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## 12      Dispersion and Heterogeneity of Firm Performances in Nine French Service Industries, 1984–1987

Elizabeth Kremp and Jacques Mairesse

The present paper has three distinct but intertwined motivations, pursuing jointly three purposes, each corresponding to one of the subsequent sections.

Since the early 1980s, the French National Institute of Statistics and Economic Studies (INSEE) has been conducting an annual survey of market services, which is thought to be a very good, and in some respects rather unique, source of general information on this sector. Our first goal is to give a brief description of this survey (in section 12.1 of the paper). This survey not only is useful to ensure a knowledge of the relevant macrofacts but also provides a wealth of microeconomic information on the structure of these industries. In recent years, an increasing number of studies have taken advantage of information at the microlevel to investigate the behavior and performance of firms. Most of these studies have, however, concentrated on manufacturing industries, because the more easily accessible data bases cover primarily large publicly traded corporate companies, which are numerous in these industries. In view of the growing importance of service industries, it is clearly desirable to initiate similar studies also for them.

The outlooks of economists working at the micro- and the macrolevels, and the ways they treat the data are quite different. Our interest, in section 12.2 of the paper, is to illustrate some of the basic problems involved and to provide

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some indications of how they can be dealt with. We do this illustration in analyzing the productivity and profitability performances of firms in selected service industries, for the four recent years, 1984–87, for which the French survey was available to us.

More precisely, we have concentrated on large firms with 20 or more salaried employees, because they are exhaustively surveyed and have to answer a more detailed questionnaire. We have also selected nine service industries that we thought typical in various ways. These are industries at the four-digit level of the French classification of industrial activities, *Nomenclature d'activités et de produits* (NAP), with at least 200 or 300 large firms. They all belong to the private competitive sector and fall in the category of personal services, where direct provider-customer interrelations are essential. Two of them are traditional consumer services, which have recently undergone important changes: restaurants and hotels. The seven others are producer services with different characteristics: engineering services, computer programming, computer processing, legal services, accounting services, personnel supply and building cleaning services.<sup>1</sup>

We focus on four measures of performances or outcome variables. We take sales per person and (preferably) value added per person, as measures of labor productivity, and value added to sales ratio and (preferably) operating income to sales ratio (price cost margin), as measures of profitability margins.<sup>2</sup> We consider these variables, both in levels (in the beginning and ending years, 1984 and 1987) and in rates of growth or changes (over the three-year period 1984–87).<sup>3</sup>

For the approximately 7000 large firms that were surveyed from 1984 to

1. Among the producer services, one might also distinguish between engineering services, computer programming, legal services, and accounting services, which are in the nature of counseling, and computer processing, personnel supply and building cleaning, which are more in the nature of doing. One should also note that personnel supply is not readily comparable to the other services in the sense that temporary workers could be considered as an intermediate input and not as labor (because they are actually recorded in the survey together with permanent employees).

2. The measure of these variables is straightforward enough on the basis of the information provided in the survey, and only three points need to be noted: The number of persons includes both salaried employees and nonsalaried persons. Value-added and operating income have been corrected to include expenditures on rented capital buildings and equipment. For a number of firms, the fiscal year, for which we have their accounts, is different from the calendar year; we found, however, that this timing problem did not matter much, and we have not done any corrections for it in the present work.

3. Rates of growth are computed for sales and value added per person, as the three-year differences in logarithms; the absolute changes are considered for the value added and operating income to sales ratios. Because we had no information on the prices of services at the firm level, in order to compute our measures of the rates of growth of productivity, we have deflated sales and value added by the corresponding aggregate price indexes, which are available at the four-digit level of the industrial activity classification. These industry price indexes are themselves rather rough; the deflated figures should be, however, more akin to real productivity indicators and more comparable across industries. Although we report in this paper sales and value added per person in nominal francs per person (usually for 1987), the corresponding rates of growth are thus given in terms of volume, i.e., constant francs of 1984. There are no such problems of deflation for the profitability margins that are expressed naturally in percentages (of total sales).

1987 in our nine selected industries, we have been able to construct a balanced and cleaned panel sample of 2289 firms. The first problem that we touch on is just that of constructing a sample and assessing some of the differences that arise in going from the analysis of the population to that of a sample. This problem raises in fact the difficult and more fundamental issue of the renewal of the population through the entry and exit of firms on the one hand and that of firms that should be viewed as outliers (or else that report incomplete or erroneous information) on the other hand.

The second typical problem that we also illustrate is that of defining an average level and growth rate, for example, productivity, for an industry and of comparing the numbers that macro- and microeconomists usually compute. In fact, the microeconomist is concerned not only with the average characteristics of the variables of interest but also with many other aspects of their full distributions. The differences between the various averages are only the reflection, more or less transparent (and easily interpreted), of the magnitude (and changes in magnitude) of the dispersions and correlations of these distributions.

One of the most striking phenomenon when analyzing microdata is precisely the extreme variability that they reveal. Part of such variability may be accounted for by heterogeneity factors, such as differences in specific activities, historical and environmental conditions, but a large part must also correspond to intrinsic or true dispersion.<sup>4</sup> In section 12.3 of the paper, we document the extent of the variability in the productivity and profitability variables in our sample of service firms and contrast it with the differences in the average levels of these variables across industries. We do so both cross-sectionally (in 1987) and in the time dimension (over 1984–87), in an attempt to exhibit a few of the heterogeneity categories that are usually thought to be relevant and that we could distinguish.

### 12.1 The French Firm Annual Survey on Services

The survey on services is part of the general French system of annual firm surveys (*enquêtes annuelles d'entreprises*). It is the last to have been launched in the early 1980s, and it is directly managed by INSEE. Over the years, its scope has been extended, and it presently covers all market services, except health, social care, education, and research activities. Sixty-two industries at the four-digit level of the French NAP are now surveyed, involving some 600,000 service firms, and about 2,500,000 persons (2,000,000 salaried and 500,000 nonsalaried) in 1987.<sup>5</sup> Table 12A.1 in the appendix provides some illustrative statistics at the two-digit industry level for all firms and for firms with 20 or more salaried employees in 1987.

4. Part of the variability, of course, is bound to arise also from the numerous observational and measurement errors.

5. This is a major survey with a permanent staff of over 80 employees.

The survey is a survey of firms or enterprises, in the sense of juridically independent profit-making entities. Liberal professions, such as lawyers and accountants, are included, but nonprofit organizations are not. The service firms surveyed are classified according to their main activities and can have one or more different establishments.<sup>6</sup>

The survey is conducted by sending a detailed mail questionnaire to all firms with 20 or more salaried employees and a simpler one to a representative sample of smaller firms. The sample for the latter is stratified by size categories and activities (the sampling rate varying between 1 and 1/100) and is renewed by half each year. The rate and quality of the answers are deemed quite satisfactory, especially considering that a very large number of very small firms (with zero, one, or two salaried employees) are surveyed.<sup>7</sup>

Basically, the survey provides detailed information on the current income accounts of the firms, as well as complementary information on their labor force and capital assets. Table 12.1 summarizes the structure and contents of the questionnaire for the larger firms (with 20 or more salaried employees).

The larger firms have to report their statement of income and expense for the last accounting period (fiscal year) with a breakdown of some 30 operations (sales of merchandise, purchased goods, and produced services; purchases of goods and raw materials; changes in inventories; taxes; wages and social security costs; interest incomes and expenses; profits and losses). All firms are asked to give a detailed breakdown both of their total turnover (*chiffre d'affaires*) by services (400 different services or commodities for 62 activities) and of their purchases (about 30 categories, including goods purchased for resale and various intersectoral exchanges).<sup>8</sup>

For labor the following items are given: the total number of salaried em-

6. The survey is *une enquête de secteur*, covering all the activities (main and secondary ones) of the firm, and is different (in accordance to the distinction of the French national accounts between sectors and branches) to what would be *une enquête de branche*, corresponding to units of production having the same activities. Branch surveys exist in manufacturing industries and other industries but not in services. The operational definition of the main activity (or primary industry) of a firm is explained in M. Tajan (1986). The problem is less difficult than in other sectors, because the majority of service firms are small, and most of them tend to be quite specialized.

7. About 70,000 questionnaires (of which 11,000 for the firms with 20 and more salaried employees) were sent for the 1987 survey in March 1988. The rate of nonresponse has been about 20 percent, nearly half of which corresponds to firms that have ceased their activities in 1987. Among the questionnaires returned, another 7 percent were also for firms interrupting their activities, and some additional 14 percent were not usable for various reasons. In terms of number of firms the rate of missing, incomplete, or erroneous data is thus about 20 percent, but is only about 6 percent in terms of number of employees or value added. Starting in 1989 for the year 1988, the sample has been expanded to 90,000 questionnaires, in order to obtain more reliable detailed results at infraregional levels. For more information, see the publications presenting the survey results for the various years.

8. The parts of the questionnaire that ask for the detailed breakdown of sales and purchases are specific to the different service sectors. Such detailed information is useful in particular to determine the main activity of firms; it is also important for the construction of branches accounts in the national accounts.

**Table 12.1 Detailed Questionnaire for Large Firms (with 20 or more salaried employees on December 31 of the year of the survey)**

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Firm characteristics:

- Identification number (SIREN)
- Address
- Legal form of organization
- Tax system

Conditions of activity:

- End and length of fiscal year
- Description of the activity (creation, merger, modification of ownership, disappearance . . .)

Employment and wages:

- Number of salaried workers: supervisory, nonsupervisory, part-timers, and family workers
- Quarterly distribution of salaried workers and number of hours worked
- Nonsalaried workers
- Earnings and fringe benefits

Breakdown of sales (turnover) varying according to the different industries

Profit and loss account:

Expenditures	Income
Purchases of goods	Sales of produced goods
Purchase of raw materials	Sales of produced services
Changes in inventories	Financial yields
Taxes	
Wages and salaries	
Taxes on profits	

Capital and investments

- Total capital outlays at the beginning of the year
- Investment and retirement during the year
- Total capital outlays at the end of year
- Breakdown of investments between investments acquired and investments brought through a modification of ownership and according to seven categories: land, new buildings and structures, existing buildings and structures, new transportation equipment, secondhand transportation equipment, new machinery and other equipment, and secondhand machinery and other equipment.

Breakdown of expenditures, varying according to the different industries

- Goods purchased for resale
- Interindustry exchanges
- Rented capital (equipment and properties)
- Subcontracting

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ployees at the end of the year, with a distinction between professionals (i.e., managerial, executive, and supervisory personnel), other full-time employees, part-time employees and apprentices; the total number of nonsalaried persons with a distinction between owners and associates (or independent workers), full-time family workers and part-time ones. The total number of hours worked by salaried employees during the calendar year is also asked, together with the corresponding wage bill.

For capital, larger firms report the gross book value of their fixed assets that is registered in their balance sheets at the beginning and end of their fiscal year, and they have to provide a decomposition of the change in gross book

value that occurred over the fiscal year, in terms of acquisitions, cessions, discounts, revaluations, and other adjustments. For all firms, investment expenditures (measured on the basis of acquisitions) are detailed in seven categories: land; new and existing buildings and structures; new and secondhand transportation equipment; new and secondhand machinery and other equipment.

## 12.2 Average Productivity and Profitability Performances: From the Survey to Sample and from Macro- to Microaverages

Economists working at the microlevel and those working at the macrolevel have divergent perspectives. Even when they investigate the same issues, adopt the same models, and rely on the same basic econometric techniques, because the data they use are so different, the ways they look at them in practice are also very different. This difference is already apparent with the problem of defining the scope of study: the macroeconomist considers the population as a whole (e.g., a complete industry); the microeconomist usually deals with a sample (e.g., of firms in a given industry). This difference is also clear in the supposedly simple question of measuring an average level or growth rate of an economic variable such as productivity (for a given agreed-on definition).

In general, the possibilities offered by microdata (typically cross-sectional or panel data coming from surveys) are much larger than for macrodata (typically aggregate time series provided by national accounts), but the difficulties in dealing with them tend also to be greater. Although the number of observations is incomparably higher, it is also the case that interesting variables are often either more crudely measured (or less manufactured) and much more affected by errors or else are simply not available.

In this section, we intend to look primarily at the average performances of our nine service industries, but at the same time we shall illustrate the different choices that arise from macroeconomic and microeconomic points of view in constructing the sample and computing averages. We first compare the two indicators of value added per person and operating income to sales margin for the survey of *all firms*, for the group of all *large firms* of 20 salaried employees and more, for the group of what we call *large continuing firms*, and finally for the panel data *sample*, which we deem satisfactory for further econometric investigation. We then proceed on comparing the two kinds of averages usually considered in macro- and microanalyses—respectively, weighted (arithmetic) means and unweighted (eventually geometric) ones.

The main numbers for comparisons across samples and between averages are given in tables 12.2 and 12.4; additional information and insight can be gained from tables 12A.2–12A.5. A number of explanations and observations could be made on these tables; we will only comment on the few points we want to stress.

Table 12.2 gives the total number of persons by industry in 1987 for our various samples and helps to define more precisely what they are (table 12A.2 gives the corresponding number of firms). The figures given for all firms are the official numbers from the French survey (see references to the INSEE publications). They correspond to the complete population of firms in the nine service industries. There is in total some 165,000 firms, with a labor force of about 1,200,000 persons in 1987 (salaried and nonsalaried employees) and an average size of seven persons per firm. Most of the firms are small. Only about 5,300 of them (3 percent) have 20 salaried employees or more, for a total, however, of as much as 47 percent of the workers (570,000 persons). These firms, which we call large firms, are the ones for which we have had individual information (in anonymous form); they are surveyed exhaustively and have answered a detailed questionnaire.<sup>9</sup> The proportion of large firms varies widely across our nine industries; in terms of number of persons it varies from a low 15 percent to 25 percent in restaurants, hotels, and legal services to a high 80 percent to 90 percent in personnel supply and building cleaning services.

What we call continuing firms are the large firms that have kept answering the detailed questionnaire during the four years, 1984–87. The proportion of continuing firms among the large firms does not vary much across the industries; it is about 80 percent on average in terms of number of persons (and 55 percent in terms of number of firms). The firms accounting for the difference between the two samples in 1984, which we call leaving, have stopped reporting in 1985, 1986, or 1987, because they ceased their activities, went bankrupt, or were taken over, or because they shrunk in size, below the limit of 20 salaried employees. Conversely, the firms accounting for the difference between the two samples in 1987, which we call entering, began answering the detailed questionnaire in 1985, 1986, or 1987, because they went in business with already 20 or more salaried employees from the start, or because they increased their size over this limit.<sup>10</sup> Although in principle it should be pos-

9. The figures we give for the large firms (of 20 or more salaried employees) are those we have computed on the basis of the data to which we have had access. They differ to some extent from the corresponding figures that have been published. These are corrected in various ways to reintroduce firms that are still existing but that for some reasons have been allowed to not report or to send back incomplete questionnaires. For example, the published numbers are about 6.5 percent higher than ours in 1987 for the total number of persons and total value added (value added per person being thus equal to the first decimal).

10. Various miscellaneous reasons, such as failing to report, or being allowed not to report, can also explain why firms have been leaving or entering during the study period. However, one would think, considering the quality of survey, that these reasons affect only a few firms. In this respect, we have eliminated altogether from the large-firms sample a number of intermittent firms leaving and then reentering (these firms amount to about 3 percent of the total number of persons in 1984 or 1987). Similarly, we have not considered the firms that are present only in the intermediate years, 1985 and 1986. We have also discarded the few firms answering the detailed questionnaire, even though they had fewer than 20 salaried employees in 1984. We thought preferable, however, to keep the few firms that had 20 or more salaried employees in 1984 and that reported fewer than 20 salaried employees in the following years but that continued answering the detailed questionnaire sent to them.



**Table 12.2** Total Number of Persons in the Survey and Sample in 1987

Service Industry (4-digit NAP)	No. of Persons (in thousands)				Corresponding Proportions (%)		
	All Firms	Large Firms	Continuing Firms	Sample	Large/ All	Continuing/ Large	Sample/ Continuing
Restaurants (6701)	258.1	40.6	28.4	19.1	15.7	70.0	67.2
Hotels (670R)	161.0	38.9	26.9	23.3	24.1	69.1	86.6
Engineering (7701)	108.5	59.3	45.7	32.7	54.7	77.1	71.6
Computer programming (7703)	98.5	44.7	25.9	19.2	45.4	57.9	73.7
Computer processing (7704)	41.4	25.6	21.1	13.9	61.8	82.4	65.9
Legal services (7708)	106.9	16.5	12.6	8.4	15.5	75.9	66.7
Accounting (7709)	95.3	35.2	26.4	19.5	36.9	75.0	73.9
Personnel supply (7713)	171.2	159.1	142.8	123.6	92.9	89.8	86.6
Building cleaning (8708)	180.6	149.3	114.8	97.2	82.7	72.2	84.7
Total	1221.7	569.4	444.5	356.6	46.6	78.1	80.2

sible from the questionnaire (or from another source to which we had access), to distinguish between the two main reasons why firms have been leaving or entering, the information was missing, and we could not do it.

Microdata sets are not in general immediately fit for econometric analyses; first, they have to be thoroughly cleaned from observations that can be seen as erroneous or that clearly appear as outliers. If this is not done, such observations, even if few, can influence the estimates (and statistical tests) to a very large extent (and wrongly so, significant correlations possibly arising from them only, or being masked by them). Thus in order to get a satisfactorily balanced panel sample, we had to clean the continuing-firms (balanced) data set. We did so in three steps: (1) we cleaned out firms with incoherent information or missing values for our main variables; (2) we eliminated firms with extreme outliers in the distributions of a few important ratios, either in 1984 or in 1987; and (3) we dropped out firms exhibiting huge rates of increase or decrease, over the three years, 1984–87, for some of the main variables.<sup>11</sup> The sample that we finally obtained (and to which we simply refer as the sample) amounts to about 80 percent of the continuing firms, both in terms of number of persons and number of firms, this percentage differing little by industry.

Table 12.3 gives the average level and average growth rate (or average absolute change) of the value added per person and operating income to sales ratios, both across industries and data sets; table 12A.3 gives the average number of persons per firm and the average growth rate of number of per-

11. To be more precise, about 50 percent of the firms that have been cleaned out have been so because of missing or incoherent figures, and the remaining 50 percent have been eliminated, in roughly equal proportions, because of extreme values of important ratios in levels or to extreme rates of growth of major variables. It can be noted that about half of the firms are dropped out for two reasons or more.

**Table 12.3** Productivity and Profitability in the Survey and Sample

Service Industry (4-digit NAP)	Value Added per Person (in thousands)				Operating Income to Sales Ratio (%)		
	All Firms	Large Firms	Continuing Firms	Sample	Large Firms	Continuing Firms	Sample
<i>A. Average Levels in 1987</i>							
Restaurants (6701)	116.2	167.9	171.1	179.8	13.7	14.2	14.5
Hotels (670R)	154.7	208.6	224.2	231.6	23.2	23.7	24.3
Engineering (7701)	245.3	295.2	297.7	297.9	6.3	6.1	9.5
Computer programming (7703)	267.5	360.7	375.8	350.6	17.3	17.0	14.4
Computer processing (7704)	298.8	335.0	326.3	314.4	25.0	23.6	23.2
Legal services (7708)	242.1	329.1	324.1	306.2	28.0	29.4	30.9
Accounting (7709)	233.7	260.4	258.1	256.5	15.7	14.9	15.0
Personnel supply (7713)	136.3	136.7	135.9	136.0	8.3	8.5	8.5
Building cleaning (8708)	78.9	75.9	75.3	73.3	9.9	9.9	9.8
Total	156.3	184.1	180.1	171.4	14.1	13.7	14.2
<i>B. Average Rates of Growth (1984-87)</i>							
Restaurants (6701)	-0.1	7.0	4.8	8.6	1.9	2.2	2.9
Hotels (670R)	-1.2	-4.6	2.4	-2.9	1.0	1.6	1.9
Engineering (7701)	-6.7	1.4	-1.8	4.1	0.1	-0.6	1.9
Computer programming (7703)	5.5	-0.5	1.0	5.6	0.5	-1.6	-1.0
Computer processing (7704)	9.3	14.3	12.5	14.3	4.0	1.8	2.3
Legal services (7708)	28.4	37.8	32.2	29.3	6.3	8.5	7.5
Accounting (7709)	16.2	10.5	9.0	11.2	1.3	1.0	1.6
Personnel supply (7713)	-2.4	-3.5	-6.3	-6.4	-0.1	-0.1	-0.1
Building cleaning (8708)	2.2	-1.6	-0.5	1.8	-0.5	-0.3	0.3
Total	5.1	0.7	0.3	1.4	1.4	0.9	1.4

sons.<sup>12</sup> Both tables show a rather clear pattern. As could be expected, because the three data sets overlap greatly, the numbers for the large firms, the continuing firms and the sample are usually close; discrepancies show up more often in growth rates than in levels and are much larger for the growth rate of employment than for the growth rate of productivity or the change in profitability. However, the numbers are much further apart in the case of all firms, with the exception of personnel supply and (to a lesser extent) of building cleaning, where large firms outweigh the smaller ones. In the seven other industries, value added per person tends to be significantly lower for firms with fewer

12. The operating income to sales ratio numbers are not available for the population of all firms, because firms with fewer than 20 salaried employees are asked only to answer a simplified questionnaire in which they do not have to report their profits and loss accounts.

than 20 salaried employees. There is no such systematic difference in terms of the corresponding change in productivity and profitability or in employment.

If we consider the three data sets consisting of large firms, the hierarchy of industries is quite well marked. The average size of these firms varies a great deal across industries; it is strikingly high in personnel supply, but it is also quite large in building cleaning and computer programming. Computer programming, computer processing, engineering, and legal services have the highest average levels of value added per person (300,000 francs per person in 1987 or more); personnel supply and building cleaning services have the lowest ones (respectively, about 135,000 and 75,000 francs per person). Computer programming and legal services are also at the top in terms of (gross) operating income margins (25 percent and 30 percent), together with hotels (25 percent). Personnel supply and building cleaning, joined by engineering, stand again at the bottom (with a margin of about 8 percent to 10 percent). Legal services have experienced by far the largest growth in labor productivity—about 30 percent from 1984 to 1987—as well as the biggest increase in profit shares, nearly 8 percent. They are followed by computer processing and accounting services, both having a very fast growth in productivity but only a modest increase in profit shares. These two industries have known also a relatively rapid growth of employment; legal services have been about the slowest. Personnel supply stands as the opposite case of legal services—it exhibits a huge increase in employment (about 70 percent over 1984–87) and has at the same time the worst productivity growth record. Hotels are still another case, with a very mediocre performance in both employment and productivity growth.

The fact that the average productivity and profitability ratios are close enough for all the large firms and the continuing ones (these two sets largely overlapping) does not preclude that these numbers differ substantially between firms leaving and firms entering (because the weight of these firms over the three-year period remains small relatively to that of the continuing firms). It is better to compare directly these two categories of firms, as in table 12A.4. Contrary to what would appear likely, however, value added per person is not clearly higher for the entering firms than for the leaving ones; nor is it the case for the operating income to sales margin. Only computer processing and legal and accounting services seem to confirm such expectations.<sup>13</sup> It is interesting to note that in all our industries the entering and leaving firms are much smaller (by about three times) than the continuing firms. However, it is again rather surprising to see that the average size of these firms is about the same, whether entering or leaving. A closer look at the individual size distributions,

13. Comparing the actual distribution of the two ratios for the firms entering and leaving (and not only their averages) shows that the differences in these three industries are real and cannot be accounted by a few outliers. In fact, one can see that the profit shares are also higher, by a small but clear margin, for the entering firms than for the leaving ones, in two more industries, engineering and computer programming.

by industry, of the two groups of firms shows that they are indeed quite similar.<sup>14</sup>

Although firms entering and leaving do not contribute much to changes in productivity or profitability, because they do not differ much, they do correspond to large flows of workers coming in and out. These flows have an important part in explaining the pattern of changes in employment in our service industries. They amount on average, over the three-year period 1984–87, to as much as 20 percent to 25 percent of the total stock of persons working in the large firms; the overall increase in the number of employees in the existing firms is about 20 percent. As can be seen from table 12A.5, such decomposition of the changes in employment varies greatly across industries. For example, although the very fast growth in personnel supply services (67 percent) is mainly due to hirings in the existing firms, that of computer programming services (61 percent) is also accounted for by the creation of new jobs in entering firms, which offsets largely (by 38 percent) the losses in jobs from the leaving firms.

What we refer to as macro- and microaverages are given in table 12.4 for our ratios of interest, both in levels and in growth rates; to make them more comparable, these are computed for our (cleaned and balanced) sample. The macroaverages are the usual ones we have been looking at in the previous table 12.3. They are defined in a sense as if an industry as a whole represented only one very large firm. In terms of the underlying individual ratios at the firm level, they are the (arithmetic) weighted means of these ratios.<sup>15</sup>

From a microeconomic point of view, there are various other possibilities. One is in fact confronted with the full distribution of the variables, and one can choose different kinds of average characteristics; one may also be very much interested in dispersion or in other aspects such as concentration. Usually, the simple unweighted means are computed, because they are most easy to interpret; medians are also often considered, being more robust in the presence of outliers. Often the original variables and ratios, when positive, are first transformed into logarithms, the main reason being to make their distri-

14. Considering per se the group of firms that we clean out of our sample is not a priori very interesting, because most of these firms are some sort of outlier. Although we know that they do differ in specific ways from the firms kept in the sample, there is little difference between the continuing firms sample (including them) and our proper sample, in terms of average productivity and profitability. In a sense this is reassuring. It also suggests that in a similar fashion the entering and leaving firms, which somewhat surprisingly show rather close productivity and profitability performances, may differ in fact in some other dimension, such as cash flows and debt-equity ratios.

15. In this sense, for example, the macroaverage of value added per person is the ratio of the total value added for the industry divided by the corresponding total number of persons in the industry (i.e., the ratio of the sample means of value added and total number of persons). It is also equal to the (arithmetic) mean of the individual value added per person ratios of the firms in the industry, *weighted* by the number of persons in these firms. This weighted mean (the ratio of the means) differs in general from the unweighted one (the mean of the ratios), the difference depending on the correlation of the individual ratios and the weights.

**Table 12.4** Macro- and Microaverages Computed from the Sample

Service Industry (4-digit NAP)	Sales per person (in thousands of francs)		Value Added per Person (in thousands of francs)		Value Added to Sales Ratio (%)		Operating Income to Sales Ratio (%)	
	Macro	Micro	Macro	Micro	Macro	Micro	Macro	Micro
	<i>A. Levels in 1987</i>							
Restaurants (6701)	323.3	305.3	179.8	168.6	55.6	55.7	14.5	11.9
Hotels (670R)	364.0	305.3	231.6	189.1	63.6	62.6	24.3	21.5
Engineering (7701)	523.5	405.7	297.9	263.4	56.9	67.1	9.5	11.0
Computer program- ming (7703)	541.1	495.0	350.6	338.2	64.8	70.7	14.4	13.9
Computer processing (7704)	505.2	342.3	314.4	234.7	62.2	70.1	23.2	20.1
Legal services (7708)	423.7	385.5	306.1	290.3	72.2	76.0	30.9	32.5
Accounting (7709)	311.7	281.7	265.5	237.1	82.2	84.4	15.0	15.4
Personnel supply (7713)	144.8	161.0	136.0	148.1	93.9	92.1	8.5	7.7
Building cleaning (8708)	84.7	89.5	73.3	76.8	88.0	86.0	9.8	10.3
Total	237.5	248.8	171.4	181.4	72.0	74.7	14.2	15.3
<i>B. Rates of Growth (1984-87)</i>								
Restaurants (6701)	2.3	0.2	8.6	4.9	3.2	2.6	2.9	1.2
Hotels (670R)	-5.0	-3.8	-2.9	-0.4	1.4	2.0	1.9	2.0
Engineering (7701)	-1.6	5.5	4.1	5.9	3.1	-0.3	1.9	1.6
Computer programming (7703)	8.6	12.1	5.6	7.2	-1.9	-2.6	-1.0	-1.3
Computer processing (7704)	13.6	9.3	14.3	8.9	0.3	-0.4	2.3	0.3
Legal services (7708)	28.2	23.6	29.1	24.0	0.5	0.3	7.5	7.6
Accounting (7709)	11.4	10.9	11.2	10.5	-0.1	-0.3	1.6	1.6
Personnel supply (7713)	-8.3	0.9	-6.4	1.6	1.9	0.7	-0.1	-0.3
Building cleaning (8708)	3.5	5.1	1.8	4.4	-1.4	-0.5	0.3	0.5
Total	-3.1	6.5	1.4	7.2	3.1	0.3	1.4	1.6

bution more normal.<sup>16</sup> What is then computed, instead of the more standard arithmetic means, are the geometric means, which can be expected to be rather close to the medians (if the distributions in logarithms fit well to the normal curve and are thus approximately symmetrical). This is what we do

16. Another advantage of taking logarithms is that dealing with ratios becomes more simple, the log of a ratio being the difference of the logs. Thus the mean of the log of a ratio is just the difference of the means of the logs.

here for the two productivity ratios, and the so-labeled microaverages in table 12.4 are precisely their geometric (unweighted) means.<sup>17</sup>

Therefore, the usual departures of the microaverages from the macroaverages are twofold. The first departure (which concerns only our two productivity measures) is that between geometric and arithmetic means, and the difference between the two is related to the dispersion of the individual ratios.<sup>18</sup> The second distinction (which concerns our four ratios) arises from the fact that the microaverages are unweighted contrary to the macro ones. The differences between the two reflect the magnitudes of correlations (or covariances) between the firm individual ratios and the corresponding values of the denominator variable.<sup>19</sup> With these distinctions in mind, various observations can be made in comparing the macro- and micronumbers from table 12.4.

A first look shows that what we have just said about the ranking of the industries according to their performances, on the basis of the aggregate data (i.e., the macroaverages), is still valid if we consider the microaverages. The industries performing best and those performing worst remain the same with respect both to productivity and profitability and both in terms of levels and rates of growth. However, if we go into more detail, the comparability in levels appears much more satisfactory than that in rates of growth. The rankings of industries according to the macro- and microaverage levels of value added per person and of operating income margin are (almost) the same, with very few inversions and only between adjacent industries. The rankings of the corresponding average rates of growth are not so close, with a number of inversions among more or less distant industries.

Although our qualitative conclusions on the relative performances of the industries appear to be similar, particularly so in levels and much less so in rates of growth, the magnitudes of the macro- and microaverages can be widely different. Taking first the case of levels, the two kinds of averages remain rather close for the value added and operating income to sales margins and reflect the absence of a systematic (and large enough) correlation across firms between these ratios and size. They can be, on the other hand, much further apart for the sales and value-added per person productivity ratios. These differences are accounted for both by the dispersion of the individual productivity ratios and their correlation with size.<sup>20</sup> Dispersion explains why

17. We verified that these geometric means differ very little in fact from the medians, showing that the log transformations achieve symmetry well enough and also that the sample has been cleaned successfully of the most offensive outliers. Note that, because the profitability margins that we consider are proportions varying between 0 percent and 100 percent, it is not appropriate to transform them into logarithms.

18. As a first approximation the arithmetic means is larger than the geometric one by a factor equal to  $\exp(\sigma^2/2)$ , if  $\sigma$  is the standard deviation of the logarithm of the variable (or ratio) considered. This is the exact formula if the distribution of the variable (or ratio) is exactly log normal.

19. The formulas are straightforward for the average levels (such as value added per person as indicated in n. 15); but they are more complicated for the average growth rates.

20. The fact that the distribution of the individual ratios is not exactly log normal is a third source of difference between their (geometric unweighted) microaverages and their (arithmetic weighted) macroaverages in levels. However, this source proved to be negligible in our case.

the (geometric) microaverages should be lower than the (arithmetic) macroaverages by about 5 percent to 20 percent, depending on the industry. The correlation explains the remaining gap, going in the same direction if positive and in the opposite one if negative. Thus, one can gather from the two sets of averages that the correlation between productivity levels and size (in numbers of persons) is positive (and strong) in computer processing and that it is negative in personnel supply and building cleaning services.<sup>21</sup>

In the case of rates of growth, the discrepancies between the two types of averages can be more substantial, particularly for the two productivity indicators. They are not, however, accounted for as simply as they are in levels. The differences between the productivity average growth rates can be seen as arising from the dispersion of the individual rates (as previously), from the correlation of these rates and the corresponding levels of productivity in the beginning year (1984), and from the change in the correlations of these individual levels of productivity with size (number of persons) between the last and first year of the period (1987 and 1984).<sup>22</sup> Thus, the impressive difference for the complete sample (i.e., the nine industries) between the microaverage rate of growth of value added per person and the corresponding macroaverage rate of growth—7.2 percent as against only 1.4 percent—can be decomposed in the following way: +3.1 percent coming from the dispersion of the individual growth rates; -2.0 percent coming from their correlation with the corresponding productivity levels; -6.9 percent resulting from the change in correlation over the three-year period between these productivity levels and size.

### 12.3 Dispersion and Heterogeneity of Productivity and Profitability Levels and Changes

Looking at average characteristics by industry and at the differences between them can be very misleading if one forgets about the extreme variability of these characteristics at the firm level. The economic performance of one industry may be much better than that of another one, and yet the distribution of a particular outcome measure usually overlaps in the two industries, with a large proportion of firms being lower in the first and higher in the second.

In this section, we focus on such within-industry variability for the four outcome variables of productivity and profitability. We investigate to what extent it is accounted for by the more detailed four-digit NAP classification (in nine service industries), and by other attributes that are usually viewed as

21. The fact that these two industries account for about 60 percent of the total number of persons in our nine industries implies that the macroaverage levels of our two productivity indicators are smaller than the microaverages.

22. The differences in the changes of the profitability averages arise only from the last of these three sources, i.e., the change in the correlations (or more precisely the covariances) of the individual ratios with size (in terms of sales) in the first and last years (of the study period).

contributing to the firm heterogeneity. These are three indicators of specialization (within five-digit subindustries), location (Paris region vs. the provinces), and form of ownership (corporate firms vs. noncorporate firms).

Tables 12.5 and 12.6 summarize the results of analyses of variance relating these outcome variables to the above-mentioned attributes. Usual presentations of such results tend to stress the statistical significance of the various effects and report corresponding *F*-statistics. In a microdata analysis such as ours, given the large number of observations, statistical tests do not convey much information. All the main effects (and most of the interactions between them), even when they are quite small, appear to be statistically significant.<sup>23</sup> What matters is whether these effects actually reduce the (unexplained) dispersion of the variables of interest substantially and whether the magnitude (and sign) of the effects themselves appear to be economically meaningful. This is what is to be looked for in tables 12.5 and 12.6.

Table 12.5 is set up in terms of the standard deviations of the four productivity and profitability ratios. It gives first the overall dispersion (i.e., across industries, using up 1 degree of freedom only), then the within-industry dispersion (using up 9 degrees of freedom), and last, the dispersion within the much finer categories constructed from the cross classification of the three indicators of specialization, location, and form of ownership (using up 71 degrees of freedom).<sup>24</sup> These standard deviations are shown in the cross-sectional and time dimensions of the data (1984 and 1987 levels and three-year growth rates).<sup>25</sup> In order to facilitate the interpretation, we have also adjusted them in terms of permanent or transitory dispersion, and we have computed the corresponding correlations between the 1984 and 1987 levels.<sup>26</sup>

The main message of table 12.5 is the extreme dispersion of firm individual productivity and profitability ratios and rates of growth, even when account is taken of systematic differences between industries and other major sources of heterogeneity. The magnitudes of the standard deviations speak for themselves. If one is ready to make the more or less crude assumption that these ratios are distributed normally, then about one-third of the firms are outside the plus or minus one standard deviation range around the mean, and these ranges can be very wide indeed.<sup>27</sup> For example, for one-third of the firms, value added per person differs by a factor of more than three across industries ( $2\sigma$  about 1.1), and (by more than two, on average, within industries ( $2\sigma$  about 0.65)). Similarly, for one-third of firms, the three-year growth rate in value added per person (or in sales per person) differs by more than 45 percent

23. At the conventional significance level of 5, or 1 percent.

24. Taking into account that the indicators are not fully interacted in order to avoid empty cells.

25. That is precisely the three-year differences of logarithms for the two productivity variables and three-year absolute changes for the two profitability ratios.

26. As an additional help to the reader, the traditional  $R^2$  coefficients of determination that parallel these standard-deviation numbers are given in table 12A.6 in the appendix.

27. This assumption is particularly crude for the two profitability ratios but provides an acceptable approximation for the logarithms of the two productivity ratios.



**Table 12.5** Estimates of Dispersion: Standard Deviations Overall, within Industries and within Categories According to Specialization, Location, and Form of Ownership

Dispersion	Logarithm of Sales per Person	Logarithm of Value Added per Person	Value Added to Sales Ratio	Operating Income to Sales Ratio
<i>Overall Dispersion</i>				
1984	0.63	0.54	0.16	0.10
1987	0.65	0.56	0.15	0.11
1987/1984	0.23	0.24	0.07	0.08
Permanent*	0.62	0.53	0.14	0.09
Transitory**	0.17	0.17	0.05	0.06
Correlation (1984, 1987)	0.93	0.91	0.90	0.70
<i>Within Industry Dispersion<sup>a</sup></i>				
1984	0.35	0.32	0.10	0.09
1987	0.35	0.32	0.10	0.09
1987/1984	0.22	0.23	0.07	0.08
Permanent*	4.32	0.28	0.08	0.06
Transitory**	0.16	0.16	0.05	0.06
Correlation (1984, 1987)	0.80	0.75	0.74	0.58
<i>Within Category Dispersion<sup>b</sup></i>				
1984	0.32	0.29	0.09	0.08
1987	0.32	0.30	0.09	0.08
1987/1984	0.22	0.23	0.07	0.08
Permanent*	0.28	0.25	0.08	0.06
Transitory**	0.16	0.16	0.05	0.05
Correlation (1984, 1987)	0.77	0.70	0.73	0.57

<sup>a</sup>9 industry parameters.

<sup>b</sup>71 industry- and firm-type parameters.

\*Permanent dispersion:  $\sigma_a^2 = (\sigma_{84}^2 + \sigma_{87}^2 - \sigma_{87/84}^2)/2$ .

\*\*Transitory dispersion:  $\sigma_t^2 = (\sigma_{87/84}^2)/2$ .

across and within industry, and the operating income to sales ratio differs by more than 20 percent, either in levels for 1984 and 1987 or in the variation between these two years.

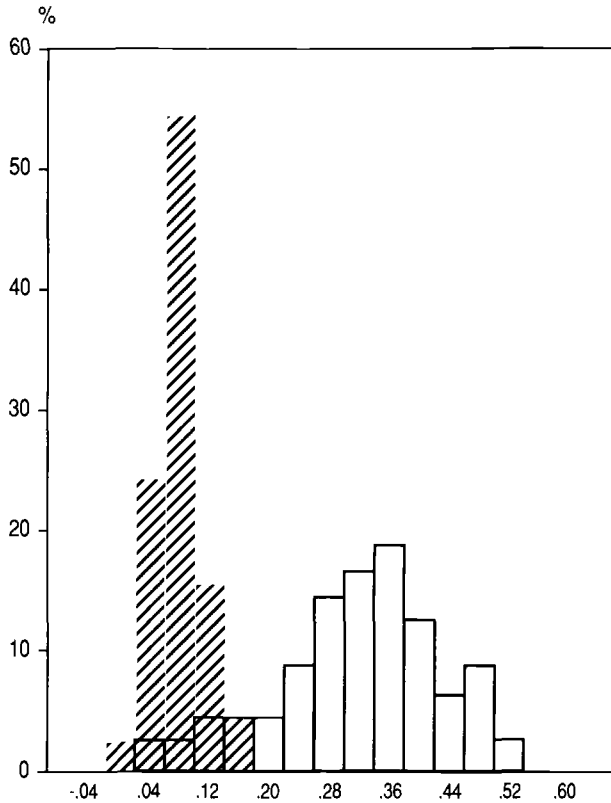
To be more specific (and also more precise by considering the actual distribution of the variables by industry), it is instructive to compare legal services and personnel supply services and look at figures for these two industries. Legal services (7708) have the highest average operating income to sales margin; personnel supply services (7713) have the lowest average one. Although the operating income margin is on average four times higher in the first industry than in the second one—0.32 as against 0.08 (see fig. 12.1)—the lower tail of the distribution in the first recovers (nearly) completely the distribution in the second. Legal services and personnel supply services are also the two

**Table 12.6** Estimates of Main Effects in 1987

Service Industry (4-digit NAP)	Firms in First Category (%)	Sales per Person	Value Added per Person	Value Added to Sales	Operating Income to Sales
<i>A. Influence of Specialization (less specialized vs. more specialized)</i>					
Overall	22.3	.10**	.09**	-.01	.01
Within subindustries:					
Restaurants (6701)	14.1	.07	.13**	.03	.04**
Engineering:					
Buildings (77011)	23.2	-.08	-.14	-.03	-.06
Infrastructures (77012)	36.1	.11	-.02	-.07	-.05
Manufacturing (77013)	16.1	.25	.15	-.06	-.02
Other (7701R)	17.6	.13	.09	-.03	-.02
Computer processing (7704)	19.2	.26*	.23*	-.03	.02
Accounting:					
Proper (77092)	18.1	.15**	.15**	.00	.00
Other (7709R)	27.9	.16**	.17**	.01	.02
Building cleaning:					
Residential (87081)	29.4	.02	-.03	-.03	-.02
Commercial (87082)	37.4	.03	.04	.01	.00
Industrial (87084)	34.8	-.04	-.06	-.02	.01
Other (8708R)	12.1	.47**	.29**	-.12**	-.01
<i>B. Influence of Location (Paris vs. provinces)</i>					
Overall	47.3	.17**	.19**	.01	-.01*
Within industries:					
Restaurants (6701)	60.9	.16**	.20**	.02	.00
Hotels (670R)	34.5	.10**	.15*	.04*	.00
Engineering services (7701)	52.7	.27**	.27**	.00	.01
Computer programming (7703)	74.0	.04	.15	.06	.00
Computer processing (7704)	41.0	.25*	.22*	-.02	.02
Legal services (7708)	48.1	.44**	.26**	-.11**	-.06**
Accounting (7709)	24.0	.28**	.25**	-.02*	-.02
Personnel supply (7713)	61.5	.19**	.20**	.01	.01*
Building cleaning (8708)	47.1	.03	.05	.01	-.02**
<i>C. Influence of Form of Ownership (corporate vs. noncorporate)</i>					
Overall	67.9	.11**	.09**	-.01*	.00
Within industries:					
Restaurants (6701)	68.6	.09**	.08*	.00	.03**
Hotels (670R)	74.4	.10**	.15**	.03*	.02
Engineering (7701)	70.8	.20**	.06	-.08**	-.02
Computer programming (7703)	81.6	.03	.08	.01	.03
Computer processing (7704)	62.8	.43**	.34**	-.07**	.04*
Legal services (7708)	90.3	.03	-.03	-.04	.07**
Accounting (7709)	84.2	.10**	.12**	.01	.03**
Personnel supply (7713)	56.6	.02	.02	-.01	-.01
Building cleaning (8708)	37.1	.00	.01	.01	-.01

\*Significant at the 5 percent level.

\*\*Significant at the 1 percent level.

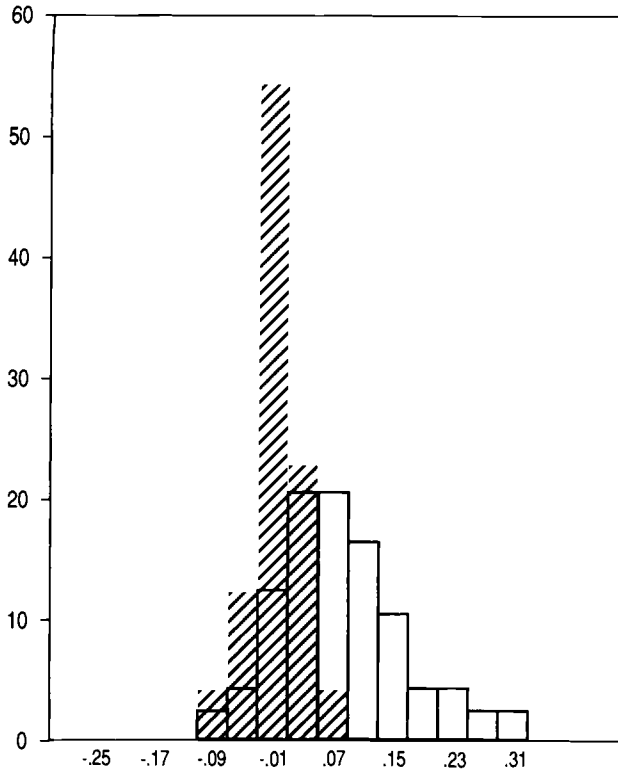


**Fig. 12.1 Distributions of the 1987 levels of firms operating income to sales ratios for legal services and personnel supply services**

industries with both the largest and (almost) the smallest changes in the operating income margin: +7.5 percent and 0 percent, respectively. In this case the lower half of the distribution in the first industry overlaps with the complete distribution in the second one (see fig. 12.2).

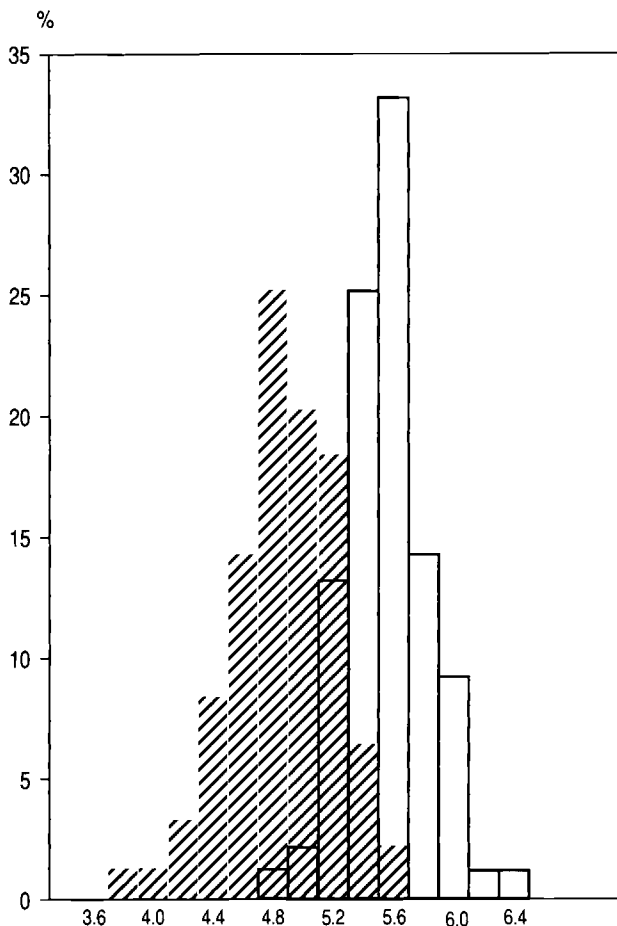
Average value added per person in legal services is twice that in personnel supply services (260,000 francs per person as against 130,000) and the lower half of the distribution in the first industry overlaps approximately with the upper half of the distribution in the second industry (see fig. 12.3). These two industries have also both the strongest and (almost) the slowest three-year productivity increase: 24 percent and 1.6 percent, respectively, but the corresponding distributions at the firm level overlap fully, except for the lower tail in personnel supply (see fig. 12.4).

Besides providing overwhelming evidence of huge dispersion, table 12.5 suggests two additional observations. The first is the predominance of industry effects in explaining the heterogeneity of productivity and profitability ra-



**Fig. 12.2** Distributions of the 1984–87 changes in firms operating income to sales ratios for legal services and personnel supply services

tios across firms. Comparing the overall and within-industry and within-category standard deviations for 1984 and 1987 shows clearly that the division of the data into nine service industries, at the four-digit level of the NAP industrial classification, contributes much more to the reduction of dispersion among firms than the breakdown into finer categories by specialization, location, and form of ownership. Although such a conclusion could, in principle, depend on the order in which the various effects are considered, this is far from true here. For example, the  $R^2$ s for the 1987 level of value added per person and operating income to sales ratio are about .65 and .40, respectively, if we take into account industry effects alone. They increase to about .75 and .45, when specialization, location, and the form of ownership are introduced as additional effects (see table 12A.6). But if we looked at these three effects alone, then the  $R^2$ s would only amount to .15 and .05, respectively. In additional analyses of variance, not reported here, we have used also different breakdowns by size groups, in particular, interacting the form of ownership with the distinction between smaller and larger firms (with fewer and more

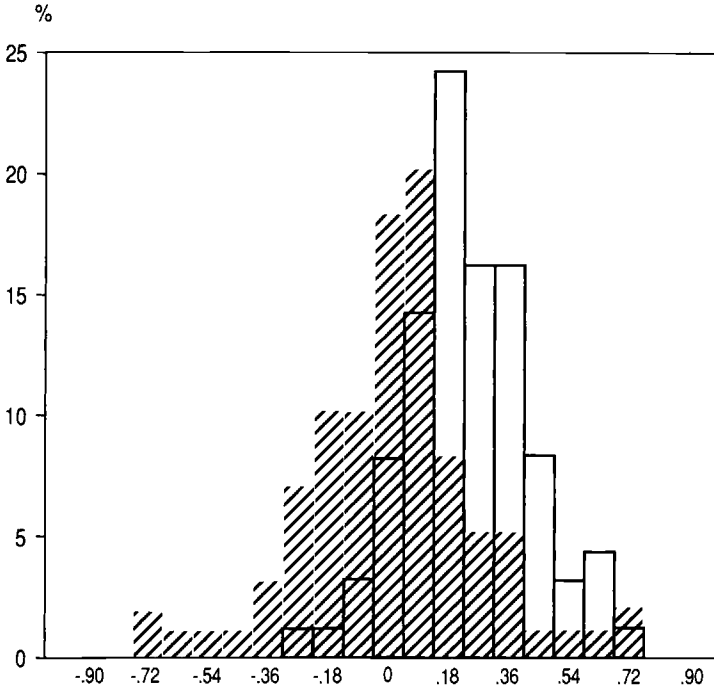


**Fig. 12.3 Distributions of the 1987 levels of firms value added per person for legal services and personnel supply services**

than 40 salaried employees). Contrary to industry effects but similar to the case of the three other attributes, size characteristics account for surprisingly little of the dispersion in productivity and profitability levels.<sup>28</sup>

The second observation is related to the comparison of levels with growth rates. Although the NAP industry classification contributes importantly to re-

28. This statement must be, of course, qualified: it applies to firms that are already large enough, because we are only considering in our sample firms with 20 or more salaried employees. As we have noted, in the previous section, in most industries (with the two exceptions of personnel supply and building cleaning) value added per person appears lower in the firms with fewer than 20 salaried employees. In other analyses of variances, we have also experimented with the number of establishments per firm; this indicator, however, played a negligible role.



**Fig. 12.4** Distributions of the 1984–87 changes in firms value added per person for legal services and personnel supply services

ducing the variability in levels, it has only a small effect on the dispersion of the rates of growth in productivity or the changes in profitability. In other words, the contrasts between the average industry growth rates, even when they are significant (economically as well as statistically), are relatively minor compared to the wide range in the rates of growth of individual firms. If we interpret the numbers in terms of permanent and transitory components, we see that permanent dispersion has an industry component but that transitory dispersion has practically none. Comparing levels and growth rates, it is also interesting to consider the relative size of the permanent and transitory components. The productivity variables and the value added to sales margin as well appear rather stable, with a permanent dispersion much larger than the transitory dispersion, even within industry (or within category). The operating income to sales margin is more volatile, the transitory and permanent dispersions being nearly of the same size within industry (and within category).

Although the three indicators of specialization, location, and form of ownership play a modest role on the whole in accounting for the heterogeneity of the levels of productivity and profitability, it is instructive to examine the magnitude of their estimated effects. These are shown in table 12.6 for 1987 lev-

els.<sup>29</sup> In each panel, the overall line provides what can be viewed as our average estimates, corresponding in fact to the intermediate specification in which the three effects are not interacted with the industry effects.<sup>30</sup> The first column gives the percentage of firms, which are, respectively, less specialized, located in the Paris region, and corporate owned.

The indicator of specialization characterizes the firms whose activity appears highly concentrated in contrast to firms that are more diversified. Whenever it is possible, this distinction is made at the most detailed level of the NAP industrial classification used in the survey. As can be seen in panel A of table 12.6, this indicator of specialization can be defined in only five out of the nine service industries (for restaurants and computer processing, and for two subindustries in accounting services, four in building cleaning services, and four in engineering services).<sup>31</sup> The particular (and somewhat arbitrary) criterion we have adopted here is that of a share of value added above 75 percent in the main detailed activity for the more specialized firms (and below that for the less specialized ones). Surprisingly enough, a large majority of firms in the various industries or subindustries are highly specialized, over three-quarters of them being classified in the more specialized group with our a priori fairly stringent definition. No definite pattern seems to emerge in the differences between the more or less specialized firms. Although in many cases diversification goes along with an increase in sales and value added per person (of about 10 percent on average), its influence is usually insignificant, and at best a minor one, on the value-added and operating income to sales ratios.

The location indicator distinguishes firms in the Paris region (Paris *intra muros* and Île de France) and in the rest of France. That almost half of the large (more than 20 employees) service firms are located in the Paris region provides further evidence of centralization in France. The pattern of differences between the Parisian and provincial firms, although somewhat analogous, is more clear-cut than that arising from the degree of specialization. The influence on profitability ratios is rather small, except perhaps in legal services, which are significantly less profitable in the Paris region. On the other hand, the effect on the two productivity variables is quite strong and significant: for at least seven of the nine service industries, sales and value added per person are about 20 percent higher on average in the Paris region than in the provinces. It may be the case (e.g., in legal services) that competition is more intense in the Paris region and hence that firms have to be more productive and tend to be less profitable. However, more likely, the observed differences reflect largely price differentials rather than true productivity differences.

29. The estimates are only shown for 1987; they are practically the same for 1984 and most of them are negligible (and insignificant) for the 1984–87 growth rates.

30. And thus using up  $9 + 3 = 12$  degrees of freedom instead of 71.

31. The four others have only more specialized firms.

Wages are notoriously higher in Paris and in Île de France than in the rest of the country (because of higher costs of living and a more competitive labor market).

The third indicator is based on the legal status of the firm and contrasts corporate firms to proprietary-owned ones. The proportion of firms belonging to one or the other categories varies according to the industry. In the sample as a whole, a third of the firms are noncorporate even though they have more than 20 employees. Unfortunately the distinction in the legal status of a firm does not correspond to the distinction that is a priori more relevant, of managerial and nonmanagerial ownership, because managers may also control the stock majority in corporate companies. The two should be at least positively correlated, and one might thus expect noncorporate firms to be more productive and profitable than corporate ones in a given industry or on average (controlling for industry). What we see in fact is rather the opposite picture: sales and value added per person are significantly higher in most industries for the corporate firms. This fact may correspond to the higher prices that corporate firms charge for their services on average (and to the higher wages that they pay), as much as it means a higher real productivity. The evidence is mixed for the two profitability ratios; in particular the operating income to sales ratio is higher for corporate firms in computer processing and legal services and for noncorporate firms in restaurants and in accounting services.

#### **12.4 Concluding Remarks and Summary**

As stated in the introduction, this paper has tried to do three things: to present the French annual survey of market services; to illustrate some of the problems arising from the different points of view of macro- and microeconomists when assessing industry average performances; to exemplify the extreme variability of such performances at the firm level and to attempt to decompose it in terms of heterogeneity components and intrinsic dispersion. Along the way, we have touched on a number of issues that would be worth investigating further and deeper. We shall end by remarking briefly on three of these issues and by summarizing what has actually been done.

Entry and exit of firms are particularly important in the services sector, as can be seen from the fact that the renewal of large firms in our nine industries is about as high as 15 percent per year (in terms of number of firms). Our somewhat puzzling (and inconclusive) findings on the differences of productivity and profitability performances between entering, leaving, and continuing firms should be reconsidered in a more focused analysis. To do such a task properly, however, one will have to be able to consider also the smaller firms (with fewer than 20 salaried employees), for which only a representative sample is surveyed. It would be particularly valuable for that purpose if firms were asked a question about their age (or date of creation) and one about their



past employment record (e.g., the number of salaried employees at the end of the year, for the last three years), or if such information could be recovered satisfactorily from other sources.

The discrepancies between what we have called macro- and microaverages of our indicators of firms performances are a reflection of the underlying distributions of the variables of interest and their interrelations. In fact, such discrepancies raise interesting questions about the relations between size and levels of productivity, size and growth rates of productivity, levels and growth rates of productivity, and so forth. To go about these questions through the comparison of average overall index numbers seems, however, rather awkward; it is better to study them *per se* either by relying on a (more straightforward) descriptive framework, or by embedding them in an explanatory model.

What we have done in order to account for the variability of our productivity and profitability measures across firms is only a first step. One would like to assess the significance and magnitude of a number of explanatory factors, by specifying and estimating production functions and price cost margins-type equations. Such studies at the microlevel are still rare in service industries, and we intend to follow this route in future work. However, it is clear from the outset that not having information on individual price differentials and quality attributes of the services provided by the firms will be a major shortcoming for an in-depth productivity or profitability analysis. More generally, standard accounting data such as the ones collected by the French annual survey of market services are most valuable and even indispensable; they have, nevertheless, important limits. In order to carry out specific investigations, economists will have to rely more and more on additional sources of information and specially designed surveys for given industries.

In the present study, we have taken advantage of the wealth of information provided by the French annual survey of market services, to construct a panel sample of data on about 2,300 large firms, from 1984 to 1987, in nine selected service industries (at the four-digit level of the industrial classification). We have contrasted the average performances of firms across industries, in terms of labor productivity ratios and profitability margins, both in levels and in growth rates. Going from the survey of all firms to a balanced and cleaned panel data sample of large firms, we have compared these averages indicators for more or less inclusive sample definitions and for the two kinds of averages usually considered in macro- and microanalyses. We have also indicated how major discrepancies could be related to size effects, to the different characteristics of firms entering or leaving the industry, or to the dispersion of the underlying variables and their correlations. Whatever the sample or average definitions, legal services ranks first in terms of labor productivity and profitability levels as well as rates of growth; personnel supply services ranks last (or almost). However, by contrast to legal services, which have done a little more than maintaining their level of employment, personnel supply services

have known a remarkable growth (of about 70 percent in total number of persons over the three years, 1984–87).

We, then, proceeded to show that the differences across industries in average productivity and profitability are usually small when compared to the range of individual differences within industries. As a striking example, the distributions of the rates of growth of firms in value added per person for legal services and personnel supply services overlap nearly completely, although these two industries have respectively the strongest and (almost) the slowest three-year productivity increase: about 24 percent and 1.6 percent. We have investigated to what extent the extreme variability in individual performances could be accounted for by other heterogeneity factors, besides the industry effects. We found that in fact the industry effects largely predominate in explaining the dispersion of the productivity ratios and profitability margins in levels and that our three other indicators of specialization (within the four-digit-level industry), location, and form of ownership play a minor role, with location being the most significant of the three and probably reflecting price differentials. However, we found also that the dispersion in the productivity growth rates and profitability changes, contrary to levels, is only weakly related to the industry breakdown.

Appendix follows on pages 486–89.

## Appendix

**Table 12A.1 Illustrative Statistics for the French Market Services Sector, Two-Digit Level of the French Classification (NAP), 1987**

Service Industry (2-digit NAP)	No. of Firms		No. of Persons		Sales (in 10 <sup>6</sup> Francs)		Value Added per person (in 10 <sup>3</sup> Francs)		Operating Income to Sales Ratio, Large Firms (%)
	All Firms	Large Firms	All Firms	Large Firms	All Firms	Large Firms	All Firms	Large Firms	
Recycling (56)	4,505	191	21,229	7,996	16,105	8,207	202	254	8.3
Repair services (66)	13,663	119	29,540	6,841	6,392	2,021	117	175	10.2
Hotels, cafes, & restaurants (67)	157,871	1,686	594,390	135,876	143,697	40,075	127	163	12.3
Travel agencies (74)	1,777	159	25,084	15,371	26,777	18,031	222	252	5.8
Business services (77)	137,405	5,481	995,445	536,367	368,170	207,559	207	222	10.6
Insurance (78)	22,062	129	67,210	9,152	18,171	3,857	195	297	13.9
Real estate management (79)	26,905	473	106,180	25,643	71,987	23,480	251	341	12.1
Automobile & equipment rent- ing (80)	8,372	243	38,380	20,845	26,653	13,743	483	455	43.3
Real estate agencies (81)	8,996	589	88,658	71,405	68,616	56,404	463	461	38.8
Motion pictures & TV (86)	3,549	257	63,987	46,431	34,798	26,782	288	323	25.5
Personal services (87)	87,836	1,603	437,063	204,190	61,335	27,776	97	101	11.7

**Table 12A.2 Total Number of Firms in the Survey and Sample**

Service Industry (4-digit NAP)	No. of Firms in 1987				Corresponding Proportions (%)		
	All Firms	Large Firms	Continuing Firms	Sample	Large/ All	Continuing/ Large	Sample/ Continuing
Restaurants (6701)	61,743	797	402	312	1.3	50.4	77.6
Hotels (670R)	28,463	567	297	235	2.0	52.4	79.1
Engineering (7701)	15,307	658	391	277	4.3	59.4	70.8
Computer programming (7703)	15,351	523	171	144	3.4	32.7	84.2
Computer processing (7704)	3,282	346	231	156	10.5	66.8	67.5
Legal services (7708)	20,418	413	276	216	2.0	66.8	78.3
Accounting (7709)	12,696	712	416	367	5.6	58.4	88.2
Personnel supply (7713)	742	451	290	205	60.8	64.3	70.7
Building cleaning (8708)	7,232	820	497	407	11.3	60.6	81.9
Total	165,234	5,287	2,971	2,289	3.2	56.2	77.0

**Table 12A.3 Average Size and Growth of Employment in the Survey and Sample**

Service Industry (4-digit NAP)	No. of Persons per Firm in 1987				Growth Rate of No. of Persons 1987/1984			
	All Firms	Large Firms	Continuing Firms	Sample	All Firms	Large Firms	Continuing Firms	Sample
Restaurants (6701)	4.2	50.9	70.7	61.2	4.2	-2.5	0.7	3.1
Hotels (670R)	5.7	68.6	90.6	99.0	8.7	9.7	-5.3	1.6
Engineering (7701)	7.1	90.2	117.0	117.9	2.6	-8.1	-4.2	-5.8
Computer programming (7703)	6.4	85.4	151.2	167.7	60.6	61.3	33.0	28.3
Computer processing (7704)	12.6	74.0	91.3	88.8	6.3	-4.8	5.4	8.5
Legal services (7708)	5.2	40.2	45.6	38.6	1.8	-7.5	2.2	2.8
Accounting (7709)	7.5	49.5	63.4	53.2	11.9	21.2	9.7	10.0
Personnel supply (7713)	230.8	352.8	492.3	602.7	64.5	66.9	76.4	74.7
Building cleaning (8708)	25.0	182.1	230.9	238.7	20.0	16.7	1.8	2.0
Total	7.4	107.7	149.6	155.8	16.7	22.1	18.9	20.6

**Table 12A.4** Comparison of Firms Leaving and Entering the Large Firms Data Set, 1984-1987

Service Industry (4-digit NAP)	No. of Firms		No. of Persons per Firm		Value Added per Person		Operating Income to Sales Ratio	
	Leaving	Entering	Leaving	Entering	Leaving	Entering	Leaving	Entering
Restaurants (6701)	353	395	37.9	30.7	143.6	160.4	11.3	12.6
Hotels (670R)	215	270	32.8	44.4	216.7	173.5	21.4	21.8
Engineering (7701)	256	267	65.8	51.0	256.6	286.6	4.6	6.8
Computer program- ming (7703)	123	352	67.3	53.5	339.9	339.9	13.4	17.8
Computer processing (7704)	129	115	53.2	39.2	302.0	375.4	19.3	30.8
Legal services (7708)	203	137	27.6	29.2	224.9	344.5	23.8	25.0
Accounting (7709)	151	296	33.3	29.9	230.3	267.0	16.8	17.9
Personnel supply (7713)	152	161	95.0	101.8	122.5	142.9	7.4	7.2
Building cleaning (8708)	218	323	69.4	107.0	88.2	77.7	12.2	10.0
Total	1,800	2,316	51.5	53.9	196.0	198.4	12.1	15.1

**Table 12A.5** Decomposition of the Change in Total Number of Persons for the Large Firms Data Set, 1984-1987

Service Industry (4-digit NAP)	Decrease for Leaving	Increase for Entering	Resulting Variation	Variation for Continuing	Total Variation
<i>A. Absolute Change of Total No. of Persons (in thousands)</i>					
Restaurants (6701)	13.4	12.1	-1.3	0.2	-1.1
Hotels (670R)	7.0	12.0	4.9	-1.5	3.4
Engineering (7701)	16.8	13.6	-3.2	-2.0	-5.2
Computer programming (7703)	8.3	18.8	10.6	6.4	17.0
Computer processing (7704)	6.9	4.5	-2.4	1.0	-1.4
Legal services (7708)	5.6	4.0	-1.6	0.3	-1.3
Accounting (7709)	5.0	8.9	3.8	2.3	6.1
Personnel supply (7713)	14.4	16.4	1.9	61.8	63.7
Building cleaning (8708)	15.1	34.6	19.4	2.0	21.4
Total	92.6	124.9	32.2	70.6	102.8
<i>B. Growth Rate of Total No. of Persons (%)</i>					
Restaurants (6701)	32.2	29.2	-3.0	0.5	-2.5
Hotels (670R)	19.9	33.8	13.9	-4.2	9.7
Engineering (7701)	25.7	20.8	-4.9	-3.1	-8.1
Computer programming (7703)	29.9	68.0	38.1	23.2	61.3
Computer processing (7704)	25.6	16.8	-8.8	4.0	-4.8
Legal services (7708)	31.3	22.3	-9.0	1.5	-7.5
Accounting (7709)	17.3	30.5	13.2	8.0	21.2
Personnel supply (7713)	15.1	17.2	2.1	64.8	66.9
Building cleaning (8708)	11.8	27.0	15.2	1.5	16.7
Total	19.8	26.8	7.0	15.1	22.1

**Table 12A.6** Coefficients of Determination  $R^2$  for Industry Effects Only and for All Effects with Interaction

Coefficients of Determination	Logarithm	Logarithm	Value	Operating
	of Sales per Person	of Value Added per Person	Added to Sales Ratio	Income to Sales Ratio
<i>R<sup>2</sup>: Industry Effects</i>				
1984	0.68	0.65	0.63	0.27
1987	0.70	0.67	0.60	0.39
1987/1984	0.10	0.07	0.03	0.07
Permanent	0.74	0.72	0.68	0.42
Transitory	0.09	0.07	0.02	0.06
Squared correlation (1984, 1987)	0.64	0.56	0.55	0.34
<i>R<sup>2</sup>: All Effects</i>				
1984	0.74	0.72	0.67	0.33
1987	0.75	0.73	0.65	0.45
1987/1984	0.14	0.11	0.08	0.12
Permanent*	0.79	0.78	0.72	0.47
Transitory	0.11	0.08	0.06	0.09
Squared correlation (1984, 1987)	0.59	0.50	0.53	0.32

Note: The  $R^2$  in this table are computed from the corresponding standard deviations in table 12.2.

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