

## Wages and Establishment Size Taux de rémunération et taille des établissements

David Swimmer

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Résumé de l'article

Depuis nombre d'années, les économistes du travail débattent les effets directs de la taille de l'établissement sur les taux de rémunération. Diverses études ont été faites à ce sujet, mais elles n'ont pas abouti aux mêmes résultats. Dans le présent document qui porte sur cinq de ces études, nous cherchons à déterminer les points forts et les points faibles de leurs méthodes et à établir une nouvelle série de conditions qui permettraient d'analyser le problème. À cette fin, nous avons conclu qu'il fallait d'abord isoler des données les causes possibles de variation des salaires, à l'exception de la taille de l'établissement. Nous avons repéré trois de ces causes. Premièrement, l'analyse des données, fournies pour Travail Canada pour l'année 1975, selon chaque profession a permis d'éliminer les variations d'une profession à l'autre. En deuxième lieu, la répartition de ces données sur les professions selon le lieu de travail a permis d'éliminer les variations d'un secteur géographique à l'autre. Et en troisième lieu, l'analyse des données selon les groupes d'activités économiques a permis d'éliminer les variations d'un groupe à l'autre. Ces données portaient sur le taux des salaires versés aux ouvriers non qualifiés, spécialisés et qualifiés de onze professions de cols bleus et de cols blancs réparties dans sept activités économiques principales et dans six localités du Canada. Nous avons retenu quatre observations, communiquées par chacun des établissements qui ont participé à cette enquête à l'égard de chaque profession: le taux de salaire minimal, le taux de salaire maximal, la moyenne pondérée, ainsi que le nombre total d'employés de l'établissement. Nous avons ensuite établi des équations de régression en nous fondant sur les données relatives à la taille de l'établissement comme variables indépendantes et sur les trois autres séries de données comme variables dépendantes. Nous n'avons pu obtenir de données (utilisables) de toutes les cases profession-activité économique-lieu de travail. Sur un nombre possible de 462 cases, seules 187 ont été analysées, ce qui nous a permis d'établir 561 régressions distinctes.

Voie les résultats de l'analyse: (1) aucune analogie précise entre la taille de l'établissement et les taux de salaire n'a pu être définie; (2) une partie importante des équations présentaient des pentes négatives, ce qui était la première conclusion; (3) un autre examen des données sur les sous-activités économiques qui forment les activités économiques principales a révélé que si nous avions réussi à isoler la différentielle inter-activité, nous n'avions pu isoler la différentielle intra-activité. Un réexamen des données selon chaque sous-activité économique nous a permis d'éliminer environ les deux tiers de la variation globale des équations relatives aux activités économiques principales.

# Wages and Establishment Size

**David Swimmer**

*The author examines some of the more prominent research in the light of their authors' methodologies and then, using current wage-size data, illustrates that size, per se, is not a determinant of wages; other factors interacting with size can produce higher wages, but do not necessarily have to do so.*

The relationship between establishment size, measured by the total number of employees, and wages paid has, for many years, been a subject of debate among labour economists. Various theories have emerged in an attempt to explain the possible direct relation of size to wages. One emphasizes the ability of the larger establishment to pay higher wages, due to (a) advantages of economies of scale, (b) a possible tendency of the large establishment to be a wage leader, (c) more productive labour and (d) a better organized labour force, while another and opposing theory cites the need of the smaller establishment to pay at least the same wages to compete effectively in the labour market.

Past research in this field has resulted in many studies supporting and opposing a positive wage-size relationship. This paper examines some of the more prominent research in the light of their authors' methodologies and then, using current wage-size data, illustrates that size, per se, is not a determinant of wages; other factors interacting with size can produce higher wages, but do not necessarily have to do so.

## **OSTRY**

In an article published in 1960, Sylvia Ostry<sup>1</sup>, using unpublished data made available by the Canada Department of Labour found a weak

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\* SWIMMER, David, Public Service Staff Relations Board, Pay Research Bureau, Ottawa.

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<sup>1</sup> Sylvia W. OSTRY, «Inter-establishment Dispersion of Occupational Wage Rates, Ontario and Quebec, 1957», *Canadian Journal of Economics and Political Science*, Toronto, vol. 26, no. 2, May 1960, pp. 277-288.

relation between size and wage level. However in almost every instance there was no clear association between plant size and level of wages.<sup>2</sup> The data for this research were taken from 1250 establishments for hourly-rated male common labour in specific manufacturing industries in Ontario and Quebec. The influences of inter-industry and geographic variation were removed from the data before proceeding with the analysis.

### REES AND SCHULTZ

Similarly, Rees and Schultz<sup>3</sup>, after having concluded a multiple regression analysis on wages broken down by establishment and individual characteristics, found «...no positive relationship between establishment size and wages within occupations after allowing for the influence of the other variables that enter the regressions. Within the same geographic area, otherwise similar establishments of different sizes do not generally pay different wages for workers having the same characteristics.»<sup>4</sup>

### STOIKOV

Vladimir Stoikov,<sup>5</sup> in a paper challenging the conventional wisdom regarding wages and firm size in the Japanese manufacturing industry, using wage data which reflected a heterogeneous labour force and basing his calculations on occupations adjusted for stable labour quality rather than on the labour force as a whole, found that firm size was not the significant wage determinant that other studies suggested.<sup>6</sup> «A great difference in the quality of the labour force found in firms of different size, has misled many scholars to believe that substantial wage differentials exist between large and small firms in Japan.»<sup>7</sup>

### LESTER

With regard to studies which have attempted to demonstrate a positive relationship between size and wages, two tend to stand out, the

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<sup>2</sup> *Ibid.*, p. 286.

<sup>3</sup> Albert REES and George P. SCHULTZ, *Workers and Wages in an Urban Labor Market* (Chicago: University of Chicago Press, 1970), pp. 184-189.

<sup>4</sup> *Ibid.*, p. 185.

<sup>5</sup> Vladimir STOIKOV, «Size of Firm, Worker Earnings, and Human Capital: The Case of Japan», *Industrial and Labor Relations Review*, vol. 26, no. 4, July 1973, pp. 1095-1106.

<sup>6</sup> *Ibid.*, p. 1096.

<sup>7</sup> *Ibid.*, p. 1103.

rest being, to the most extent, similar. The first is the oft-cited work by Richard Lester<sup>8</sup>, in which he set hourly wages, in establishments of 100 employees and over, equal to 100 and calculated the index values of hourly wages for establishments in smaller size groups. The data used were for specific manufacturing industries across the United States, and for an average of production and maintenance workers taken together. This method enabled two additional influences to be present within the data. First, geographic wage variations formed part of the purported size differentials and second, the varying occupational mix in establishments of different sizes produced the appearance of a wage-size differential, even in the same industry, where higher average wage levels in the larger establishments were the results of a better quality labour force. As Lester wrote, «Clearly it would be desirable to have extensive wage data by occupational categories on a metropolitan basis so that comparisons could be made by firm sizes in a single city and among metropolitan areas<sup>9</sup>... To some extent the differentials may be the result of statistical shortcomings. Since small manufacturing establishments are more likely than large establishments to be located in small communities, size-of-city wage differentials may be a factor.»<sup>10</sup> And, «on the average, for the same occupation, the quality of labour is higher in large establishments than in small ones<sup>11</sup> ...clearly, size-of-establishment differences in employee compensation need much more thorough study and analysis than they have received to date.»<sup>12</sup> Rees and Schultz, in analyzing the differences between their findings and Lester's commented that Lester«... includes data for cities of different sizes. There is undoubtedly a positive correlation between city size and establishment size, and... a very substantial positive relation between city size and average hourly earnings.» And, «the data [Lester's] are for all production and maintenance workers taken together, whereas ours are for individual occupations. Part of the relation between establishment size and average hourly earnings... could rise from a tendency for occupation mix to differ systematically by establishment size, with larger establishments having a higher proportion of more skilled and more specialized occupations.»<sup>13</sup> These data deficiencies would make Lester's conclusions suspect.

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<sup>8</sup> Richard LESTER, «Pay Differentials by Size of Establishment», *Industrial Relations*, October 1967, pp. 57-67.

<sup>9</sup> *Ibid.*, p. 58.

<sup>10</sup> *Ibid.*, p. 62.

<sup>11</sup> *Ibid.*, p. 64.

<sup>11</sup> *Ibid.*, p. 65.

<sup>13</sup> REES and SCHULTZ, *op. cit.*, p. 185.

**BAILEY AND SCHWENK**

The second paper supporting a positive wage-size relationship was authored by Bailey and Schwenk<sup>14</sup> of the United States Bureau of Labour Statistics. In it they claimed the existence of a positive relationship between the level of wage rates and establishment size... «analysis does support the contention that higher wage rates are positively related to... the size of the establishment, even after other factors are taken into consideration.»<sup>15</sup> Included, however, in their definition of the wage variable was «straight-time compensation per man-hour worked, both straight-time earnings and fringe benefits.»<sup>16</sup> Wages per man-hour and fringe benefits should have been separated, to examine the effects of size upon each of these components of compensation.

Second, the compensation data used was «the average for all production workers in the establishment.»<sup>17</sup> The argument used by Rees and Schultz above, regarding occupational mix and establishment size would also apply here. Third, there is also the matter of the statistical significance of their regressions. Equation 1 «explains» 25 percent while equation 2, which includes six variables, «explains» only 40 percent of the wage variation in the model.<sup>18</sup> Partial correlation analysis would have provided a more clear assessment of the size effect.

These three factors taken together seriously undermine the validity of the conclusions drawn by the authors.

**THE DATA AND FRAMEWORK**

It would seem, therefore from the work done by the researchers cited above and from the problems which some of them encountered, that three conditions are necessary in order to accurately assess the impact of establishment size upon wages. First, the comparisons must be made of specific, defined occupations, analyzed separately, not of establishment average wage levels. Second, industrial variations must be removed and third, geographic variations must be eliminated from the data.

Wage rate data for eleven occupations in seven major industries in six locations across Canada were chosen to test the effect of size

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<sup>14</sup> William R. BAILEY and Albert E. SCHWENK, «Wage Differences in Manufacturing», *Monthly Labor Review*, Washington, vol. 94, no. 5, May 1971, pp. 16-19.

<sup>15</sup> *Ibid.*, p. 16.

<sup>16</sup> *Ibid.*, p. 16.

<sup>17</sup> *Ibid.*, p. 18.

<sup>18</sup> *Ibid.*, p. 18.

upon wages. The occupations were selected because they represent wide cross-sections of the labour force, such as skilled, semi-skilled and unskilled labour and both the blue and white collar sectors. The data reflect wage rates for approximately 106,000 employees in 16,000 establishments employing 20 or more workers, and were part of the observations gathered by the Canada Department of Labour for the October 1, 1975 Wage Rate Survey. The extent to which major industry and location influence earnings are illustrated in Table 1. For this reason, the wage observations were separated into occupation-industry-location cells, reflecting the eleven occupations, seven industries and six locations selected, and a separate analysis was conducted of each cell.

The occupations for which data were obtained were: Carpenter, Maintenance; Electrical Repairman; Janitor; Clerk, General Office,

**TABLE 1**  
**Average Weekly Earnings and Differentials, by Province**  
**and Broad Industry, October 1975**

	<i>Average Weekly Earnings (\$)</i>	<i>Differentials</i>
Canada	213.01	1.000
Newfoundland	206.56	0.970
Prince Edward Island	155.72	0.731
Nova Scotia	177.14	0.832
New Brunswick	188.70	0.886
Quebec	209.35	0.983
Ontario	214.10	1.005
Manitoba	193.91	0.910
Saskatchewan	199.01	0.934
Alberta	218.90	1.028
British Columbia	241.41	1.133
Industrial Composite, Canada	213.01	1.000
Forestry	262.46	1.232
Mining, including Milling	296.72	1.393
Manufacturing	222.66	1.045
Construction	320.78	1.506
Transportation, Communications and Other Utilities	246.18	1.156
Trade	164.78	0.774
Finance, Insurance and Real Estate	196.67	0.923
Service	149.98	0.704

Source: *Employment, Earnings and Hours*, Statistics Canada, November 1975, Table 1A.

Junior; Clerk, General Office, Intermediate; Clerk, General Office, Senior; Truck Driver, Light; Secretary, Senior; Labourer, Non-Production; Programmer, Junior; Stationary Engineer, third class.

The major industries from which the occupations were selected were: Manufacturing; Transportation, Communications and Other Utilities; Trade; Service; Provincial and Municipal Governments; Mining; Finance, Insurance and Real Estate.

Data were taken from establishments in Halifax, Montreal, Toronto, Winnipeg, Edmonton and Vancouver.

In each cell, four observations were retrieved from each establishment; the lowest wage paid, the highest wage paid, the weighted mean wage and the establishment size, measured in terms of total employees. Three measures were selected for analysis to determine if there were wage rate differences between large and small establishments for employees entering the establishment, for those who had been employed there for long periods and for the average employee. The weighted mean wage was that for the occupation within each establishment. This provided three wage-establishment size data sets for analysis. Only 187 of the possible 462 occupation-industry-location cells yielded sufficient data for further analysis. An arbitrary lower limit of 15 observations per cell were set, in order to ensure that the regressions were not affected by too few observations. The number of paired observations in each cell varied considerably, as a result of the location industry and occupation. For example, due to the minimum observation cut-off, it would be expected that there would be fewer cells to regress for electricians than for clerks. For some cells, the number of observations was over 300. Three regressions were performed on the data in each remaining cell, depending upon the wage measure, for a total of 561 regressions. The model used was of the form

$$(W = a + b.size)_{i, j, k}$$

where size was measured in terms of total establishment employment, and i, j and k denote the occupation, location and industry respectively. Because the occupational data had already been corrected for the effects of major industry and location, a simple, bivariate regression method was chosen with wages as the dependent and establishment size as the independent variables. In effect, this method allowed for the direct assessment of size on wages with the occupation, major industry and location held constant.

## RESULTS

As the resultant tables of statistics were too bulky for inclusion in this paper, a summary of the regression statistics follows.

1. Significance statistics were at the 95 per cent confidence level or better.

2. In every regression the coefficient of determination ( $R^2$ ) indicated that no clear association could be established between size and wage rates. About 86 per cent of the regressions produced  $R^2$  of less than .1, 10 per cent had  $R^2$  between .1 and .2, 4 per cent had  $R^2$  between .2 and .3 and .4 per cent had  $R^2$  greater than .3. No  $R^2$  was equal to or greater than .6.

3. Although the major proportion of the trends established by the regressions were positive, a significant proportion were negative, indicating that in these instances the larger establishments paid lower wages. Approximately 44% of the lowest-wage regression equations were negative, as well as 23% of those performed on the mean data and 13% of those performed on the highest wages. Thus, at the lowest rate paid, there is no clear indication as to whether large or small establishments pay higher wages. At the highest wage paid, it appears as if the larger establishment pays more, however, it can be argued that this is more appearance than fact. This could be due, at least in part, to higher average employee seniority in large establishments compared to small ones. At least three studies indicate a lower turnover rate among employees of large establishments compared to small ones.<sup>19</sup> As stated by Rees and Schultz, lower turnover would yield higher average seniority and since seniority is positively related to wages paid, on average, employees in larger establishments, with more seniority, would likely receive more in wages than those in small establishments, with less seniority, for the same occupation, as the result of previous periodic wage increases. Another factor could be a reflection of better quality of the labour force in the larger establishments even though the occupational titles are the same as in the smaller establishments.<sup>20</sup> These circumstances could likely account for a good portion of the difference in the results between the low and high wage estimates. Other factors, of course, could also contribute.

<sup>19</sup> See *Labour Turnover and Absenteeism in Nova Scotia's Manufacturing Industries*, Nova Scotia Departments of Development and Labour, February 1976, p. 39; *People and Jobs*, Economic Council of Canada, Ottawa, 1976, p. 92 and REES and SCHULTZ, *op. cit.*, p. 189. Also, the same conclusion can be drawn from STOIKOV, *op. cit.*, Table 1, p. 1098.

<sup>20</sup> LESTER, *op. cit.*, p. 64.



4. Utilizing the regression data, estimates of the differences in wages paid between establishments employing 20 and 1000 were made for each cell. The average weekly effect which could be attributed to size, amounted to \$0.80 for the lowest wage equations, \$1.23 for the mean wage equations and \$2.32 for the highest wage equations.

5. Looking at the data from another point of view, the estimated variations in wages paid between establishments of 20 and 1000 employees were distributed as shown in Table 2.

6. Upon further examining the data in the form of sub-industries, that is the sub-industries which make up the major industries, such as manufacturing, it was found that, although the inter-industry differential had been removed, an intra-industry differential remained and showed its influence, although to a smaller relative extent. It is estimated that about two-thirds of the overall variation in the major industry regression equations could be removed by re-examining the data on a sub-industry basis. Calculations performed on some of the data at a sub-industry level produced regression equations having slopes closer to zero and  $R^2$  statistics similar to those for the major industries. For the weighted mean wage rates in each establishment, the average weekly difference

TABLE 2

**Distribution of Estimated\* Differences Due to Size in Weekly Wages Between Establishments of 20 and 1000 Employees within Major Industries, October 1, 1975, Canada**

	<i>Smaller Establishment Pays More</i>				<i>Larger Establishment Pays More</i>				<i>Total</i>	
	\$3.00 or more	\$2.00 to \$2.99	\$1.00 to \$1.99	\$0.01 to \$0.99	\$0.01 to \$0.99	\$1.00 to \$1.99	\$2.00 to \$2.99	\$3.00 or more		
	<i>Per cent of Establishments</i>									
Lowest Wage Regressions	0.0	1.1	3.9	30.4	19.9	28.2	6.1	3.3	7.2	100
Weighted Mean Wage Regressions	0.5	0.5	0.5	14.8	17.0	43.4	6.0	4.4	12.6	100
Highest Wage Regressions	0.6	0.0	0.0	9.4	9.4	41.7	10.6	6.1	22.2	100

\*Estimates provided by regressions.

due to size for sub-industry groups of establishments amounted only to \$0.24.

## CONCLUSION

From the examination of the studies cited above and from the results of the analysis conducted upon the Wage Rate Survey data, it would appear that there is no statistical evidence to support the theory that large establishments as a group pay higher wages than small establishments for specific occupations, when industry and location are held constant. Other factors interacting with size can produce higher wages but do not necessarily have to do so.

## Taux de rémunération et taille des établissements

Depuis nombre d'années, les économistes du travail débattent les effets directs de la taille de l'établissement sur les taux de rémunération. Diverses études ont été faites à ce sujet, mais elles n'ont pas abouti aux mêmes résultats. Dans le présent document qui porte sur cinq de ces études, nous cherchons à déterminer les points forts et les points faibles de leurs méthodes et à établir une nouvelle série de conditions qui permettraient d'analyser le problème. À cette fin, nous avons conclu qu'il fallait d'abord isoler des données les causes possibles de variation des salaires, à l'exception de la taille de l'établissement. Nous avons repéré trois de ces causes. Premièrement, l'analyse des données, fournies pour Travail Canada pour l'année 1975, selon chaque profession a permis d'éliminer les variations d'une profession à l'autre. En deuxième lieu, la répartition de ces données sur les professions selon le lieu de travail a permis d'éliminer les variations d'un secteur géographique à l'autre. Et en troisième lieu, l'analyse des données selon les groupes d'activités économiques a permis d'éliminer les variations d'un groupe à l'autre. Ces données portaient sur le taux des salaires versés aux ouvriers non qualifiés, spécialisés et qualifiés de onze professions de cols bleus et de cols blancs réparties dans sept activités économiques principales et dans six localités du Canada. Nous avons retenu quatre observations, communiquées par chacun des établissements qui ont participé à cette enquête à l'égard de chaque profession: le taux de salaire minimal, le taux de salaire maximal, la moyenne pondérée, ainsi que le nombre total d'employés de l'établissement. Nous avons ensuite établi des équations de régression en nous fondant sur les données relatives à la taille de l'établissement comme variables indépendantes et sur les trois autres séries de données comme variables dépendantes. Nous n'avons pu obtenir de données (utilisables) de toutes les cases profession-activité économique-lieu de travail. Sur un nombre possible de 462 cases, seules 187 ont été analysées, ce qui nous a permis d'établir 561 régressions distinctes.

Voici les résultats de l'analyse: (1) aucune analogie précise entre la taille de l'établissement et les taux de salaire n'a pu être définie; (2) une partie impor-

tante des équations présentait des pentes négatives, ce qui étayait la première conclusion; (3) un autre examen des données sur les sous-activités économiques qui forment les activités économiques principales a révélé que si nous avons réussi à isoler la différentielle inter-activité, nous n'avons pu isoler la différentielle intra-activité. Un réexamen des données selon chaque sous-activité économique nous a permis d'éliminer environ les deux tiers de la variation globale des équations relatives aux activités économiques principales.

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