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INTERNAL AND EXTERNAL LABOR MARKETS: AN ANALYSIS OF MATCHED LONGITUDINAL EMPLOYER-EMPLOYEE DATA

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ABSTRACT

We decompose the real annual full time compensation costs of 1.1 million French workers followed over 12 years into a part that reflects their external opportunity wage and a part that reflects their internal wage rate. Using these components of compensation we investigate the extent to which firm-size wage differentials and inter-industry wage differentials are due to variability in the external wage (person effects) versus variability in the internal wage (firm effects). For France, we find that most of the firm-size wage effect and most of the inter-industry wage effect is due to person effects–differences in the external wage rates.

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1. Introduction

For more than three decades, since the publication of Gary Becker's classic treatise on human capital in 1964 and Jacob Mincer's fundamental empirical analysis of earnings in 1974, the study of wage determination has relied heavily on models of labor supply and the analysis of individual wage outcomes. The supply-based models considered the labor market as a whole, the external market, to represent essentially all of the economically important possibilities for the individual. Glenn Cain recognized in 1976 that the labor supply based analysis of earnings determination would have difficulty explaining the internal (to the firm) market phenomena that were then called the "segmented" labor markets. In 1986 both Sherwin Rosen and Robert Willis called for increased analysis of matched employer-employee data as a necessary part of the unification of the supply and demand side models of compensation and employment outcomes. The external labor market represents a heterogeneous collection of employment opportunities that might be available as an alternative to any particular person's current job. The internal labor market represents a heterogeneous collection of compensation and human resource management policies that describe the career possibilities for an individual who does not change employers. There is now a general consensus within labor economics that symmetric modeling of the employee and employer outcomes and detailed information on both the employer and employee are essential to distinguish internal and external labor market factors. More importantly, longitudinal data on employers and employees, data in which individuals are observed at multiple employers and a significant percentage of employees are observed within sampled firms, are required to identify the basic individual and firm effects that are at the heart of internal and external labor market models and descriptions.

We begin our analysis by supposing that real compensation costs per employee can be described as the sum of effects due to observable human capital investments by the individual, heterogeneous individual factors revealed to the labor market (but not to the statistician, except by inference) and heterogeneous employer factors. The internal labor market is modeled as factors specific to the employing firm. These include the firm effect in the compensation equation and also the firm's choices regarding the distribution of individual characteristics (including unobservable heterogeneity). The external labor market is the description of the opportunities available to a given individual at a given time. These include the returns to human capital and the returns to search among the heterogeneous potential employers. Building on the analysis of Abowd, Kramarz and Margolis (1996, AKM hereafter) we define a measure of an employee's external wage rate that depends the worker's labor market characteristics and the characteristics of other the worker's other wage outcomes (those observed at different employers). We also define an internal-external wage differential that we show depends only upon the firm's compensation policy and the correlation of its human resource management policies with the other firm policies in the labor market. Our measure of the internal-external wage gap can only be identified using longitudinal data on employees and employers. We use estimates from AKM to assess the correlation among the observable human capital, individual heterogeneity, and firm heterogeneity components of compensation. We then use our sample estimates to examine the sources of inter-industry wage differentials and firm-size wage differentials for French firms. For France, person and firm effects are positively, but weakly correlated. The firm-size wage effect is due almost entirely to variation in the external wage rate (person effects). Ninety percent of the inter-industry wage differential is due to variation in the external wage rate.

There are two major barriers to the statistical and economic analysis of models with unobservable personal and firm heterogeneity. First, one must be able to quantify the components of pay related to individual characteristics, individual heterogeneity, employer characteristics and employer heterogeneity. In an imperfectly designed sample, one may not be able to distinguish among individual and firm effects and may, as a consequence, attribute too much of the empirical variation to one source. This purely statistical phenomenon places heavy demands upon the data--demands that can only rarely be satisfied. Second, in the face of the measured heterogeneity of labor market outcomes among individuals and among employers, modeling the economic structure of the worker's "opportunity wage" or the firm's "internal compensation policy" is not straightforward, even if statistical components associated with the individual or the firm are estimable.

Section 2 presents a linear model of components of compensation based upon a statistical decomposition of real annual compensation costs per employee. The relation between various sources of heterogeneity in wages and inter-industry or firm-size differentials is explained. Section 3 describes our analysis of a matched longitudinal sample of French employers and employees. Section 4 presents our results on the employer size-wage differential. Section 5 presents our results on the inter-industry wage differential. Section 6 concludes.

2. A model of internal and external wages

We begin with a straightforward model, taken directly from AKM, for the statistical structure of individual compensation:

$$w_{it} = \theta_i + \psi_{J(i,t)} + x_{it}\beta + \varepsilon_{it} \tag{1}$$

where w_{it} is the natural logarithm of pay per unit of time for individual i in period t; θ_i is the part related to the individual, including observable non-time-varying characteristics; $\psi_{J(i,t)}$ is the part related to the firm;[1] $x_{it}\beta$ is the part related to individual and general time-varying characteristics; ε_{it} is the idiosyncratic part uncorrelated with θ, ψ, and $x\beta$; and the function J(i,t) gives the identity of the employing firm. For a sample of N individuals followed over $t = 1,\ldots,T_i$ years, the general statistical structure of equation (1) is:

$$\mathrm{E}\begin{bmatrix} \theta_i \\ \psi_{J(i,t)it} \\ x_{it}\beta \\ \varepsilon_{it} \end{bmatrix} = \begin{bmatrix} \mu \\ 0 \\ \bar{x}\beta \\ 0 \end{bmatrix} \tag{2}$$

$$\mathrm{V}\begin{bmatrix} \theta_i \\ \psi_{J(i,t)it} \\ x_{it}\beta \\ \varepsilon_{it} \end{bmatrix} = \begin{bmatrix} \sigma_{\theta\theta} & \sigma_{\theta\psi} & \Sigma_{\theta x}\beta & 0 \\ \sigma_{\psi\theta} & \sigma_{\psi\psi} & \Sigma_{\psi x}\beta & 0 \\ \beta'\Sigma_{x\theta} & \beta'\Sigma_{x\psi} & \beta'\Sigma_{xx}\beta & 0 \\ 0 & 0 & 0 & \sigma_{\varepsilon\varepsilon} \end{bmatrix} \tag{3}$$

where μ is the overall intercept of w, Σ is the covariance matrix for [θ, ψ, x] and σ represents elements of Σ. Using data for 1.1 million French workers followed from 1976 to 1987, AKM estimated that the covariance matrix in equation (3) had the form shown in Table 1.[2]

Equations (1) to (3) can be used to construct direct measures of an individual's internal and external wage rate. Define the internal wage rate as the expected wage rate, given employment in firm j:

$$\mathrm{E}\left[w_{it} \middle| \theta_i, x_{it}, \mathrm{J}(i,t) = j\right] = \theta_i + \psi_{jit} + x_{it}\beta \tag{4}$$

Define the external wage rate, w^a, as the expected wage rate alternative employment in a firm other than j:

$$\mathrm{E}\left[w_{it}^a \middle| \theta_i, x_{it}, J(i,t) = j' \neq j\right] = \theta_i + \mathrm{E}\left[\psi_{j'} \middle| \theta_i, x_{it}\right] + x_{it}\beta \tag{5}$$

The expectation in equation (5) is taken over all possible employers $j' \neq j$ according to the distribution of employer effects in the population of employees conditional on the individual effect and observable characteristics. We assume that the expectation on the right-hand side of equation (5) is zero. Hence, the expected difference between an individual's internal and external wage rate is given by:

$$\mathrm{E}\left[w_{it} - w_{it}^a \middle| \theta_i, x_{it}, \mathrm{J}(i,t) = j\right] = \psi_j .$$

In data where individual and firm characteristics are both observable for representative longitudinal samples of the relevant populations, a natural estimator of the gap between an individual's internal and external wage rate is given by the least squares estimator of equation (1) from the sample of individuals for the vector of firm effects $\hat{\psi}_j$ for $j = 1, \ldots J$, where J is the total number of firms in the sample. Similarly, a natural estimator for the individual-specific component of the wage rate is the least squares estimator of the person effects $\hat{\theta}_i$ for $i = 1, \ldots N$. This leads to the natural least squares decomposition of equation (1). The statistical problem arises because the full least squares solution to equation (1) is difficult or impossible to compute for samples sufficiently large to permit estimation of a reasonable percentage of the firm effects. AKM propose a solution based upon the use of a set of variables z_{it} that do not appear in the model (1) and for which they maintain the assumptions $Cov\left[\theta_i, \psi_{J(i,t)} | Z\right] = 0$ and $Cov\left[x_{it}, \psi_{J(i,t)} | Z\right] = 0$ for all $t = 1, ..., T_i$ and $i = 1, \ldots, N$, where Z is the matrix of all observations of the variables z_{it}. Under these maintained assumptions, there are a variety of potential estimators for the effects in equation (1). In this paper we focus on the implications of the estimator in which the person effects are estimated first and the firm effects are estimated second, conditional on z_{it}. The estimation formulas give the following statistical decomposition of equation (1):[3]

$$w_{it} = \hat{\theta}_i + x_{it}\hat{\beta} + z_{it}\hat{\lambda} + \hat{u}_{it} \tag{6}$$

$$\hat{u}_{it} = \hat{\psi}_{J(i,t)} + \hat{\varepsilon}_{it} \tag{7}$$

where the circumflex over the indicated effect means that it was estimated by least squares in the given equation, either (6) or (7). An individual's estimated internal wage rate is then

$$\hat{w}_{it} = \hat{\theta}_i + \psi_{J(i,t)} + x_{it}\hat{\beta} \tag{8}$$

and an individual's estimated external wage rate is

$$\hat{w}_{it}^{a} = \hat{\theta}_i + x_{it}\hat{\beta} \tag{9}$$

An alternative to direct estimation of the internal-external wage difference is to use estimates of the person and firm effects to decompose conventional aggregated components of compensation, such as industry effects or firm-size effects, into the part due to person and firm effects. Suppose that one considered the following model as an alternative to equation (1):

$$w_{it} = \kappa_{K(i,t)} + x_{it}\beta + \varepsilon_{it} \tag{10}$$

where the effect κ measures the effect of some aggregation, say industry or firm size, and the function K(i,t) classifies the individual into the aggregated category k. AKM show that the least squares estimator of κ can be expressed as a properly-weighted average of the average person and firm effect within the category k:

$$\hat{\kappa}_k = \overline{\theta}_k + \overline{\psi}_k \qquad (11)^4$$

where $\overline{\theta}_k$ and $\overline{\psi}_k$ are the average firm and person effect, respectively, in category k, given the individual characteristics, x.[5] The interpretation of equation (11) is also straightforward: given the individual characteristics, x, the measured average effect of being in a category k consists of the amount by which the external wage rate differs from the average ($\overline{\theta}_k - \mu$) plus the amount by which the internal wage rate differs from the average ($\overline{\psi}_k - 0$), in both cases given x.

3. Characteristics of the French longitudinal matched employer-employee data

Our analysis sample is the same one used by AKM. The reader is invited to consult the data appendix therein for details on the construction of the employee and firm characteristics. We review only the variables used in the present analysis.

The longitudinal sample of employees is a 1/25th sample of all persons for whom employers filed the mandatory "Déclaration annuelle des salaires," (DAS) the French equivalent of the American Social Security earnings report (see INSEE 1990c and Lollivier undated). A person is sampled if he or she was born in October of an even year.

Once sampled, all data from 1976 until 1987 are available (except for the years 1981 and 1983 when the underlying administrative data were not sampled). We converted the reported net salaries of the sampled individuals into annual equivalent real total compensation cost using information on the days worked during the year and on the employer/employee payroll tax rates in effect each year.[6] From the DAS and supplemental sources, AKM were able to measure labor force experience, education, sex, region of employment and seniority at the employing firm. These variables, as well as data year, were included in the statistical model for estimating the coefficients β in equation (1). The effect of observable characteristics was fully-interacted in sex and included unrestricted individual and firm effects.[7] For the present paper, the internal-external wage differentials given in equation (7) and (8) for the DAS individuals were estimated using the AKM estimates of $x_{it}\hat{\beta}$.

Our sample of firms is also the same one used by AKM from the Echantillon d'entreprises (INSEE 1990a,b). The EE sample of 21,642 firms is representative of private French industry. The agricultural and governmental sectors were not sampled. A firm (entreprise) is a business unit engaged in a principal economic activity that involves substantially all of the component establishments. For all firms, regardless of their presence in the Echantillon d'entreprises (EE), an estimate of the size of the firm is available based on the sampling method used for the DAS. The firm size measure, used below, is an estimated of average employment over the calendar year for all the sampled years that the firm appears in the DAS.

Table 2 summarizes the pattern of individual responses and employers in our analysis data set. An important consideration in the identification of the person and firm effects in equation (1) is the extent of within-sample mobility between firms. Column 1a of Table 2 shows that a very large fraction of our single-employer individuals worked for a firm that employed a worker who also worked for another firm in the sample. This feature of large administrative databases is the reason why we are able to estimate person and firm effects for almost 90% of the observations.

4. Results of the analysis of firm size-wage differentials

To study the extent to which the firm size-wage differential is related to our measure of the internal-external wage gap, we constructed an estimate of $\hat{\kappa}_k = \overline{\theta}_k + \overline{\psi}_k$ in equation (11) for 25 firm size cells as shown in Table 3. As is clear from the table, French firms display the same strong firm-size wage relation that Brown and Medoff (1989) found for American firms.[8] The column labeled "Raw firm size effect" shows the estimated differential for firms of that size as compared to 0, the arbitrary reference point, and is the estimated $\hat{\kappa}_k$, controlling for x. The column labeled "Average person effect" shows the average, within firm-size cell, of the person effects, again controlling for x, and is the estimated $\overline{\theta}_k$. Finally , the column labeled "Average firm effect" shows the average, within firm-size cell, of the firm effects, again controlling for x, and is the estimated $\overline{\psi}_k$. Figure 1 presents the results graphically. Except for the largest firm size, virtually all of the firm-size wage effect in France is explained by the average person effect in the firm-size group. In France, the largest firms are almost all stock-based companies in which the government is the sole or majority shareholder. The presence of a firm-size effect in the wage rates of the employees of these firms that is not due to a high average person effect could be interpreted as evidence of rent splitting between the government and the employees of these firms. Alternatively, these firms may also be the ones that use technologies most conducive to compensation plans that involve a distinction between the internal and external wage rate.

5. Results of the analysis of inter-industry wage differentials

We also used our estimates of the internal-external wage differential to revisit the question of inter-industry wage differentials in France. Table 4 shows the basic inter-industry wage differentials at the 2-digit level for the sample of French firms. These basic differentials are adjusted for time-varying individual characteristics x, and non time-varying characteristics so that they represent only the unobservable personal and firm level heterogeneity. The column labeled "Raw industry effect" is our estimate of $\hat{\kappa}_k = \overline{\theta}_k + \overline{\psi}_k$ for the 2-digit industrial classification. The overall magnitude of the inter-industry wage differentials in France is not as great as in the U.S. (compare our weighted standard deviation of 0.098 to the Krueger and Summers, 1988, estimate of 0.160). The column labeled "Average person effect" shows the part of the inter-industry wage differential that is the average person effect within the industry, the estimated $\overline{\theta}_k$. The weighted adjusted standard deviation of this average person effects is 0.090, so that it is clear that the person effects represent the major part of the inter-industry wage differential in France. The column labeled "Average firm effect," is the average firm effect within the industry, the estimated $\overline{\psi}_k$. The weighted adjusted standard deviation of the firm effects is only 0.032; thus the firm effects account for only about 10% of the total inter-industry wage differential in France.[9] Virtually all of the inter-industry wage differential in France is due to the tendency to employ individuals with high external wage rates (high θ_i). Evidently, accounting for the higher external wage rates of employees in high wage industries is an important part of understanding the economic basis of these differentials.[10]

6. Conclusions

We have proposed a new measure of external wage rates that is identified in matched longitudinal individual-firm data. Using this measure, in conjunction with other firm and individual data, we have shown that virtually all of the firm-size wage effect (adjusted for individual characteristics) is due to the tendency of large firms to employ individuals with high external wage rates. Similarly, about 90% of the inter-industry wage differential, again adjusted for individual characteristics, is due to the tendency of high wage industries to employ individuals with high external wage rates. We believe that these calculations demonstrate, once again, the importance of matched individual-firm data, particularly longitudinal data, for understanding the structure of the labor market.

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[1] The firm effect may vary across individuals and over time because of individual-specific seniority effects, which we ignore in this discussion for simplicity.

[2] AKM actually estimate a model in which the individual effect is decomposed in to a part due to permanent (non-time-varying) individual characteristics and a part due to nonobservable (to the statistician) individual characteristics. The effect labeled θ in this paper is the full person effect from AKM. Similarly, the firm effect in AKM is decomposed into a part due to initial differences in firm compensation policies and a part due to differential slopes on seniority within the firm. The effect labeled ψ in this paper is the full firm effect from AKM.

[3] The estimator discussed here is called the order-dependent, persons first method in AKM. It is the of two estimators that they used for most of their analyses.

[4] The effect κ in this paper is called κ^{**} in AKM. The average person and firm effects within the category k are estimated conditional on the time-varying observable characteristics x and any observable non-time-varying personal characteristics (e.g. education and sex).

[5] For simplicity we have not used the matrix weighting formulas to express the averages in equation (9). If the variables x_{it} do not enter the equation, then these are simple averages but otherwise

[6] The difference between net salary and gross salary in the French reporting system is employee payments for social benefits (health insurance, retirement income, unemployment insurance, workers compensation, family support, etc.) which are collected through the imposition of a variable rate payroll tax. The difference between gross salary and total compensation costs is employer payments for these same social benefits, which are also collected through the imposition of a (different) variable rate payroll tax. We used the total compensation costs as our measure of the employee's wage rate.

[7] See AKM Table 3, column "Conditional Method, Persons First" for the full set of coefficients in this statistical analysis.

[8] The reported results adjust for the time-varying personal characteristics x and for measurable non time-varying personal characteristics (e.g. education) so that the person and firm effects reflect only nonobservable heterogeneity. The amount of the firm-size wage effect not related to differences in personal unobservable heterogeneity is much smaller in France than the amount reported by Brown and Medoff in their longitudinal analysis (their Table 2).

[9] The decomposition is not orthogonal because our method permits the average person and firm effects to be correlated across individuals, firms and industries. Our estimates are not comparable to Groshen (1991) because she cannot control for individual heterogeneity except through an observable occupation effect.

[10] It is interesting to note, especially in conjunction with the firm-size wage coefficient for the largest firm size category, that the estimated average person effect for the railroad transportation industry, a national monopoly called the SNCF, is large and negative while the average firm effect in this industry is large and positive. This again supports the rent-sharing interpretation we made above.

Covariance (above diagonal) Correlation (below)	Individual effect	Firm effect	Individual characteristics
Individual effect θ	0.1811	0.0027	0.0046
Firm effect ψ	0.1079	0.0042	0.0003
Individual characteristics $x\beta$	0.0787	0.0325	0.0192
Source: Abowd, Kramarz and Margolis (1996) Table VI, order dependent estimates with persons first. The correlations with the individual effect have been corrected for sampling variability (not required for the other correlations).			

Table 1

Covariances and Correlations among Components of Real Compensation for a Sample of French Workers

Years in Sample	Number of Employers			
	1	1a	2	3+
1	318,627	247,532		
2	75,299	57,411	51,066	
3+	298,572	254,105	203,710	219,031
Total	692,498	559,048	254,776	219,031

Note: Individuals in column 1a had only one employer but worked for a company employing a mover. N=1,166,305
Source: Abowd, Kramarz and Margolis, 1996, Table I.

Table 2

Distribution of French Workers by Number of Employers and Years in the Sample

Firm Size	N	Average Firm Size in Cell	Raw Firm Size Effect	Average Person Effect	Average Firm Effect
0 to 25	1,226,844	11.4	-0.092	-0.068	-0.016
26 to 50	614,604	34.4	-0.021	-0.011	-0.007
51 to 100	535,169	70.5	-0.015	-0.009	-0.006
101 to 200	449,723	142.7	-0.015	-0.012	-0.005
201 to 300	257,305	245.7	0.010	0.010	-0.004
301 to 400	164,426	346.6	0.014	0.015	-0.004
401 to 500	140,786	447.6	0.029	0.028	-0.003
501 to 600	110,075	548.1	0.023	0.023	-0.005
601 to 700	95,336	648.7	0.033	0.030	-0.002
701 to 800	91,048	747.5	0.053	0.050	-0.001
801 to 900	72,221	850.1	0.051	0.047	-0.002
901 to 1,000	56,384	947.4	0.038	0.034	-0.001
1,001 to 1,250	104,416	1,118.4	0.035	0.035	-0.004
1,251 to 1,500	90,103	1,362.1	0.063	0.058	0.000
1,501 to 1,750	68,537	1,621.9	0.048	0.041	-0.003
1,751 to 2,000	60,723	1,882.5	0.056	0.049	0.002
2,001 to 2,500	117,750	2,224.6	0.042	0.042	-0.005
2,501 to 3,000	83,316	2,728.7	0.075	0.068	-0.002
3,001 to 4,000	138,872	3,542.5	0.084	0.079	-0.001
4,001 to 5,000	102,670	4,427.4	0.054	0.047	-0.002
5,001 to 7,500	138,154	6,165.6	0.075	0.066	0.002
7,501 to 10,000	69,059	8,437.2	0.132	0.106	0.008
10,001 to 15,000	76,514	12,290.3	0.043	0.034	0.000
15,001-20,000	41,252	17,304.1	0.090	0.068	0.006
20,001 or more	399,821	101,444.2	0.111	0.032	0.081

Note: The maximum standard error for the raw firm size effect and the average person effect is 0.003 while the maximum standard error for the average firm effect is 0.0005. Source: Abowd, Kramarz and Margolis (1996), estimates related to Table VIII, order dependent with persons first.

Table 3

Analysis of the Importance of Internal and External Factors

in the Firm Size Wage Differential

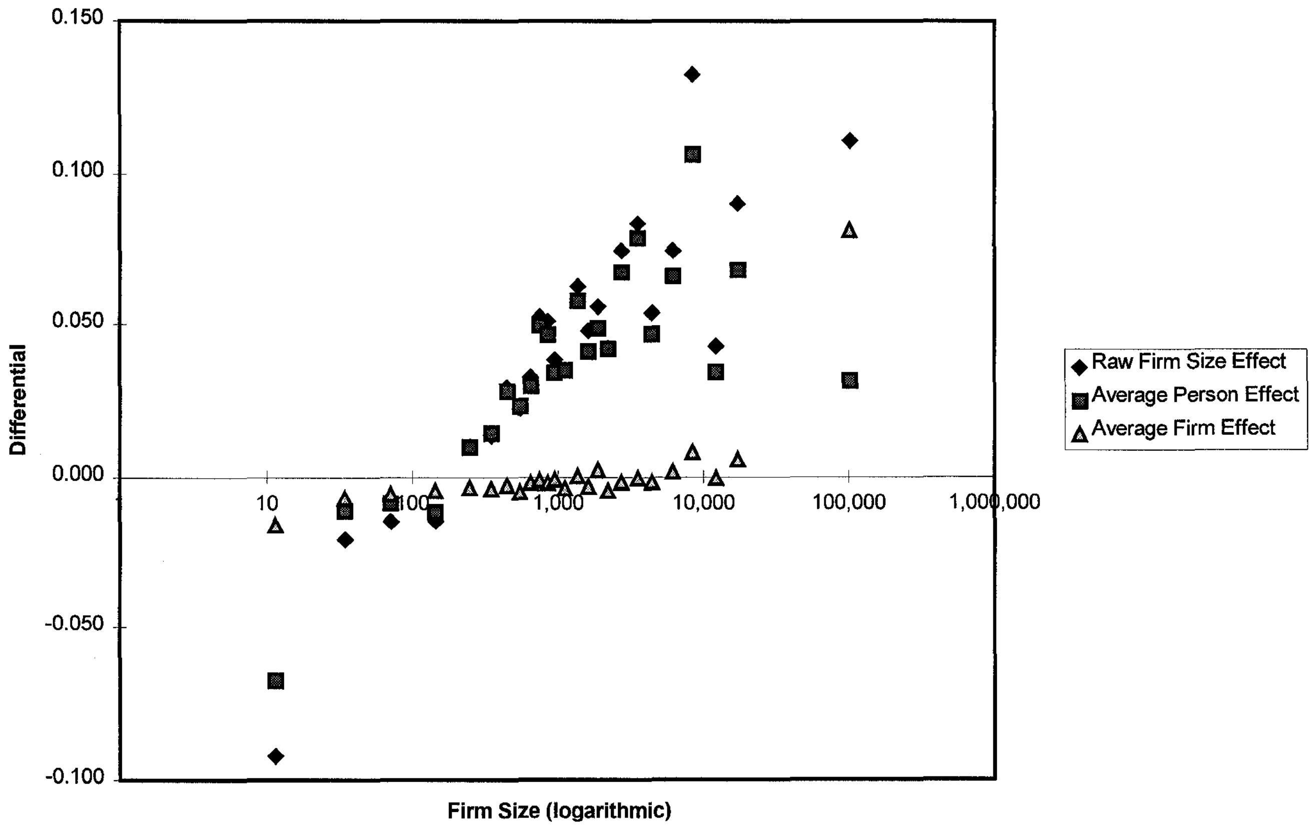

Figure 1

Firm-size Wage Effects in France

	Industry (Translation of the NAP-100)	N	Raw Industry Effect	Average Person Effect	Average Firm Effect
04	Coal mining	6,020	0.251	0.218	0.023
05	Crude petroleum and natural gas extraction	15,009	0.340	0.316	0.002
06	Electricity production and supply	52,017	0.188	0.084	0.109
08	Water and city-heating supply	9,064	0.137	0.109	-0.001
09	Ferrous metal mining	88	0.056	0.048	-0.024
10	Iron and steel foundries	48,708	0.082	0.053	0.008
11	Primary metal manufacturing	18,385	-0.031	-0.051	-0.003
13	Primary nonmetallic manufacturing	23,694	0.107	0.079	0.003
14	Miscellaneous mineral production	2,622	0.036	0.008	0.002
15	Cement, stone, and concrete products	63,544	-0.041	-0.061	-0.007
16	Glass and glass products	27,307	0.113	0.084	0.001
17	Basic chemical manufacture	52,526	0.193	0.166	0.002
18	Allied chemical products, soaps and cosmetics	46,553	0.110	0.099	-0.001
19	Pharmaceuticals	27,691	0.170	0.151	0.007
20	Founderies and smelting works	30,673	-0.015	-0.040	0.001
21	Metal works	154,626	-0.002	-0.023	-0.007
22	Farm machinery and equipment	17,755	-0.025	-0.048	-0.004
23	Metalworking machinery manufacture	24,740	0.038	0.012	-0.004
24	Industrial machinery manufacture	100,679	0.044	0.020	-0.005
25	Material handling machines and equipment	28,277	0.052	0.022	0.000
26	Ordnance	3,073	0.110	0.075	0.000
27	Office and accounting machines	20,918	0.328	0.283	0.018
28	Electrical machinery equipment	82,859	0.025	-0.005	-0.001
29	Electronic computing equipment	101,851	0.058	0.026	0.001
30	Household appliances	21,367	-0.016	-0.049	-0.002
31	Motor vehicles, trains and land transport manufacture	180,678	0.027	-0.014	0.024
32	Ship and boat building	20,145	0.101	0.065	0.007
33	Aircraft and parts manufacture	45,188	0.182	0.153	0.008
34	Professional and scientific equipment manufacture	34,121	0.017	-0.010	-0.006
35	Meat products	30,861	-0.003	-0.033	-0.004
36	Dairy products	27,123	0.061	0.023	0.005
37	Canned and preserved products	14,528	-0.004	-0.051	0.002
38	Bakery products	46,156	-0.067	-0.095	-0.012
39	Grain mill and cereal products	25,195	0.044	0.008	0.002
40	Miscellaneous food preparations	29,140	0.082	0.043	0.006
41	Beverage industries	21,277	0.118	0.083	0.007
42	Tobacco products manufacture	3,464	0.246	0.212	0.007
43	Knitting mills, threads and artificial fibers	4,132	0.052	0.022	0.006
44	Textile products	112,839	-0.082	-0.099	-0.005
45	Leather products except footwear	14,004	-0.105	-0.120	-0.011
46	Footwear	26,097	-0.077	-0.097	-0.007
47	Apparel, clothing and allied products	91,927	-0.098	-0.115	-0.007
48	Lumber mills	36,965	-0.111	-0.115	-0.009
49	Furniture and fixtures manufacture	42,245	-0.097	-0.098	-0.009
50	Pulp and paper mills and packaging products	49,447	0.065	0.037	-0.003
51	Printing and publishing	81,786	0.126	0.115	-0.004
52	Rubber products	39,252	0.026	-0.008	0.013

53	Plastic products	46,464	0.014	-0.015	-0.004
54	Miscellaneous manufacturing industries	43,463	-0.068	-0.077	-0.006
55	Construction	580,802	-0.119	-0.076	-0.012
56	Waste product management	8,978	-0.123	-0.090	-0.013
57	Wholesale food trade	94,773	-0.009	-0.004	-0.007
58	Wholesale non-food trade	100,879	0.020	0.029	-0.008
59	Inter-industry wholesale trade	139,851	0.061	0.068	-0.007
60	Commercial intermediaries	23,632	0.091	0.105	-0.013
61	Retail food and supermarkets	63,039	-0.037	-0.035	0.000
62	Retail specialty and neighborhood food trade	110,251	-0.103	-0.091	-0.008
63	Retail general merchandise and non food trade	30,734	-0.040	-0.033	-0.005
64	Retail specialty non food trade	202,973	-0.059	-0.043	-0.014
65	Automobile dealers, auto parts and repair trade	131,469	-0.059	-0.023	-0.008
66	Miscellaneous repair services	7,733	-0.096	-0.056	-0.013
67	Hotels, motels, bars and restaurants	171,703	-0.132	-0.103	-0.013
68	Railroad transportation	94,582	0.051	-0.135	0.207
69	Bus, taxicab and other urban transit	105,248	-0.039	-0.029	-0.009
70	Inland water transportation	1,076	-0.011	-0.017	-0.001
71	Marine transport and coastal shipping	3,469	0.191	0.187	-0.001
72	Air transportation	18,400	0.269	0.256	0.018
73	Allied transportation and warehousing services	12,739	0.069	0.066	-0.003
74	Travel agencies	50,459	0.015	0.015	-0.005
75	Telecommunications and postal services	3,036	0.069	0.070	-0.008
76	Financial holding companies	4,457	0.299	0.301	0.004
77	Advertising and consulting services	275,102	0.038	0.070	-0.016
78	Brokers, credit agencies, and insurance sales	20,119	0.076	0.108	-0.005
79	Commercial real estate development and sales	38,615	-0.045	-0.007	-0.012
80	Nonresidential goods rental services	14,453	0.031	0.057	-0.004
81	Real estate renting and leasing	28,879	-0.080	-0.048	-0.013
82	Commercial education services	7,141	-0.141	-0.092	-0.016
83	Commercial research services	3,837	0.165	0.182	-0.005
84	Commercial health services	368,696	0.064	0.089	-0.001
85	Commercial social services	35,987	-0.120	-0.094	-0.007
86	Commercial entertainment and recreation services	27,719	0.111	0.127	0.005
87	Miscellaneous commercial services	85,144	-0.246	-0.207	-0.023
88	Insurance carriers	53,292	0.099	0.124	-0.001
89	Banks and financial institutions	138,909	0.172	0.188	0.003
	Weighted adjusted standard deviation		0.098	0.090	0.032

Source: Abowd, Kramarz and Margolis (1996) Table VII, order dependent persons first. Standard errors available on request. Except for ferrous metal, the maximum standard error for the raw industry effect and the average person effect is 0.006 and for the average firm effect 0.001. The weighted average standard deviation is based on the formula from Krueger and Summers (1988).

Table 4

Analysis of the Importance of Internal and External Factors

Inter-industry Wage Differential