concentration more than smaller ones. In this case, both effects are at work, with the former being relatively stronger The two effects derive from negative correlations between the level of concentration and the change in weights and the change in concentration and the level of the weights (the weights are simply relative industry turnovers).

Table 7 - Concentration by industry type

(CR5 %, arithmetic means)

	1993	**1987**	**% change 93/87**
All Manufacturing (Full sample of 96 industries)			
Weighted (by turnover)	25.6	26.2	-0.6
Simple arithmetic mean	25.68	24.76	+0.92
Very sensitive to SEM	32.44	29.24	+3.20
By type of product			
Type 1	17.97	16.57	+1.40
Type 2	32.20	31.69	+0.51
of which			
Type 2A	25.13	22.95	+2.18
Type 2R	33.61	34.19	-0.58
Type 2AR	41.49	40.98	+0.51
By trade intensity (Reduced sample of 88 industries)			
High	34.13	35.54	-1.41
Medium-high	31.14	32.71	-1.57
Medium-low	25.02	22.04	+2.98
Low	21.05	19.89	+1.16

Table 7 explores those differences, using the sub-sample means for the three typologies. The most immediately striking result is that concentration tended to increase most rapidly amongst SEM-sensitive set - as might be expected if one believes that integration is a concentrating force. Second, there is little difference, on average, between

homogeneous (Type 1) and differentiated product (Type 2) industries, taken as a whole: both increased concentration slightly on average. This means that, as established in D&L, the *level* of C5 continues to be significantly higher in Type 2 industries - a result which is entirely consistent with most received theory on the determinants of concentration. On the other hand, there is some evidence of marked differences within the differentiated set. Concentration tended to rise where advertising is more important, but fall where R&D is the primary source of differentiation. This finding will be the subject of more detailed research in later work.

At this stage, however, the most intriguing results concern the differences between industries when grouped according to initial trade-intensity. In both of the high-intensity groups concentration fell back on average, but in the medium-low group it increased by almost 3% points on average. Coupled with our earlier finding, that it may be in this latter group that integration was advancing most rapidly, this is consistent (as is the SEM-sensitivity result) with the hypothesis that, especially where integration was beginning to bite, it is more likely that concentration has increased. This is pursued in a little more detail by the following regression (excluding the "non-tradeable" low group).

$$\{C593 - C587\} = 0.182 - 0.048 \ln (INTRA87) - 0.084\ C587 \qquad R^2 = 0.165$$
$$(0.061)\ (0.020) \qquad\qquad (0.047)$$

Thus, the change in concentration is significantly inversely related to intra-EU trade intensity at the start of the period and inversely related (although only significantly at the 8% level) to the initial level of concentration. The former confirms the implication of the sample means in the table, and the latter suggests that there was also a mild reversion to the mean tendency in C5. This is not uncommon in studies of concentration change, and the variable is included largely for control reasons[16]. Again, we should stress that this result is of largely descriptive interest, and is no substitute for a fuller multivariate analysis. Provisionally, however, it again consistent with the hypothesis that change in structure was more pronounced in those industries in which integration was initially least advanced

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[16] However, the significance of INTRA is robust to the exclusion of C5: excluding C5, INTRA rises in significance.

Underlying turbulence within industries

Table 8 explores whether the turbulence identified above, within the top 100, is replicated by a similar tendency within individual industries. Arguably, underlying turbulence of individual market shares provides a richer picture of the competitive process at work than merely observing the net change in an industry concentration ratio (Davies and Geroski, 1997). For example, as is well known in the stochastic literature, a random walk in market shares, with a high variance, is capable of generating an industry in which concentration is consistently high, but in which there is considerable turnover in the identities of the leading firms.

The table employs two alternative measures of turbulence. The first is the number of entrants (and therefore also exitors) into the top 5 in individual industries. Judged on this basis, it would appear that there has, indeed, been considerable turbulence. An entry rate of 1.72 implies a probability of only 2 in 3 that a firm which was amongst the 5 leaders in any particular industry in 1987 would continue to be so just six years later. Ideally, this statistic should be evaluated against typical values found in previous studies, for periods less obviously subject to potentially crucial structural change. Unfortunately, we know of only one such study - Davies and Geroski (1991) found a much higher probability of survival, for UK industry 1979-86 of 4 in 5. On this admittedly very limited comparison then, this statistic does appear to indicate considerable turbulence. This is confirmed by the second measure of turbulence, subject to the same qualification about lack of an obvious comparator. The rank correlation coefficient between the ranking of firms within industries between the two years (an inverse indicator of turbulence) is less than 0.5.

Turning briefly to the differences between industries according to the typologies, turbulence appears to have been lower on average in differentiated product (especially 2AR) industries and in SEM-sensitive industries. Judged by entry rates, we observe the same hump shaped relationship for trade intensity as was found for concentration change. Superficially at least, this suggests that not only were the medium trade-intensity industries more likely to have increased concentration, but also they tend to have exhibited more turbulence. On the other hand, this is not confirmed by the rank correlation coefficient.

Table 8 - Turbulence by industry type

	Group arithmetic means	
	No. of entrants into top 5	Rank correlation coefficient amongst leaders
Full sample of 96 industries		
All Manufacturing	1.72	0.491
Very sensitive to SEM	1.93	0.594
By type of product		
Type 1	1.89	0.424
Type 2	1.58	0.549
of which		
Type 2A	1.65	0.391
Type 2R	1.73	0.565
Type 2AR	1.00	0.797
By trade intensity (Reduced sample of 88 industries)		
High	1.40	0.596
Medium-high	1.61	0.569
Medium-low	1.97	0.486
Low	1.57	0.422

Notes:
1. "Entrants" refers to entry into the top 5, as opposed to entry into the industry.
2. The rank correlation coefficient is the Spearman index, with entrants attributed with a ranking of 6 in 1987, and exitors a ranking of 6 in 1993.

These simple comparisons are an insufficient basis for any definitive conclusions. However, they do suggest that further analysis of structural change at the industry level should not be confined to simplistic analysis of concentration alone.

7.   **Diversification**

This, and the following, section switch the focus away from the industry towards the individual firm-level data, in order to examine changes in the matrix firms' diversification and intra-EU multinationality.

From the basic summary statistics reported in section 5, it appears that the diversification of firms across industries has declined slightly on average, with most of the contraction in "non-leading" operations. However, as for mean concentration, these changes are not large. Again, this is surprising, not so much because there were strong expectations of an SEM effect, but because of the considerable evidence (much of it, admittedly, anecdotal) of a worldwide trend towards de-diversification, i.e. "return to the core", in recent years[17].

A persistent theme in the 'return to the core' literature is that de-diversification in the 1980s and 1990s was, in effect, a correction of over-diversification which took place in the 1960s and 1970s. To the extent that diversification outside the core industry had no strong industrial logic (and was located in smaller scale production in industries in which the firm's special attributes or assets were less relevant), then the greater competitive pressures from SEM might have reinforced the tendency to retreat. However, on the basis of the statistics reported in section 5, our provisional conclusion must be that any "return to the core" has been fairly marginal, although the evidence does confirm that what de-diversification there was has been more prevalent in non-leading activities.

Again, this is a subject on which we intend to undertake further research. Pending this, the present paper, confines attention to a preliminary disaggregation, designed to identify suggestive patterns in the inter-firm differences. To do this, diversification will be measured using an entropy index, defined, for firm I, as

$$D = - \Sigma \, p_j \ln p_j \qquad\qquad (1)$$

where the summation is across industries (j). Thus a firm which is specialised in a single

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[17] Most of the less anecdotal evidence relates to the USA, see Markides (1995) and Bhagat et al. (1990), for example. Two rare UK studies are Geroski and Gregg, and Haynes et al. (1998).

industry records: $D_i = 1*0=0$, while one spreading its output in equal amounts across k
industries records $D_i = -\Sigma 1/(k).\ln(1/k) = \ln k$. It follows that larger values of D indicate
higher levels of diversification. Moreover, the antilog of any firm's actual D value can be
interpreted as a *number equivalent*: equating the firm's actual distribution across industries
into a hypothetical distribution, in which the firm shared its output equally across k
industries. (All D values are reported hereafter in this paper in this number equivalent
form).

Table 9 - Diversification by firm size

	1993	**1987**	**change**
arithmetic mean values of D			
All Matrix Firms	2.80	2.87	-0.07
Top 50	4.94	4.70	+0.24
Top 100	3.96	4.34	-0.38
Firms outside top 100	2.21	2.10	+0.11
Distribution of D across firms			
Decile 9	5.38	5.69	-0.31
Quartile 3	3.62	3.83	-0.21
Median	2.01	2.03	-0.02
Quartile 1	1.14	1.00	+0.12
Decile 1	1.00	1.00	-

In 1993, the average firm was diversified to an extent equivalent to operating on
equal scales in 2.80 different industries. This is, of course, less than the actual number of
industries (4.85, see section 5) because the D index weights relatively smaller scaled
operations less strongly. Nevertheless, this does suggest that the typical matrix firm was

still substantially diversified in 1993. (Obviously, this does not distinguish, *per se*, between those operations which are, and are not, leading, but it does attach more weight to those operations which account for a larger proportion of the *firm's* activities). As can be seen from Table 9, this amounts to a marginal decrease on 1987, confirming the conclusion in section 5.

Diversification and firm size

The first part of the Table investigates whether there are noticeable differences between "large" and "smaller" firms by comparing mean values for the top 50, the top 100 and the remaining 200 (or so) matrix firms. Judged by the levels, it is clear that larger firms tend to be more diversification, in both years. However, the mean changes display a non-monotonicity: both the smaller matrix firms and the top 50 have increased diversification on average, whilst the top 100 as a whole post a quite sizeable reduction. Necessarily, therefore, the firms ranked 51 to 100 appear to have de-diversified substantially. Indeed, it may be this de-diversification which has caused some very large firms to drop down from a top 50 to a second 50 ranking.

The distribution of diversification across firms

The second part of the table compares the quartiles and extreme deciles of the distribution of D across firms (with firms now ranked by D rather than size). This brings into focus more clearly a discernible "regression to the mean": both the upper quartile and decile decline between the two years, whilst the lowest quartile increases; and the median is virtually unchanged. In other words, the most diversified firms in 1993 are somewhat less diversified than the most diversified firms in 1987, whilst there are fewer completely specialised firms in 1993 than in 1987. Again, this is consistent with return to the core but it also suggests, perhaps unexpectedly, that there have been marginal increases in diversification amongst those firms who were previously undiversified.

Diversification by country of origin

For 1987, D&L found evidence of systematic differences in diversification, depending on firms' country of origin. For 1993, the point estimates shown in Table 10 appear to confirm that such differences still exist, although casual inspection suggests that they may have narrowed - with the exception of Germany. Putting aside the very small

number of firms from the smaller member states and the non-EU multinationals[18], only the German firms have, on average increased their diversification. This raises the possibility that there has been a general convergence of corporate structures, albeit with the very significant exception of Germany. This is clearly a matter for further research.

Table 10 - Diversification by country of origin

Member state	1993			1987		
	number of firms		mean D	number of firms		mean D
	total	diversified		total	diversified	
Germany	64	54	3.81	69	47	3.36
UK	52	40	2.79	61	56	3.23
France	48	36	2.54	54	41	2.70
Italy	47	33	2.50	45	29	2.58
Belgium/Luxembourg	13	8	2.03	11	8	2.34
Holland	8	5	2.13	8	6	3.03
Spain	5	1	1.05	5	0	1.00
Other member states	4	2	1.27	2	0	1.00
Non-EU	53	46	2.67	36	30	2.47
Total	294	225	2.80	291	217	2.87

Diversification by firms' industry types

Finally, Table 11 briefly explores the influence of product market factors by grouping firms according to the nature of their primary industries. Again, results are suggestive rather than conclusive, with some indications of convergence. For example, whilst, in 1987,

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[18] Diversification for non-EU multinationals in the matrix is a problematic concept since it refers only to their diversification within the EU. We have no way of telling, without extensive further data collection,

firms originating from differentiated product industries tended to be more diversified than firms from homogenous product industries, by 1993, the differential had disappeared, and was even slightly reversed. Within the differentiated group, both Type 2R and 2AR firms were noticeably less diversified in 1993 than in 1987, whilst Type 2A diversification tended to remain largely unchanged on average. There is also some evidence of an SEM effect: firms from the SEM-sensitive industries display a net de-diversification - perhaps refocusing in order to exploit the new market opportunities. Similarly, the reductions in R&D intensive firms (Types 2R and 2AR) may reflect the fact that these industries tend to be more trade-intensive than 2A industries.

Table 11 - Diversification by industry type

arithmetic mean values of D

	1993	**1987**	**Change**
All Manufacturing	2.80	2.87	-0.07
Very sensitive to SEM	2.61	2.71	-0.10
By type of product			
Type 1	2.84	2.80	+0.04
Type 2	2.77	2.93	-0.16
of which:			
Type 2A	2.42	2.37	+0.05
Type 2R	3.29	3.50	-0.21
Type 2AR	2.40	2.78	-0.38
By trade intensity			
High	2.50	2.67	-0.17
Medium-high	3.40	3.92	-0.52
Medium-low	2.80	2.62	+0.18
Low	2.32	2.19	+0.13

whether or not this mirrors similar changes in their operations at home (or in the rest of the world).

When grouping firms according to the initial extent of intra-EU trade, there seem to have been weak tendencies to increased diversification in the less trade-integrated industries, but the reverse is true where integration was already well advanced. This may indicate that in such industries, second-round rationalisation had begun to appear.

Taken together, this evidence on diversification is far too preliminary for strong conclusions. There is, however, some suggestion of a broad tendency towards convergence - with respect to inter-industry, inter-country (subject to the large exception of German firms), and firm size differentials - and some indications that "return to the core" may have been more pronounced amongst firms most exposed to the effects of integration.

8.   Cross-border production/Intra-EU multinationality

One of the strongest findings in section 5 was the increasing scale of multinational activity between 1987 and 1993 - the manifestation in production terms of the explosion of FDI over this period.

Rather strangely, perhaps, this was not anticipated (at least explicitly) in most of the literature pre-1992. Nevertheless, partly with the benefit of hindsight, it is possible to enumerate a number of potential effects of the SEM on multinational operations. Working from first principles, any reduction in the marginal costs of exporting within the EU should have made within-EU multinational operations less necessary - given the extra fixed costs of the additional plants involved in multi-country production, one would expect at least some existing multinational activity to be superfluous post-integration. On the other hand, there are some reasons why integration might stimulate intra-EU FDI. First, where certain member states enjoy a comparative advantage and the SEM enables this to be more fully exploited, then there will be greater inward FDI inflows into those member states. Second, to the extent that integration leads to increased market size, convergence in income levels and factor endowments, then, as shown by Markusen and Venables (1995), this can promote FDI relative to trade (because the absence of strong comparative advantage or market size differences between two countries makes it more attractive for firms to produce in both economies). Third, to the extent that the SEM liberalised FDI in some member states, and perhaps some individual markets (e.g. those previously prone to 'public

procurement bias', D&L, chapter 12), this may have reduced the fixed and marginal costs of multinational operations. Fourth, firms may simply have become more aware of the wider European market place. In a loose form, one might argue that exhortations for companies to 'think European', might have revealed previously ignored opportunities for growth. More rigorously, strategic motives for FDI and multinationality may have emerged (see, for example, Smith, 1987, and Campa et al., 1998).

In the event, the evidence of section 5 strongly suggests that the positive influences prevailed on balance. We now turn to a slightly deeper examination of the data at the individual firm level, estimating, for each matrix firm, an entropy M index, defined in an exactly equivalent way to diversification, with member states replacing industries. Thus for a firm operating across up to 11 member states, its multinationality is:

$$M = - \Sigma \, w_k \ln w_k \qquad\qquad (2)$$

where the summation is across member states (k). (All M values are reported hereafter in this paper in the number equivalent form, i.e. antilogs of the above).

As can be seen from Table 12, on average in 1993, matrix firms had multinational activities equivalent to operating on equal scales in 2.26 different member states, representing a sizeable increase over the 1987 figure.

Table 12 - Multinationality by firm size

	1993	**1987**	**change**
Arithmetic mean values for M:			
All Matrix Firms	2.26	1.77	+0.49
Top 50	2.99	2.56	+0.43
Top 100	2.87	2.40	+0.47
Firms outside top 100	1.95	1.44	+0.51
Distribution of M across firms			
Decile 9	4.59	3.45	+1.12
Quartile 3	2.97	2.13	+0.83
Median	1.71	1.27	+0.44
Quartile 1	1.00	1.00	-
Decile 1	1.00	1.00	-

Multinationality and Firm Size

The Table reveals that this increase was broadly based, with very similar increases chalked up by firms within and outside the top 100. This leaves the strong positive relationship between size and multinationality, as detected by D&L for 1987, substantively unchanged.

On the other hand, when ranked by values of the M index, and unlike for diversification above, there is some suggestion that the spread has increased - whilst the lower quartile remains unchanged (no multinationality amongst the bottom 25%), values at the top end of the distribution have increased most rapidly.

Multinationality by country of origin

Table 13 also confirms the broad-based nature of the increase. By 1993, only 88 firms remained without any cross-border operations, compared to 117 in 1987, and mean values have increased for firms from all countries. As for diversification, Germany appears

to be something of an exception, recording relatively minor increases in typical M, and with a 1993 average which is now noticeably lower than those for UK, French, Dutch and Belgian firms. The high typical values/increases in M for firms from the non-EU countries are not comparable since, as should be stressed, again, that the database is confined only to firms' operations within the EU. It therefore completely ignores, for example, the home production of American firms in the USA. Nevertheless, the finding that these firms have increased tended to increase their multinationality within the EU is an important finding: it offers no support for the hypothesis that non-EU firms would react to the removal of internal barriers by concentrating their production in fewer, but larger, platforms within the EU.

Table 13 - Multinationality by country of origin

Member state	1993			1987		
	number of firms		mean M	number of firms		mean M
	total	multi-national		total	multi-national	
Germany	64	38	1.54	69	39	1.33
UK	52	41	2.30	61	41	1.82
France	48	34	2.31	54	32	1.63
Italy	47	25	1.61	45	16	1.26
Belgium/Luxembourg	13	8	2.22	11	5	1.53
Holland	8	6	3.70	8	6	2.63
Spain	5	1	1.14	5	0	1.00
Other member states	4	2	1.33	2	0	1.00
Non-EU	53	51	3.62	36	35	3.40
Total	294	206	2.26	291	174	1.77

Multinationality by firms' industry types

The broad-based nature of the increase is confirmed once again when firms are grouped according to the nature of their primary industries (Table 14). Mean values increase for all types, but two exceptional cases are worthy of note. First, there are signs that the rate of increase tended to be somewhat slower in the research intensive industries. This contrasts with the earlier finding (Table 2), that it was in these industries that the highest rate of increase is recorded for EU trade intensity. This is consistent with the hypothesis that, for this set of industries, increased exporting was a viable alternative for increased multinationality. Second, the fastest typical increase was recorded by the initially medium-low EU trade group, and the slowest rate occurred amongst the initially high EU trade group. In this case, this mirrors the ranking of Table 2, in which trade integration also

increased most rapidly amongst the former, and least rapidly amongst the latter. In other words, from the perspective of this typology, trade and multinationality appear to have been complementary. Quite clearly, this is an example of the limitation of simple bivariate analysis. However, it does suggest that a more developed investigation of the trade-multinationality nexus may prove to be fruitful.

Table 14 - Firm Multinationality by industry type

arithmetic mean values

	1993	**1987**	**Change**
All Manufacturing	2.26	1.77	0.49
Very sensitive to SEM	2.54	1.99	0.55
By type of product			
Type 1	1.90	1.36	+0.54
Type 2	2.53	2.09	+0.44
of which:			
Type 2A	2.25	1.66	+0.59
Type 2R	2.54	2.25	+0.29
Type 2AR	3.04	2.58	+0.46
By trade intensity			
High	2.21	2.03	+0.18
Medium-high	2.40	2.07	+0.33
Medium-low	2.52	1.76	+0.76
Low	2.00	1.45	+0.55

The non-EU Multinationals

Finally, we return briefly to the non-EU multinationals: the increased penetration of foreign multinationals is one of the most striking features to have emerged from the broad-brush statistics in section 5.

Table 15 - Non-EU MNEs by country of origin

	Sales (ECUs bn.)		Shares (%)		numbers		number in top 100	
	1993	**1987**	**1993**	**1987**	**1993**	**1987**	**1993**	**1987**
Sweden*	15.9	8.7	9.7	8.9	5	3	4	3
Switzerland	16.0	16.1	12.9	16.4	5	4	1	3
Japan	3.45	0.5	2.4	0.5	5	1	0	0
USA	100.1	67.7	70.7	68.9	33	24	13	11
Canada	4.9	4.4	3.45	4.4	3	3	0	1
rest of world	1.2	0.9	0.8	0.9	2	1	0	0
total	141.6	98.4	100	100	53	36	18	18

*Note * For the purpose of this table, ABB has been designated a Swedish firm. Its matrix turnovers are 7303 mn ecus in 1993 and 3640 mn ecus in 1987.*

A breakdown by country of origin reveals that US firms still account for about 70% of the sales produced by all foreign MNEs in the EU matrix; and the majority of the remainder is accounted for by Swiss and Swedish (still non-EU as at 1993) firms. The much vaunted expansion in Japanese activity is confirmed by a rapid increase, but starting from an insignificant base in 1987. Evidently, by 1993, inward Japanese FDI had failed to establish many leading positions in EU markets, so far as production is concerned.

The last columns of the table are based on headcounts (rather than sales) of the number of non-EU MNEs on the matrix and in the matrix top 100. These reveal the rapid penetration even more strikingly. In 1987, they accounted for 12% of all matrix firms, but this had risen to 18% by 1993. On the other hand, this entry failed to increase the number of foreign owned firms in the EU's top 100, which remained constant at 18.

9.   Geographical Concentration

Prior to 1992, there was some discussion of whether further integration would lead to geographical agglomerations of activity in certain industries. As mentioned earlier, the EC's ex-post evaluation failed to identify such forces to be systematically at work. However, much of this debate, and the evidence so far, has concentrated on trade flows.

One potentially useful feature of the market share matrix is that it can provide a detailed mapping, for each industry, of the bilateral links between member states with respect to multinational production. Although this is, admittedly, confined mainly to the operations of the leading firms, this adds importantly to the information provided in the much more aggregated FDI datasets already in the public domain.

As an illustration of the potential of this feature of the database, Tables 16 and 17 report three additional indexes, each constructed at the industry level, by aggregating across the leading firms in the industry concerned. For industry j,

M_j : the degree of multinationality

P_j : the concentration of production across member states

O_j : the concentration of ownership across member states.

Thus M_j is the weighted average of the 5 leading firms' multinationality Entropy indexes *in that industry* (not to be confused with the M indices discussed in the previous section, which take the individual firm as the unit of observation, and record the multinationality of the firm's aggregate multinationality)[19]. This has a lower limit of 1 if none of the leaders is multinational in that industry, and an hypothetical upper limit of 11, if they spread their operations equally across all member states. P_j is constructed by calculating the firms' combined production in each member state, and then calculating the Entropy of those aggregates across the member states. This would take the value of 1 if all 5 firms produced all their output in a single member state, whilst the theoretical upper limit is 11, if, in aggregate, their output is spread evenly across all member states. O_j is constructed by first aggregating the turnovers of firms originating from the same country (regardless of where the turnover is produced), and then calculating the Entropy of those aggregates across the member states. This has a lower limit of 1 if all 5 firms originate from the same country, and an upper limit of 5, when the top firms are all of equal size and each originates from a different member state.

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[19] Only in the special case of a firm which operates in a single industry, will its *overall* multinationality coincide with its multinationality in a particular industry. The most obvious (if relatively rare) example would be a firm which operates exclusively in industry I in country A, and exclusively in industry II in country B. Although multinational overall, such a firm would not be multinational in either I or II.

Table 16 - Multinationality of industries by type

arithmetic mean values

	1993	**1987**	**change 1993/87**
All Manufacturing	2.06	1.67	+0.39
Very sensitive to SEM	2.35	1.99	+0.36
By type of product			
Type 1	1.74	1.32	+0.42
Type 2	2.33	1.96	+0.39
of which:			
Type 2A	2.34	1.85	+0.49
Type 2R	2.16	1.81	+0.35
Type 2AR	2.81	2.59	+0.22
By trade intensity			
High	1.82	1.62	+0.20
Medium-high	2.17	1.86	+0.31
Medium-low	2.43	1.86	+0.57
Low	1.76	1.34	+0.42

See text for definition of the industry M_j index.

We first consider the results for each index separately, and then explore the additional insights yielded by their inter-relationships. The results for the M index (Table 16) largely reiterate the pattern revealed by the analysis of the firm-level M index in Table 14: increased multinationality is the norm, and it occurs in all types of industry. (Although this is not to deny that the *levels* of M differ, sometimes substantially, across industry types in a way which is consistent with conventional theory). As before, there are signs that the increase tends to be greatest in the initially medium-low trade group, and slowest in the initially high trade group. Generally, the levels/rates of increase are lower in Table 16, reflecting the more restrictive concept of multinationality explored here.

Table 17 - Agglomeration of production and ownership

	Production (P_j)			Ownership (O_j)		
	1993	1987	change	1993	1987	change
All Manufacturing	4.09	3.69	+0.40	2.97	2.95	+0.02
Very sensitive to SEM	4.19	4.17	+0.02	2.87	3.11	-0.24
By type of product						
Type 1	3.92	3.44	+0.48	3.12	3.03	+0.09
Type 2	4.23	3.90	+0.33	2.84	2.88	-0.04
of which:						
Type 2A	4.71	4.13	+0.58	2.94	2.98	-0.04
Type 2R	3.94	3.60	+0.34	2.77	2.75	+0.02
Type 2AR	4.18	4.33	-0.15	2.85	3.04	-0.19
By trade intensity						
High	3.43	3.38	+0.05	2.98	2.92	+0.06
Medium-high	4.13	3.84	+0.29	2.99	2.95	+0.04
Medium-low	4.60	4.04	+0.56	2.97	3.03	-0.06
Low	3.92	3.46	+0.46	3.05	2.99	+0.06

See text for definition of the industry P_j and O_j indices.

The O index, on the other hand, remains remarkably stable across industry types. The overall average reveals that the 5 leaders in the typical industry originate from roughly 3 different countries, and that this does not change between the two years. This suggests that the extent of comparative advantage, (in the special sense that it is embodied in the nationality of firms, as opposed to location of production) has not changed over this period. There are, however, two interesting exceptions: the SEM-sensitive and Type 2AR (competition through both advertising and R&D) industries, in both of which there has been a discernible reduction in O - at least, as judged by these point estimates. This indicates an increased tendency for firms from the same country to dominate in these types of industry.

The P index, on the other hand, reveals a similar pattern to M - across the board increases, and noticeable differences in the levels. An example of the latter is the greater typical geographical concentration of production in Type 2R than Type 2A industries - reflecting the typically larger intra-EU trade flows (and German comparative advantage) in R&D intensive industries. For present purposes, however, we focus more on the changes between the years. In general, P increases, indicating that the leading firms are tending to spread their activities across more geographical locations, i.e. the opposite of geographic specialisation. There are, however, intriguing differences between industry types. Thus, there is no tendency towards greater dispersion in SEM-sensitive industries, and even increased specialisation amongst Type 2AR industries. When distinguishing by initial trade-integration, it appears that dispersion of production has increased most rapidly amongst industries initially less integrated, but which (as found earlier) were more inclined to increase trade integration more rapidly over this period. If this last result is confirmed by further, more rigorous analysis, it would constitute important evidence, reputing the hypothesis that integration has led to geographical concentration in pursuit of comparative advantage.

Further insight on this, and other, issues can be provided by contemplating the *relationship between* the three indices. As an illustration, consider two extreme scenarios, each starting with the same O and M values. Suppose that the leading firms in a given industry are equal sized and each from a different country; moreover, each is equally multinational, spreading its operations equally between its home country and one other. Thus O =5 and M=2. Under **scenario 1**, the multinational operations all involve production in "outside" countries (i.e. in countries other than those from which the leaders originate). In that case, production is spread equally across 10 member states, and P= 10. Alternatively, under **scenario 2**, all multinational activity is confined within the same 5 member states. For example, suppose the leaders originate from member states A-E, and that the leader from A produces in B, the firm from B produces in C, and so on, but that none of the firms produces in member states F-K. In that case, P=5. Thus, under scenario 1, all flows are unidirectional and P=O*M, but in scenario 2, they are all bilateral, and P=O. To borrow the terminology of international trade, it depends on whether multinational production is **intra-industry** or **inter-industry**.

Now consider the actual numerical values reported in Tables 16 and 17. The "typical"

values for 1987 are: O=3, M=5/3 and P=11/3, i.e. O*M > P > O. This tends to suggest that some multinationality exists involving member states other than those from which the leaders originate (P>O), but there is also some intra-industry multinationality in the above sense (O*M>P). Turning to the changes in the three indices, O increases marginally by 0.02, whilst M increases by 0.39 and P by 0.40. At face value, this suggests that nearly all of the increase in multinationality between 1987 and 1993 involved "third party" countries, i.e. mainly increases in inter-industry multinationality.

Casual inspection of the relationship between the three indexes for the different types of industry suggests that a similar analysis, at a disaggregated level, might be fruitful. This is one of our priorities for future research.

10. Summary and agenda for future research

This paper has had two purposes. First, on a factual level, it provides some new evidence on the changes which have occurred in EU manufacturing over a period which straddles the introduction of the SEM. In contrast to most other current evaluations of the impact of SEM, which have drawn largely on published data on trade, FDI and M&A, it highlights the changes which have occurred in the structures of individual firms and industries. Second, it has helped establish an agenda of priorities for our own future, more detailed, research.

The main "headline" findings, on changes between 1987 and 1993 are as follows:

- **Concentration** has remained stable, on average. At the aggregate level, the largest 100 firms continue to account for nearly 30% of total manufacturing production - if anything, there has been a marginal fall in this share. Similarly, concentration within individual manufacturing industries has changed by very little: the share of the top 5 firms in the "typical" market remains steady, at about 25%.

- **Multinational activity** within the EU has increased rapidly. Amongst Europe's "leading" firms (as defined here), the share of total turnover produced outside their home countries has increased from 30% to 37%. This is due in part to increased intra-EU multinationality of firms originating from within the member states, and in part to the rapid increase of inward FDI by non-EU firms. In the case of the former,

this expansion appears to have been, to a large extent, at the expense of production in their home countries. In the case of the latter, there appears to have been no concentration (or "rationalisation") of their activities within fewer locations - if anything, the contrary is true.

- **Diversification** by firms across different product markets has declined only slightly on average. Thus, there is only weak evidence of "return to core business".

- There appears to have been no general increase in **geographical concentration**. In terms of the nationality of the EU's leading firms, German firms have increased their share, whilst firms from France, Italy and (particularly) the UK have a reduced presence. In terms of the location of production, the leading firms appear to have dispersed their operations across more, rather than fewer, member states.

Superficially, these "headlines" are perhaps surprising. After all, most expectations were that concentration, both producer and geographical, would rise with increasing integration; and diversification is supposed to have been reversed during this period (although that is reputedly a worldwide, rather than European-specific, trend). In fact, none of these trends is discernible from the **aggregate** estimates in our paper. Indeed, the most pronounced increases are to be found in intra-EU multinationality - if anything, the element of structure which was largely ignored in the ex-ante literature.

However, as is often the case, the aggregate summary statistics conceal a rich diversity which becomes immediately apparent, once the data are exposed to more disaggregated attention (as in sections 6-9). Underlying each of the headlines, we detect turbulence and considerable differences between industries and firms, and it is these which lead to the second objective of this paper - namely, to set an agenda for the next stage of our research, in which descriptive statistics and broad typologies are replaced with more formal analysis. Briefly, the main items on the agenda are as follows.

Although **concentration** has remained stable on average, this hides considerable **turbulence** of market shares. This is apparent in both the make-up of the aggregate top 100 firms - only 78 of the top 100 in 1987 remained in the top 100 by 1993 - and in the identities of the leading firms in individual markets - only about two-thirds of the 1987 top

5 firms remained in the top 5 by 1993. There are also considerable **inter-industry differences**, some of which suggest that concentration has indeed increased in those industries most exposed to the forces of integration (when judged by the EC's ex-ante evaluation of SEM-sensitivity and our own typologies of trade integration and nature of product). Similar inter-industry differences are also apparent in turbulence.

On **diversification,** although there has been only a minor decline in aggregate, this actually reflects the balance of opposing developments - noticeably increased diversification by many German firms, on the one hand, but de-diversification (and some signs of convergence) by firms from the other member states, on the other hand. There are also signs of (i) "regression to the mean", with increased diversification by previously undiversified firms, but de-diversification amongst the most initially diversified firms; and (ii) de-diversification by firms in those industries most exposed to the single market (notably in R&D intensive industries).

The widespread increase in **intra-EU multinationality** certainly deserves further attention. Again, the German firms are the exception, but this time tending to lag behind those from the other member states in the rate at which they have expanded cross-border production. This raises, again, the question of a possible substitutability between multinationality and diversification (Davies, Rondi and Sembenelli, 1997). A similar question arises concerning the relation between multinationality and trade. Some of our descriptive statistics point to an element of substitutability (in the R&D intensive industries), whilst others reveal rapid increases in multinationality in the group of industries in which intra-EU trade has also tended to increase most rapidly. It may be that the *mode of integration* differs systematically between industries.

This also spills over on to the issue of **geographical concentration, or agglomeration**. Most empirical work to date on this subject has focused on trade flows. However, the nature of our database allows us to track the bilateral directions of multinational activity. Are FDI flows (as reflected here by multinational production) driven by cost differentials and comparative advantage? Or are they reciprocal (intra-industry) and a manifestation of an EU wide strategic game between large oligopolists, in which the national identity of the firms and the markets is of secondary interest?

Necessarily, we have only touched on these and other questions in the current paper.

Table A.1 - Coverage of Matrix by Sector

NACE	Population		Matrix Firms	
	Sales[1]	No. of inds[2]	Sales	Coverage(%)
22 Metal Manufacturing	107.2	4	51.4	47.8
24 Mineral Products	86.3	6	26.2	30.3
25 Chemicals	281.2	6	121.3	43.1
26 Man-made Fibres	7.3	1	7.3	100.0
31 Metal Goods	169.1	6	20.6	12.2
32 Mechanical Engineering	208.2	8	60.6	29.1
33 Office mach/computers	42.0	1	28.0	66.7
34 Electrical Engineering	275.6	7	110.2	42.8
35 Motor Vehicles & Parts	250.9	2	159.2	63.4
36 Other Vehicles	69.6	4	43.3	62.2
37 Instrument Engineering	24.8	4	11.7	47.1
41/2 Food, Drink & Tobacco	460.5	18	129.5	28.1
43 Textiles	74.8	8	10.3	13.7
44 Leather	9.0	2	1.3	14.9
45 Clothing & Footwear	64.0	3	7.0	11.0
46 Timber & Furniture	71.7	6	5.6	7.8
47 Paper, Printing & Publishing	162.1	3	26.7	16.5
48 Rubber & Plastics	105.9	2	21.1	19.9
49 Other Manufacturing	19.0	5	4.9	25.7
Total	**2470.9**	**96**	**846.4**	**34.25**

Notes:
1. Sectoral sales are measured in ECUs bn. (EUROSTAT)
2. The following industries are excluded from the matrix: Nace 21 (extraction of metal ores), 23 (extraction of minerals), 348 (assembly and installation of electrical equipment), 365 (miscellaneous vehicles), 435 (jute) and the industries listed in the following note.
3. The 1987 matrix differs from the form in which it was reported in D&L by excluding NACE 244 (asbestos), 245 (stone products), 456 (furs), 465 (other woods).

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