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DISPERSION AND HETEROGENEITY OF FIRM PERFORMANCES  
IN NINE FRENCH SERVICE INDUSTRIES, 1984-1987

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ABSTRACT

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 2300 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. We have compared these averages indicators for more or less inclusive sample definitions, going from the survey of all firms to a "balanced" and "cleaned" panel data sample of large firms, and for the two kinds of averages usually considered in macro and micro-analyses. 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, and have investigated to what extent the extreme variability in individual performances could be accounted for by other heterogeneity factors, besides the industry effects.

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## I. INTRODUCTION AND MOTIVATION

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 Institute of Statistics has been conducting an annual survey of market services, which is thought as 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 II of the paper). This survey is not only useful to ensure a knowledge of the relevant macro-facts, but it 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 micro level to investigate the behavior and performance of firms. Most of these studies have, however, concentrated on manufacturing industries, since the more easily accessible databases 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 for them also.

The outlooks of economists working at the micro and the macro levels, and the ways they treat the data are quite different. Our interest, in section III of the paper, is to illustrate some of the basic problems involved, and provide some indications of how they can be dealt with. This we do in analyzing the productivity and profitability performance of firms in selected service industries, for the four recent years, 1984 to 1987, for which the French survey was available to us.

More precisely, we have concentrated on large firms with twenty or more salaried employees, since they are exhaustively surveyed and have to answer a more detailed questionnaire. We have also selected nine service industries which we thought typical in various

ways. These are industries at the four digit level of the French classification of industrial activities, with at least two or three hundred 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 which have been surveyed from 1984 to 1987 in our nine selected industries, we have been able to construct a "balanced" and "cleaned" panel sample of 2289 firms. The first problem which we touch upon is just that of constructing a "sample", and assessing some of the differences which 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 which should be viewed as "outliers" (or else which report incomplete or erroneous information) on the other hand.

The second typical problem which we also illustrate is that of defining an average level and growth rate, say of productivity, for an industry, and comparing the numbers that macro- and microeconomists will 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 interpretable), 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 IV 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 as relevant and that we could distinguish.

## II. 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, the French National Institute of Statistics and Economic Studies. 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 classification of activities and commodities (NAP: "*Nomenclature d'Activités de Produits*") are now surveyed, involving some 600,000 service firms, and about 2,500,000 persons (2,000,000 salaried and 500,000 non-salaried) in 1987.<sup>5</sup> Table A-1 in the appendix provides some illustrative statistics at the two digit industry level for all firms, and for firms with twenty or more salaried employees in 1987.

The survey is a survey of firms or "enterprises," in the sense of juridically independent profit making entities. Liberal professions, such as lawyers or accountants, are included, but non-profit 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 twenty 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 down to 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 0, 1, or 2 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 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 merchandises,

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 of their total turnover ("*chiffre d'affaires*") by services (400 different services or commodities for 62 activities), and also a detailed one 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 employees 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 non-salaried 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 corresponding wage bill.

For capital, larger firms report the gross book value of their fixed assets which are 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 second-hand transportation equipment; new and second-hand machinery and other equipment.

### III. AVERAGE PRODUCTIVITY AND PROFITABILITY PERFORMANCES: FROM THE SURVEY TO "SAMPLE" AND FROM "MACRO" TO "MICRO" AVERAGES

Economists working at the micro level and at the macro level 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 is already apparent with the problem of defining the scope of study: while the macroeconomist considers the population as a whole (say, a complete industry), the microeconomist usually deals with a sample (say, of firms in a given industry). This 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-upon definition).

In general, the possibilities offered by micro data (typically cross-sectional or panel data coming from surveys) are much larger than for macro data (typically aggregate time series provided by national accounts), but the difficulties in dealing with them tend also to be greater. While the number of observations is incomparably higher, it is also the case that interesting variables are often 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 a macro point of view and a micro one 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 twenty 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 micro-analyses: respectively, weighted (arithmetic) means and unweighted (eventually geometric) ones.

The main numbers for comparisons across "samples" and between "averages" are given in Tables 2 to 4, while additional information and insight can be gained from Tables A2 to A5 in appendix. 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 2 gives the total number of persons by industry in 1987 for our various "samples", helping to define more precisely what they are (while Appendix Table A2 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 non-salaried employees) and an average size of seven persons per firm. Most of the firms are small. Only about 5300 of them (3%) have twenty salaried employees or more, for a total, however, of as much as 47% 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 to 25% in Restaurants, Hotels, and Legal Services to a high 80 to 90% in Personnel Supply and Building Cleaning Services.

What we call "continuing firms" are the large firms which have kept answering the detailed questionnaire during the four years 1984 to 1987. The proportion of continuing firms among the

large firms does not vary too much across the industries; it is about 80% on average in terms of number of persons (and 55% 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 under 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 possible 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.

Micro data sets are not in general immediately fit for econometric analyses; first, they have to be thoroughly "cleaned" from observations which can be seen as erroneous or which 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 satisfactory balanced panel sample, we had to clean the continuing firms (balanced) data set. We did so in three steps. First, we cleaned out firms with incoherent information or missing values for our main variables. Then we eliminated firms with extreme outliers in the distributions of a few important ratios, either in 1984 or in 1987. Lastly, we dropped out firms exhibiting huge rates of increase or decrease, over the three years 1984 to 1987, for some of the main variables.<sup>11</sup> The sample which we finally obtained (and to which we simply refer as the sample) amounts to about

80% of the continuing firms, both in terms of number of persons and number of firms, this percentage differing little by industry.

Table 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, while Appendix Table A3 gives the average number of persons per firm and the average growth rate of number of persons.<sup>12</sup> Both tables show a rather clear pattern. As could be expected, since the three data sets overlap greatly, the numbers for the large firms, the continuing firms and the sample are usually close, discrepancies showing up more often in growth rates than in levels, and being much larger for the growth rate of employment than for that of productivity or the change in profitability. However, the numbers are much farther 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 less than 20 salaried employees. There is no such systematic difference in terms of the corresponding change in productivity and profitability or that 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 thousand francs per person in 1987 or more), while Personnel Supply and Building Cleaning Services have the lowest ones (respectively about 135 and 75 thousand francs per person). Computer Programming and Legal

Services are also at the top in terms of (gross) operating income margins (25% and 30%), together with Hotels (25%). Personnel Supply and Building Cleaning, joined by Engineering, stand again at the bottom (with a margin of about 8 to 10%). Legal Services have experienced by far the largest growth in labor productivity: about 30% from 1984 to 1987, as well as the biggest increase in profit shares, nearly 8%. 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, while that of Legal Services has been about the slowest. Personnel Supply stands as the opposite case of Legal Services, exhibiting a huge increase in employment (about 70% over 1984-87) and having 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 could differ substantially between firms leaving and entering (since 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 it is done in Appendix Table A4. 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, either, for the operating income to sales margin. Only Computer Processing, Legal and Accounting Services seem to confirm such expectations.<sup>13</sup> It is interesting to note that in all of 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, 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, since 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 to 25% of the total stock of persons working in the large firms, while the overall increase in the number of employees in the existing firms is about 20%. As can be seen from Appendix Table A5, such decomposition of the changes in employment varies greatly across industries. For example, while the very fast growth in Personnel Supply Services (67%) is mainly due to hirings in the existing firms, that of Computer Programming Services (61%) is also accounted for by the creation of new jobs in entering firms, which offsets largely (by 38%) the losses in jobs from the leaving firms.

What we refer to as "macro" and "micro" averages are given in Table 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 macro-averages are the usual ones we have been looking at in the previous Table 3. They are defined in a sense as if an industry as a whole would represent 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 micro 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, since 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, will be first transformed into logarithms, the main reason being to make their distribution 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 here for the two productivity ratios, and the so-labeled micro-averages in Table 4 are precisely their geometric (unweighted) means.<sup>17</sup>

Therefore, the usual departures of the micro averages from the macro ones are twofold. The first one (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 micro averages 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 "micro" numbers from Table 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 macro averages), is still valid if we consider the micro averages. The industries performing "best" and those performing "worst" remain the same with respect to productivity as well as 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 micro average 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 that 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 in rates of growth, the magnitudes of the macro and micro averages 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, reflecting the absence of a systematic (and large enough) correlation across firms between these ratios and size. They can be on the other hand much farther 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 the (geometric) micro averages should be lower than the (arithmetic) macro averages by about 5 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 so simply as 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 micro average rate of growth of value added per person and the corresponding macro average 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 years period between these productivity levels and size.

#### IV. 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 will usually overlap 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 classification (in nine service industries), and by other attributes which are usually viewed as contributing to the firm heterogeneity. These are three indicators of specialization (within five digit sub-industries), location (Paris region versus the provinces),



and form of ownership (corporate firms versus non-corporate firms).

Tables 5 and 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 micro-data 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 5 and 6.

Table 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" and "transitory" dispersion and we have computed the corresponding correlations between the 1984 and 1987 levels.<sup>26</sup>

The main message of Table 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 across and within industry, and the operating income 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 to be 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 graphs for these two industries. Legal Services (7708) have the highest average operating income to sales margin while 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 Figure 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 industries with the largest and (almost) smallest changes in the operating income margin: +7.5 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 Figure 2).

Average value added per person in Legal Services is twice that in Personnel Supply Services (260 thousand francs per person as against 130 thousand), and the lower half of the

distribution in the first industry overlaps approximately with the upper half of the distribution in the second one (see Figure 3). These two industries have also the strongest and (almost) the slowest three years productivity increase: 24 and 1.6 percent respectively, but the corresponding distributions at the firm level overlap fully, except for the lower tail in Personnel Supply (see Figure 4).

Besides providing overwhelming evidence of huge dispersion, Table 5 suggests two additional observations. The first is the predominance of industry effects in explaining the heterogeneity of productivity and profitability ratios across firms. Comparing the overall, 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 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, taking 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 Appendix Table A6). 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 less and more 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. While the industry classification contributes importantly to reducing the variability in levels, it has only a small impact 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 while 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 6 for 1987 levels.<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 which are more diversified. Whenever it is possible, this distinction is made at the most detailed level of the industrial classification used in the survey. As can be seen in Panel A of Table 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 "sub-industries" in Legal Services, three 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 sub-industries are highly specialized, over three quarter 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 "Ile de France") and in the rest of France. Almost half of the large (more than 20 employees) service firms are located in the Paris region, thus providing another 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 impact 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 as compared to the provinces. It may be the case (for example in Legal services) that competition is more intense in the Paris region and hence that firms would have to be more productive and would tend to be less profitable. However, more likely, the observed differences reflect largely price differentials rather than true productivity differences. Wages are notoriously higher in Paris and Ile de France than in the rest of the country (due to 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 non corporate even though they have more than 20 employees. Unfortunately the distinction in the legal status of a firm does not correspond to the distinction which is *a priori* more relevant of managerial and non-managerial ownership, since managers may also control the stock majority in corporate companies. The two should be at least positively correlated and one might thus expect that non corporate firms would 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, which may correspond to the fact that they charge higher prices for their services on average (and pay higher wages), as much as it means real productivity superiority. 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, while it is higher for non corporate firms in Restaurants and in Accounting Services.

## V. 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 averages differences; to exemplify the extreme variability of such performances at the firm level, and attempt to decompose it in terms of heterogeneity components and intrinsic dispersion. Along the way, we have touched upon a number of issues which 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 less than 20 salaried employees), for which only a representative sample is surveyed. It will 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 (say, 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 micro averages of our indicators of firms performances are a reflection of the underlying distributions of the variables



of interest and their interrelations. Such discrepancies raise in fact interesting questions about the relationships 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 micro level 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 2300 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. We have compared these averages indicators for more or less inclusive sample definitions, going from the survey of all firms to a "balanced" and "cleaned" panel data sample of large firms, and for the two kinds of averages usually considered in macro and micro-analyses. 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, while 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 years productivity increase: about 24 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.

## Footnotes

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 "counselling", and Computer Processing, Personnel Supply and Building Cleaning, which are more in the nature of "doing". One should also note that Personnel Supply are not readily comparable to the other services in the sense that temporary workers could be considered as an intermediate input, and not as labor (as 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 years differences in logarithms, while the absolute changes are considered for the value added and operating income to sales ratios. Since 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 indices, which are available at the four digit of the industrial activity classification. These industry price indices are themselves rather rough; the deflated figures should be,

however, more akin to real productivity indicators and more comparable across industries. While 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 which are expressed naturally in percentages (of total sales).

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.

6. The survey is "une enquete 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 enquete 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, since 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 twenty and more salaried employees) have been sent for the 1987 survey in March 1988. The rate of non-response has been about 20%, nearly half of which corresponds to firms which have ceased their activities in 1987. Among the questionnaires returned, another 7% were also for firms interrupting their activities, and some additional 14% were not usable for various reasons. In terms of number of firms the rate of missing, incomplete or erroneous data is thus about 20%, but is only about 6% 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 infra-regional levels. For more information, see the publications presenting the survey results for the various years.

8. The parts of the questionnaire which 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.

9. The figures we give for the "large firms" (of 20 and more salaried employees) are those we have computed on the basis of the data we have had access to. They differ to some extent from the corresponding figures which have been published. These are corrected in various ways to reintroduce firms still existing, but which for some reasons have been allowed to not report or to send back incomplete questionnaires. For example, the published numbers are about 6.5% 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% of the total number of persons in 1984 or 1987). Similarly, we have not considered the firms which 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 less than 20 salaried employees in 1984. We thought preferable, however, to keep the few firms with 20 or more salaried employees in 1984, which reported less than 20

salaried employees in the following years, but continued answering the detailed questionnaire sent to them.

11. To be more precise, about 50 percent of the firms which 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, due to 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.

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

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.

14. Considering per se the group of firms which we clean out of our sample is not a priori very interesting, since 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 macro-average 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 (that is, 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.

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.

17. We have 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, since the profitability margins we consider are proportions varying between 0 and 100%, 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 footnote 14); 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) micro averages and their



(arithmetic weighted) macro averages in levels. However, this source proved to be negligible in our case.

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 macro average levels of our two productivity indicators are smaller than the micro ones.

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).

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 which parallel these standard deviation numbers are given in Table A6 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.

28. This statement must be, of course, qualified: it applies to firms which are already large enough, since 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 less 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.

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.

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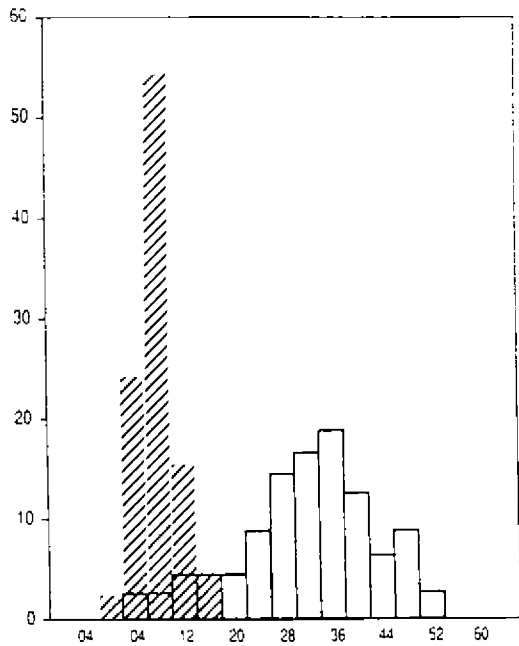


Figure 1

Distributions of the 1987 Levels of Firms Operating Income to Sales Ratios for Legal Services and Personnel Supply Services

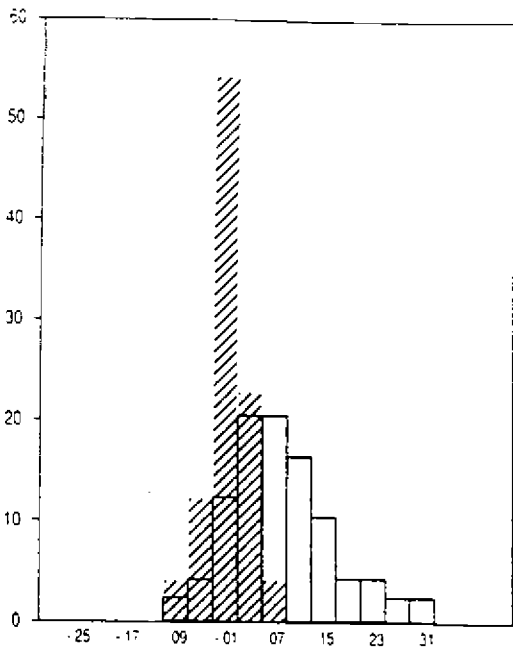


Figure 2

Distributions of the 1984-87 Changes in Firms Operating Income to Sales Ratios for Legal Services and Personnel Supply Services

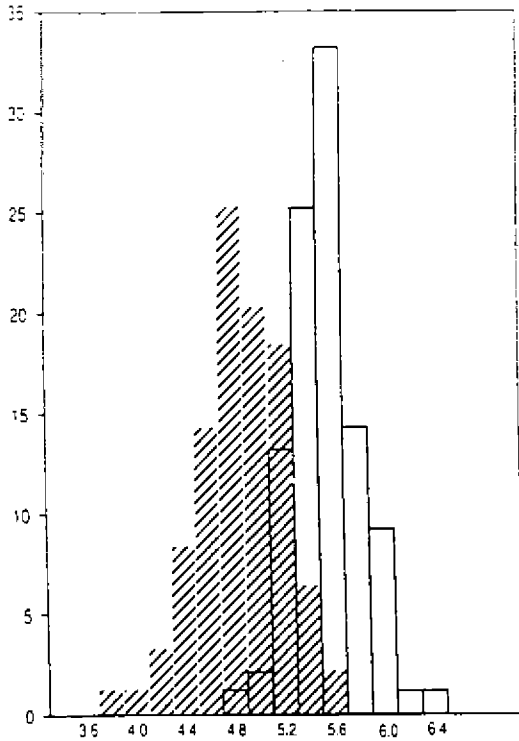


Figure 3

Distributions of the 1987 Levels of Firms Value Added per Person for Legal Services and Personnel Supply Services

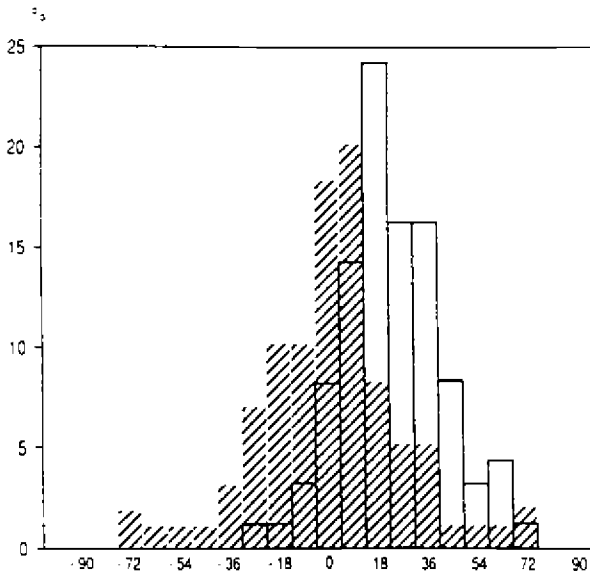


Figure 4

Distributions of the 1984-87 Changes in Firms Value Added per Person for Legal Services and Personnel Supply Services

Table 1

Detailed Questionnaire for Large Firms  
(with 20 or More Salaried Employees on December 31 of the year of the Survey)

---

I. - Firm characteristics

Identification Number (called SIREN)

Address

Legal form of organization

Tax system

II. - Conditions of activity

End and length of fiscal year

Description of the activity (creation, merger, modification of  
ownership, disappearance...)

III.- Employment and wages

Number of salaried workers: supervisory, non-supervisory, part-  
timers, and family workers

Quarterly distribution of salaried workers and number of hours  
worked

Non-salaried workers

Earnings and fringe benefits

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

V. - 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

---



Table 1 (Continued)

Detailed Questionnaire for Large Firms  
(with 20 or More Salaried Employees on December 31 of the year of the Survey)

---

VI.- Capital and Investments

Total capital outlays of 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; second-hand transportation equipment; new machinery and other equipment; second-hand machinery and other equipment.

VII.- Breakdown of expenditures varying according to the different industries

Including in particular:

Goods purchased for resale

Interindustry exchanges

Rented capital (materials and properties)

Sub-contracting

---

Table 2

Total Number of Persons in the Survey and Sample in 1987

	Number of Persons in thousands				Corresponding Proportions in percent		
	All Firms	Large Firms	Continuing Firms	Sample	Large/ All	Continuing/ Large	Sample/ Continuing
6701 Restaurants	258.1	40.6	28.4	19.1	15.7	70.0	67.2
670R Hotels	161.0	38.9	26.9	23.3	24.1	69.1	86.6
7701 Engineering	108.5	59.3	45.7	32.7	54.7	77.1	71.6
7703 Computer Programming	98.5	44.7	25.9	19.2	45.4	57.9	73.7
7704 Computer Processing	41.4	25.6	21.1	13.9	61.8	82.4	65.9
7708 Legal Services	106.9	16.5	12.6	8.4	15.5	75.9	66.7
7709 Accounting	95.3	35.2	26.4	19.5	36.9	75.0	73.9
7713 Personnel Supply	171.2	159.1	142.8	123.6	92.9	89.8	86.6
8708 Building Cleaning	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

Table 3

## Productivity and Profitability in the Survey and Sample

	Value Added Per Person			Operating Income to Sales Ratio			
	All Firms	Large Firms	Continuing Firms	Sample	Large Firms	Continuing Firms	Sample
<u>Panel A: Average Levels in 1987</u>							
6701 Restaurants	116.2	167.9	171.1	179.8	13.7	14.2	14.5
670R Hotels	154.7	208.6	224.2	231.6	23.2	23.7	24.3
7701 Engineering	245.3	295.2	297.7	297.9	6.3	6.1	9.5
7703 Computer Programming	267.5	360.7	375.8	350.6	17.3	17.0	14.4
7704 Computer Processing	298.8	335.0	326.3	314.4	25.0	23.6	23.2
7708 Legal Services	242.1	329.1	324.1	306.2	28.0	29.4	30.9
7709 Accounting	233.7	260.4	238.1	256.5	15.7	14.9	15.0
7713 Personnel Supply	136.3	136.7	135.9	136.0	8.3	8.5	8.5
8708 Building Cleaning	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

Table 3 (Continued)

	Value Added Per Person			Operating Income to Sales Ratio			
	All Firms	Large Firms	Continuing Firms	Sample	Large Firms	Continuing Firms	Sample
<u>Panel B: Average Rates of Growth 87/84</u>							
6701 Restaurants	-0.1	7.0	4.8	8.6	1.9	2.2	2.9
670R Hotels	-1.2	-4.6	2.4	-2.9	1.0	1.6	1.9
7701 Engineering	-6.7	1.4	-1.8	4.1	0.1	-0.6	1.9
7703 Computer Programming	5.5	-0.5	1.0	5.6	0.5	-1.6	-1.0
7704 Computer Processing	9.3	14.3	12.5	14.3	4.0	1.8	2.3
7708 Legal Services	28.4	37.8	32.2	29.3	6.3	8.5	7.5
7709 Accounting	16.2	10.5	9.0	11.2	1.3	1.0	1.6
7713 Personnel Supply	-2.4	-3.5	-6.3	-6.4	-0.1	-0.1	-0.1
8708 Building Cleaning	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

Table 4

## "Macro" and "Micro" Averages Computed From the Sample

	Sales Per Person		Value Added Per Person		Value Added to Sales Ratio		Operating Income to Sales Ratio	
	Macro	Micro	Macro	Micro	Macro	Micro	Macro	Micro
<u>Panel A: Levels in 1987</u>								
6701 Restaurants	323.3	305.3	179.8	168.6	55.6	55.7	14.5	11.9
670R Hotels	364.0	305.3	231.6	189.1	63.6	62.6	24.3	21.5
7701 Engineering	523.5	405.7	297.9	263.4	56.9	67.1	9.5	11.0
7703 Computer Programming	541.1	495.0	350.6	338.2	64.8	70.7	14.4	13.9
7704 Computer Processing	505.2	342.3	314.4	234.7	62.2	70.1	23.2	20.1
7708 Legal Services	423.7	385.5	306.1	290.3	72.2	76.0	30.9	32.5
7709 Accounting	311.7	281.7	265.5	237.1	82.2	84.4	15.0	15.4
7713 Personnel Supply	164.8	161.0	136.0	148.1	93.9	92.1	8.5	7.7
8708 Building Cleaning	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

Table 4 (Continued)

"Macro" and "Micro" Averages Computed From the Sample

	Sales Per Person		Value Added Per Person		Value Added to Sales Ratio		Operating Income to Sales Ratio	
	Macro	Micro	Macro	Micro	Macro	Micro	Macro	Micro
<u>Panel B: Rates of Growth 87/84</u>								
6701 Restaurants	2.3	0.2	8.6	4.9	3.2	2.6	2.9	1.2
6708 Hotels	-5.0	-3.8	-2.9	-0.4	1.4	2.0	1.9	2.0
7701 Engineering	-1.6	5.5	4.1	5.9	3.1	-0.3	1.9	1.6
7703 Computer Programming	8.6	12.1	5.6	7.2	-1.9	-2.6	-1.0	-1.3
7704 Computer Processing	13.6	9.3	14.3	8.9	0.3	-0.4	2.3	0.3
7708 Legal Services	28.2	23.6	29.1	24.0	0.5	0.3	7.5	7.6
7709 Accounting	11.4	10.9	11.2	10.5	-0.1	-0.3	1.6	1.6
7713 Personnel Supply	-8.3	0.9	-6.4	1.6	1.9	0.7	-0.1	-0.3
8708 Building Cleaning	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

Table 5

Estimates of dispersion: Standard deviations  
Overall, Within Industries and Within Categories  
according to specialization, location and form of ownership

	Logarithm of sales per person	Logarithm of value added person	Value added to sales ratio	Operating Income to sales ratio
<u>Overall Dispersion</u>				
1984	0.63	0.54	0.16	0.10
1987	0.65	0.56	0.15	0.11
87/84	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 (84,87)	0.93	0.91	0.90	0.70
<u>Within Industry Dispersion<sup>(1)</sup></u>				
1984	0.35	0.32	0.10	0.09
1987	0.35	0.32	0.10	0.09
87/84	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 (84,87)	0.80	0.75	0.74	0.58
<u>Within Category Dispersion<sup>(2)</sup></u>				
1984	0.32	0.29	0.09	0.08
1987	0.32	0.30	0.09	0.08
87/84	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 (84,87)	0.77	0.70	0.73	0.57

Notes: (1) 9 industry parameters; (2) 71 industry and firm type parameters.

\* Permanent Dispersion:  $\sigma_{\alpha}^2$ ;  $\sigma_{\alpha}^2 = (\sigma_{84}^2 + \sigma_{87}^2 - \sigma_{87/84}^2) / 2$ .

\*\* Transitory Dispersion:  $\sigma_{\epsilon}^2$ ;  $\sigma_{\epsilon}^2 = (\sigma_{87/84}^2) / 2$ .

Table 6  
Estimates of Main Effects in 1987

	% of firms in first category	Sales per person	Value added per person	Value added to sales	Operating income to sales
<u>Panel A: Influence of Specialization</u>					
Less specialized versus more specialized					
<u>Overall</u>	22.3	.10**	.09**	-.01	.01
<u>Within sub-industries</u>					
6701 Restaurants	14.1	.07	.13**	.03	.04**
77011 - Buildings	23.2	-.08	-.14	-.03	-.06
77012 Engineering - Infrastructures	36.1	.11	-.02	-.07	-.05
77013 Services in: - Manufacturing	16.1	.25	.15	-.06	-.02
7701R - Other	17.6	.13	.09	-.03	-.02
7704 Computer processing	19.2	.26*	.23*	-.03	.02
77092 Legal - Proper	18.1	.15**	.15**	.00	.00
7709R Services - Other	27.9	.16**	.17**	.01	.02
87081 Building - Residential	29.4	.02	-.03	-.03	-.02
87082 Cleaning - Commercial	37.4	.03	.04	.01	.00
87084 Services: - Industrial	34.8	-.04	-.06	-.02	.01
8708R - Other	12.1	.47**	.29**	-.12**	-.01
<u>Panel B: Influence of location</u>					
Paris versus Provinces					
<u>Overall</u>	47.3	.17**	.19**	.01	-.01*
<u>Within Industries</u>					
6701 Restaurants	60.9	.16**	.20**	.02	.00
670R Hotels	34.5	.10**	.15*	.04*	.00
7701 Engineering services	52.7	.27**	.27**	.00	.01
7703 Computer programming	74.0	.04	.15	.06	.00



Table 6 (Continued)

## Estimates of Main Effects in 1987

		% of firms in first category	Sales per person	Value added per person	Value added to sales	Operating income to sales
<u>Panel B: Influence of location (Continued)</u>						
Paris versus Provinces						
<u>Within Industries</u>						
7704	Computer processing	41.0	.25*	.22*	-.02	.02
7708	Legal services	48.1	.44**	.26**	-.11**	-.06*
7709	Accounting services	24.0	.28**	.25**	-.02*	-.02
7713	Personnel supply	61.5	.19**	.20**	.01	.01*
8708	Building cleaning	47.1	.03	.05	.01	-.02**
<u>Panel C: Influence of Form of Ownership</u>						
Corporate versus Non-Corporate						
<u>Overall</u>		57.9	.11**	.09**	-.01*	.00
<u>Within Industries</u>						
6701	Restaurants	68.6	.09**	.08*	.00	.03**
670R	Hotels	74.4	.10**	.15**	.03*	.02
7701	Engineering services	70.8	.20**	.06	-.08**	-.02
7703	Computer programming	81.6	.03	.08	.01	.03
7704	Computer processing	62.8	.43**	.34**	-.07**	.04*
7708	Legal services	90.3	.03	-.03	-.04	.07**
7709	Accounting services	84.2	.10**	.12**	.01	.03**
7713	Personnel supply	56.6	.02	.02	-.01	-.01
8708	Building cleaning	37.1	.00	.01	.01	-.01

Appendix Table A1

Illustrative Statistics for the French Market Services Sector,  
Two Digit Level of the French Classification (NAP), 1987

	Number of firms		Number of persons		Sales (in 10 <sup>6</sup> francs)		Value added per person (in 10 <sup>6</sup> francs)		Operating income to sales ratio in %	
	All Firms	Large Firms	All Firms	Large Firms	All Firms	Large Firms	All Firms	Large Firms	All Firms	Large Firms
Service Industry (two digit NAP)										
56 Recycling	4505	191	21229	7996	16105	8207	202	254	8.3	
66 Repair services	13663	119	29540	6841	6392	2021	117	175	10.2	
67 Hotels, Cafes,										
Restaurants	157871	1686	594390	135876	143697	40075	127	163	12.3	
74 Travel Agencies	1777	159	25084	15371	26777	18031	222	252	5.8	
77 Business Services	1137405	5481	995445	536367	368170	207559	207	222	10.6	
78 Insurance	22062	129	67210	9152	18171	3857	195	297	13.9	
79 Real Estate Management	26905	473	106180	25643	71987	23480	251	341	12.1	

Appendix Table A1 (Continued)

Illustrative Statistics for the French Market Services Sector,  
Two Digit Level of the French Classification (NAP), 1987

	Number of firms		Number of persons		Sales (in 10 <sup>6</sup> francs)		Value added per person (in 10 <sup>3</sup> francs)		Operating income to sales ratio in %
	All Firms	Large Firms	All Firms	Large Firms	All Firms	Large Firms	All Firms	Large Firms	
Service Industry (Two digit NAP)									
80 Automobile and Equipment									
Renting	8372	243	38380	20845	26653	13743	483	455	43.3
81 Real Estate Agencies	8996	589	88658	71405	68616	56404	463	461	38.8
86 Motion Pictures and Television	3549	257	63987	46431	34798	26782	288	323	25.5
87 Personal services	87836	1603	437063	204190	61335	27776	97	101	11.7

Appendix Table A2

	Total Number of Firms in the Survey and Sample				Corresponding Proportions in Percent			
	Number of Firms in 1987							
	All Firms	Large Firms	Continuing Firms	Sample	Large All	Continuing/ Large	Sample/ Continuing	
6701 Restaurants	61743	797	402	312	1.3	50.4	77.6	
670R Hotels	28463	567	297	235	2.0	52.4	79.1	
7701 Engineering	15307	658	391	277	4.3	59.4	70.8	
7703 Computer Programming	15351	523	171	144	3.4	32.7	84.2	
7704 Computer Processing	3282	346	231	156	10.5	66.8	67.5	
7708 Legal Services	20418	413	276	216	2.0	66.8	78.3	
7709 Accounting	12696	712	416	367	5.6	58.4	88.2	
7713 Personnel Supply	742	451	290	205	60.8	64.3	70.7	
8708 Building Cleaning	7232	820	497	407	11.3	60.6	81.9	
Total	165234	5287	2971	2289	3.2	56.2	77.0	

Appendix Table A3

## Average Size and Growth of Employment in the Survey and Sample

	Number of Persons Per Firm in 1987			Growth Rate of Number of Persons 87/84				
	All Firms	Large Firms	Continuing Firms	Sample	All Firms	Large Firms	Continuing Firms	Sample
6701 Restaurants	4.2	50.9	70.7	61.2	4.2	-2.5	0.7	3.1
670R Hotels	5.7	68.6	90.6	99.0	8.7	9.7	-5.3	1.6
7701 Engineering	7.1	90.2	117.0	117.9	2.6	-8.1	-4.2	-5.8
7703 Computer Programming	6.4	85.4	151.2	167.7	60.6	61.3	33.0	28.3
7704 Computer Processing	12.6	74.0	91.3	88.8	6.3	-4.8	5.4	8.5
7708 Legal Services	5.2	40.2	45.6	38.6	1.8	-7.5	2.2	2.8
7709 Accounting	7.5	49.5	63.4	53.2	11.9	21.2	9.7	10.0
7713 Personnel Supply	230.8	352.8	492.3	602.7	64.5	66.9	76.4	74.7
8708 Building Cleaning	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

Appendix Table A4

## Comparison of Firms Leaving and Entering the Large Firms Data Set from 1984 to 1987

	Number of Firms		Number of Persons Per Firm		Value Added Per Person		Operating Income to Sales Ratio	
	Leaving	Entering	Leaving	Entering	Leaving	Entering	Leaving	Entering
6701 Restaurants	353	395	37.9	30.7	143.6	160.4	11.3	12.6
6709 Hotels	215	270	32.8	44.4	216.7	173.5	21.4	21.8
7701 Engineering	256	267	65.8	51.0	256.6	286.6	4.6	6.8
7703 Computer Programming	123	352	67.3	53.5	339.9	339.9	13.4	17.8
7704 Computer Processing	129	115	53.2	39.2	302.0	375.4	19.3	30.8
7708 Legal Services	203	137	27.6	29.2	224.9	344.5	23.8	25.0
7709 Accounting	151	296	33.3	29.9	230.3	267.0	16.8	17.9
7713 Personnel Supply	152	161	95.0	101.8	122.5	142.9	7.4	7.2
8708 Building Cleaning	218	323	69.4	107.0	88.2	77.7	12.2	10.0
Total	1800	2316	51.5	53.9	196.0	198.4	12.1	15.1

Appendix Table A5

Decomposition of the Change in Total Number of Persons  
For the Large Firms Data Set from 1984 to 1987

	Decrease for Leaving	Increase for Entering	Resulting Variation	Variation for Continuing	Total Variation
Panel A: Absolute Change of Total Number of Persons in Thousands					
6701 Restaurant	13.4	12.1	-1.3	0.2	-1.1
670R Hotels	7.0	12.0	4.9	-1.5	3.4
7701 Engineering	16.8	13.6	-3.2	-2.0	-5.2
7703 Computer Programming	8.3	18.8	10.6	6.4	17.0
7704 Computer Processing	6.9	4.5	-2.4	1.0	-1.4
7708 Legal Services	5.6	4.0	-1.6	0.3	-1.3
7709 Accounting	5.0	8.9	3.8	2.3	6.1
7713 Personnel Supply	14.4	16.4	1.9	61.8	63.7
8708 Building Cleaning	15.1	34.6	19.42	2.0	21.4
Total	92.6	124.9	32.2	70.6	102.8

Appendix Table A5 (Continued)

Decomposition of the Change in Total Number of Persons  
for the Large Firms Data Set

	Decrease for Leaving	Increase for Entering	Resulting Variation	Variation for Continuing	Total Variation
Panel B: Growth Rate of Total Number of Persons in %					
6701 Restaurants	32.2	29.2	-3.0	0.5	-2.5
670R Hotels	19.9	33.8	13.9	-4.2	9.7
7701 Engineering	25.7	20.8	-4.9	-3.1	-8.1
7703 Computer Programming	29.9	68.0	38.1	23.2	61.3
7704 Computer Processing	25.6	16.8	-8.8	4.0	-4.8
7708 Legal Services	31.3	22.3	-9.0	1.5	-7.5
7709 Accounting	17.3	30.5	13.2	8.0	21.2
7713 Personnel Supply	15.1	17.2	2.1	64.8	66.9
8708 Building Cleaning	11.8	27.0	15.2	1.5	16.7
Total	19.8	26.8	7.0	15.1	22.1



Appendix Table A6

Coefficients of determination  $R^2$  for industry effects only  
and for all effects with interaction\*

	Logarithm of sales per person LQY_N	Logarithm of value added per person LQVC_N	Value added to sales ratio VC_Y	Operating Income to sales ratio OIT_Y
<u><math>R^2</math>: Industry Effects</u>				
1984	0.68	0.65	0.63	0.27
1987	0.70	0.67	0.60	0.39
87/84	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 (84,87)	0.64	0.56	0.55	0.34
<u><math>R^2</math>: All Effects</u>				
1984	0.74	0.72	0.67	0.33
1987	0.75	0.73	0.65	0.45
87/84	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 (84,87)	0.59	0.50	0.53	0.32

\*The  $R^2$  in this table are computed from the corresponding standard deviations in Table 2.