References

BHAGWATI, J.N. (1958). "Immiserizing Growth: A Geometrical Note". *Rev. Econ. Studies,* 25, June.

COLEMAN, R.R. (1961). "A Study of Urban Travel Times in Pennsylvania Cities", *Highway Research Board Bulletin*, Nº 303: 62-75.

DREW, D.R. (1968). *Traffic Flow Theory and Control.* McGraw-Hill (New York).

ELSE, P.K. (1981). "A Reformulation of the Theory of Optimal Congestion Taxes". *Jour. Transport Econ. and Policy,* Sept: 217-232.

GORDON, H.S. (1954). "The Economic Theory of a Common Property Resource: The Fishery". *JPE,* 62, April: 124-42.

MOHRING, H. (1970. "The Peakload Problem with Increasing Returns and Pricing Constraints". *AER,* 60, Sept.: 693-705.

--------. (1976). *Transportation Economics.* Ballinger Publishing Co. (Cambridge, Mass.).

-------- and M. HARWITZ (1962). *Highway Benefits: An Analutical Framework.* North Western Univ. Press (Evanston, Il.).

NEWBERY, D.M. (1986). "The Time Path of Efficient Road User Charges". IMF, Fiscal Affairs Dept., mimeo, August.

----------. (1987). "Road User Charges and the Taxation of Road Transport". IMF, Fiscal Affairs Dept. Working Paper WP/87/5, Feb.

PIGNATARO, L.J. (1973). *Traffic Engineering: Theory and Practice.* Prentice-Hall (Englewood Cliffs, N.J.).

SCOTT, A. (1955). "The Fishery: The Objectives of Sole Ownership". *JPE,* 63, April: 116-24.

SHAH, A. (1976). "Optimal Pricing of Traffic Externalities: Theory and Measurement", mimeo.

SMALL, K.A. and C. WINSTON. (1986). "Efficient Pricing and Investment Solutions to Highway Infraestructure Needs". *AER,* May: 165-69.

SMITH, V.L. (1968). "Economics of Production from Natural Resources". *AER,* June: 409-431.

VICKERY, W. (1969). "Congestion Theory and Transport Investment". *AER,* 59, May: 251-60.

WALTERS, A.A. (1968). *The Economics of Road User Charges.* Johns Hopkins (Baltimore).

WINSTON, C. (1985). "Conceptual Developments in the Economics of Transportation: An Interpretative Survey". *J.E.L.*, 23, March: 57-94.

WOHL, M. and B.V. MARTIN (1967). *Traffic Systems Analysis for Engineers and Planners.* McGraw-Hill (New York).

Revista de Análisis Económico, Vol. 6, Nº 1, pp. 93-111 (Junio 1991)

MODELS OF WAGE DETERMINATION AND THE INDUSTRY WAGE STRUCTURE IN URUGUAY*

MARIO ABUHABDA**

División de Estudios
Superintendencia de Administradoras
de Fondos de Pensiones

Abstract:

This paper examines the wage structure in Uruguayan manufacturing during the period 1968 to 1987. It analyzes the size and stability of intre-industry wage differentials, and compares these differentials across occupations, establishment sizes, and across countries. The paper also relates industry wage levels to industry characteristics. The analyses are used to test the competitive and the efficiency models of wage determination.

The results confirm the predictions of the efficiency wage model, as wage differentials are substantial, they persist over time, they are strongly correlated between white– and blue-collar workers, and to a lesser extent, across establishment sizes. In addition, some industry characteristics are positively correlated to wages.

I. Introduction

The study of inter-industry wage differentials has received an increased attention in the recent labor market literature. Several papers have been devoted to examine the pattern of wage differentials in the U.S. economy. They have consistently found a number of facts: the magnitude of the differentials is considerable; they persist even after controlling for human capital variables; they have been remarkably stable over long periods of time; and they are similar across countries and occupations.

Competitive and non-competitive models of wage determination give alternative explanations for the existence of wage differentials. The competitive model explains wage

* This paper is part of my Ph.D. dissertation at Boston University.

** I am very grateful to Kevin Lang for encouraging and challenging comments. I also thank two anonymous referees for suggestions to a, previous draft. Any remaining errors are, of course, my own.

differentials arguing the existence of compensating differentials, unobserved skill differences and transitory shifts of supply or demand for labor. On the other side, the most recurrent non-competitive hypotheses include efficiency wage, rent sharing and collective bargaining models.

The empirical evidence of inter-industry wage structure suggests that the explanation for the observed regularities should consider non-competitive considerations. The remarkable stability of the differentials through time indicates that the differentials are not explained by transitory disequilibria in the labor market, but they correspond to a constant pattern of correlations; the high correlations of wage differentials across occupations reveal that there are high-wage and low-wage firms regardless the occupation. This rules out compensating differentials and unobserved skill differences.

While the evidence on wage differentials for developed economies is abundant, the subject has been far less investigated for Latin-American countries. The importance of studying the wage structure in these countries relies on the volatility of these economies that contrasts markedly with the stability of the U.S. economy.

Among Latin-American countries, Uruguay represents a very interesting study case given the sweeping economic and political changes that it has experienced during the last decades. Starting in the mid-seventies, a stabilization and liberalization programa was implemented to fight a historical stagnation, a galloping inflation, a growing fiscal deficit and adverse external shocks. One of the main objectives of this economic program was to increase the openness of the economy: import protection was lowered, export incentives were improved and the exchange rate system was simplified. Finally, various fiscal incentives to traditional and non-traditional exports were instituted.

The implementation of the policies also affected the labor market. The composition of the supply and demand for labor was modified, increasing the participation of secondary labor force, and the nominal wage rate was used as an instrument for stabilization. In addition, collective bargaining was severely restricted until 1985[1].

The objective of this paper is to study the inter-industry wage structure in Uruguay. It examines the size and stability of wage differentials, and compares these differentials across occupations and establishment-size classes. The analysis also compares wage differentials among Uruguay, Argentina and Chile, emphasizing the establishment size effect as a potential explanation for the high correlations across countries. Finally, the research estimates wage equations to examine industry chracteristics associated with high wages.

Despite the important contrasts between the Uruguayan and the U.S. economies, our results show strong similariries to those of past studies. Wage differentials are larger than those reported for the U.S. industrial sector and they persist for a period of almost twenty years. The fact that wage differentials are highly correlated in a period characterized by economic and institutional changes suggests that wage differentials are not explained by transitory disequilibria: the correlations do not diminish over time but they reflect an underlying pattern of differentials. In addition, we find that wage differentials between white and blue collar workers are strongly correlated, as predicted by sociological and rent-sharing models, but the correlations are partially explained by the establishment-size effect.

We also find wage differentials in Uruguay to be highly correlated with those in Argentina and Chile. To some extent, however, these differentials reflect technologically-determined wage differences related to establishment size. The analysis of wage differentials across firm sizes confirms the effect of the establishment size on wages, large establishments pay higher wages than small establishments.

Besides this introduction the paper contains four sections. Section II briefly summarizes competitive and efficiency wage models of wage determination, and the results of empirical research on wage differentials. Section III analyzes the pattern of the wage structure in Uruguay. It examines the dispersion in wages, the stability of the wage structure, the industry wage structures in Argentina, Chile and Uruguay, the wage structure by establishment size and the wage structure across occupations. Section IV carries out the estimation of the wage equations. Finally, Section V presents the conclusions of this work.

II. Competitive and Efficiency Wage Models of Wage Determination

Differences in wages for equally qualified workers are explained by compensating differentials, unobserved worker characteristics, and transitory disequilibria under the competitive model. Compensating differentials generate wage differentials because diverse wages are needed to compensate equally qualified workers for a particular job attribute. For example, poor or dangerous working conditions should be compensated for with higher wages. Secondly, according to the unobserved skill argument, two equally skilled workers employed in the same firm may be paid differently if, for example, one is more motivated in the work than the other. Motivation is a factor that can be seen by the worker's suppervisor and recompensed for with a higher wage, but econometricians cannot control for it. Finally, wage differentials may reflect transitory shifts of supply or demand for labor. In this case, wage differentials will disappear when equilibrium is restored.

Alternatively, efficiency wage models argue that similarly skilled workers are paid differently according to the industry of employment. They emphasize the relationship between wages and productivity. Higher wages will increase productivity and, therefore, reducing wages will be unprofitable for firms.

These models identify different benefits for firms of high wage payments. Shapiro and Stiglitz (1984), Bulow and Summers (1986) and other authors argue that higher wages will deter workers from shirking and, therefore, higher wages may be an efficient alternative to monitoring workers. A second efficiency wage argument, formalized by Stiglitz (1974), states that labor turnover is costly for firms because they incur training and hiring costs, therefore they pay higher wages to reduce quitting.

A third efficiency wage explanation, advanced by Weiss (1980), argues adverse selection motives. This argument assumes that more competent workers have higher reservation wages than less competent workers, therefore higher wages will attract a more qualified pool of applicants to the firm. A fourth explanation for high payments adduces sociological reasons. A worker's effort depends on his perception of being fairly treated. This depends, in turn, on how profitable the firm is, Akerlof (1982, 1984) develops a model emphasizing these factors.

Finally, Lang (1990) argues that firms will decrease the number of job offers turned down by offering high wages. Weitzman (1989) suggests that firms will choose a variety of recruitment strategies because they face uncertainty about aggregate demand levels and labor market tightness. High wages will secure a reliable labor supply.

Similar to predictions of efficiency wage models are the results of the union threat model developed by Dickens (1986). In this case, high wages may arise as a consequence of collective action by workers, who can claim through collective bargaining a part of monopoly rents earned by firms. This benefit may be extended to nonunion workers.

The evidence supporting non-competitive models of wage determination is extensive. Krueger and Summers (1987, 1988) and Dickens and Katz (1987a, b) have consistently

found a number of facts that are suggestive of efficiency wage predictions. Wage differentials persist even after controlling for human-capital variables, they have been remarkably stable over long periods of time, and they are similar across countries and occupations. In addition, workers who move from a low-wage industry to a high-wage industry capture the differential in wages showed by the industry. The opposite phenomenon is also observed. Furthermore, a strong negative correlation is found between wage differentials and quit rates.

Finally, a significant dispersion in wages has been reported even in well defined industries. The intra-industry differentials vary according to the specific industry but persist for long periods (Groshen, 1988 and Leonard, 1988).

This empirical evidence is difficult to reconcile with competitive market-clearing explanations of wage differentials. First, the standard deviation of inter-industry wage differentials is only slightly reduced when controlling for human capital variables (less than 10% in Krueger and Summers, 1988), and the correlation between wage differentials with and without controls is very high (see next section). Second, the remarkable constant pattern of the wage structure does not support transitory disequilibrium arguments. Third, wage differentials are highly correlated across occupations. On this fact, it is very unlikely that a firm would offer particularly poor working conditions or it would require highly qualified managers, and the same working conditions or job abilities would be required for janitors. Therefore, unobserved skill differences and compensating differentials do not explain solely the pattern of the wage structure. Finally, certain industry characteristics are associated with higher wages, in particular more profitable and more concentrated industries tend to pay better salaries (see more details in section IV).

In view of the failure of the competitive model to account for the evidence on wage differentials, efficiency wage models have been put forward as a better explanation of the empirical regularities.

The main implication of efficiency wage models is the existence of wage differentials in equilibrium. Similarly skilled workers are paid differently according to the industry of employment. These differentials do not reflect particular working conditions and, therefore, do not need to be compensated for with higher wages.

Different industry characteristics are predicted to affect wages by some efficiency wage approaches presented above. The most theoretically developed of all these models is the shirking model. This model predicts that higher wages will arise in industries where monitoring workers is costly[2]. For empirical testing, costly worker monitoring has been assumed mostly in large establishments, typically industries with investments in expensive equipment[3]. A high capital-labor ratio is usually used as a *proxy* for empirical purposes.

Sociological models emphasize the importance of the teamwork, the worker's feeling of being fairly treated and the firms' ability to pay. All these conditions will increase the worker's effort on the job.

It is necessary to note that the strong correlation presented by wage differentials across occupations impose problems to most efficiency wage models. A high correlation across occupations means that some firms pay higher wages to managers, secretaries and janitors, while other firms pay lower wages regardless the occupation. This implication is not derived from most efficiency wage models. However it can be derived from models based on norms. These models argue equity considerations and the worker's concern for his relative wage position in the firm's wage structure as an explanation for a correlation in wages across occupations. Likewise, rent-sharing models, linking wages to the firms ability to pay, seem to be more consistent with that empirical evidence.

III. The Industry Wage Structure in Uruguay

As mentioned in the Introduction, the industry wage structure in Uruguay is a very appealing study case given the political, economic and institutional changes that the country experienced during the last decades.

It is particularly interesting to study the behavior of wage differentials in the presence of large output, employment and real wage fluctuations, and major changes in the situation of unions. In addition, changes in demand across sectors coming from the implementation of liberalization and stabilization policies are expected to have different repercussions on wages in the competitive model than in the efficiency wage explanations. In the competitive model, liberalization policies will likely induce changes in labor demand that may produce transitory differentials which will tend to disappear as the labor market returns to equilibrium. On the other hand, a more permanent effect could be envisaged under the efficiency wage hypotheses[4].

1. Sources of Information and Industry Wage Dispersion

The analysis carried out in this paper uses manufacturing censuses and surveys as sources of information. We count on manufacturing censuses for 1968 and 1978, and on manufacturing surveys from 1980 to 1987. This data set has the advantage of allowing us to study the behavior of wage differentials over a long period of time. However, the use of aggregate data is not without costs. The most important shortcoming of the data is the lack of worker characteristics. This prevent us from controlling for human capital variables to calculate wage differentials.

Failing on to control for human capital variables has been referred to in the literature as a "naive" way of measuring wage dispersion. As different industries may employ workers with different qualifications, there is no reason to expect equal wage structure across industries. However, this approach finds strong support from results of the recent empirical literature on wage differentials. Krueger and Summers (1987) find that wage differentials with and without labor quality controls in the U.S. industrial sector are highly correlated (0.95). An even higher correlation (0.97) is reported for Brazilian manufacturing by Gatica, Mizala and Romanguera (1990). Finally, Márquez (1989) reports a correlation of 0.84 in 1985 for Venezuela, and Romaguera (1989) shows a correlation of 0.68 for 1987 for Chile[5].

In short, the empirical evidence suggests that controlling for human capital variables does reduce but does not change the pattern of wage differentials. However, we recommend to take our results with caution.

To study the variability in wages across industries in Uruguay we use the employment-weighted standard deviation of wage differentials. This measure is calculated on three different International Standard Industrial Classification (ISIC) codes. The first includes 70 industries on a four-digit basis covering 1981-87, the second includes 25 industries on a three-digit basis for 1978, and the calculations for 1968 use the two-digit ISIC code with 21 industries.

Wage differentials in Uruguay are larger than those reported for the U.S. economy. Krueger & Summers (1987), using the 1984 Current Population Survey (CPS), reported 0.24 of weighted standard deviation with no labor quality controls. Our results in Table 1 show a high and relatively stable dispersion in wages. The wage dispersion is 0.212 for 1968, 0.246 for 1978, and ranging from 0.308 to 0.353 in the 1980s. This decrease in wage differentials at lower ISIC codes reflects that the differentials tend to compensate at more aggregate levels of classifications[6].

These findings are contradictory with the hypothesis that less developed countries may have lower dispersion of wages than developed countries because their labor force presents a lower level of human capital. On the contrary, the impact of industry characteristics and institutional factors on wages may be larger in less developed countries than in developed countries. On the same way, our results are suggestive of the literature emphasizing efficiency elements in the wage structure, the differentials are persistent feature of the labor market and not a transitory phenomenon due to economic shocks.

2. Stability of the Wage Structure

A number of studies have found the wage structure stable over time[7]. Several economic and institutional factors such as galloping inflation, a change in the legislation ruling collective bargaining and a substantial trade reform as part of a liberalization process lead us to expect changes in the pattern of the wage structure during the priod of study.

The correlation analysis in Table 1 shows that the pattern of wage differentials has remained relatively stable between 1981 and 1987, even though the correlations increased drastically after 1983. The correlations are 0.882 between 1981 and 1987, 0.822

TABLA 1

WAGE DISPERSION AND CORRELATIONS OF WAGE DIFFERENTIALS
1968-87

Year	Standard Deviation	Correlation with 1987
	4-Digit International Standard Industrial Classification (ISIC)	
1987	0.351	1.000
	(70)	(70)
1986	0.352	0.990
	(66)	(66)
1985	0.341	0.968
	(67)	(66)
1984	0.353	0.968
	(67)	(66)
1983	0.332	0.915
	(66)	(65)
1982	0.308	0.822
	(67)	(65)
1981	0.319	0.882
	(65)	(61)
1978	0.246	0.970
	(25)	(25)
1968	0.212	na
	(21)	

Notes:
1) Number of industries in parentheses
2) The wage dispersions corresponding to 1968 and 1978 are calculated on 2-digit and 3-digit ISIC basis respectively.
3) Coefficients are weighted by 1987 employment.

Sources: Based on data taken from manufacturing census and surveys.

between 1982 and 1987, 0.968 between 1984 and 1987 and between 1985 and 1987. Finally, the correlation between 1987 and 1987 is 0.97[8].

The most important feature of the wage structure is the absence of a decline in the correlations over time. This suggests that the wage differentials have an underlying pattern rather than being the consequence of random shocks. The wage structure seems to converge after 1983 to 1987 values. This change may partially be explained by the reinstatement of the bargaining power held by labor organizations.

3. International Comparisons of the Industry Wage Structure

In this section we address the issue of whether the structure of wages is similar in Argentina, Chile and Uruguay. Previous studies have found a high correlation of the wage structure across countries. Krueger and Summers (1987) find a very high correlation in wages, especially among developed countries. In fact, 11 of the 13 correlations between the U.S. and other countries are above 0.6 in 1982. However, these studies have not controlled for establishment size and labor characteristics. Here we attempt to account for the first of these problems.

We use manufacturing censuses for Argentina (1974), Chile (1979) and Uruguay (1978) in the three-digit ISIC code to examine their wage structure. The wage differentials are calculated without controlling for human capital variables[9].

The correlation analysis of the industry wage structure in Argentina, Chile and Uruguay in Table 2 shows a very similar wage structure among the countries. The overall correlations are 0.86 between Uruguay and Argentina, 0.77 between Uruguay and Chile, and 0.84 between Argentina and Chile.

TABLE 2

CORRELATIONS OF WAGE DIFFERENTIALS BY ESTABLISHMENT SIZE
URUGUAY (1978), CHILE (1979) AND ARGENTINA (1974)
ALL WORKERS

Country		Argentina						Uruguay					
	Size	All	1-5	6-10	11-25	26-50	50+	All	2-4	5-9	10-19	20-49	50+
Uruguay	All Sizes	0.86	0.30	0.55	0.79	0.74	0.87						
	2-4	-0.20	-0.32	-0.26	-0.23	-0.30	-0.25						
	5-9	0.49	-0.42	-0.14	0.33	0.58	0.40						
	10-19	0.61	0.62	0.76	0.80	0.79	0.39						
	20-49	0.57	0.60	0.73	0.78	0.72	0.36						
	50+	0.86	0.41	0.63	0.82	0.71	0.89						
Chile	All Sizes	0.84	0.65	0.79	0.82	0.69	0.85	0.77	-0.14	0.07	0.50	0.43	0.86
	5-9	0.72	0.85	0.91	0.81	0.66	0.70	0.62	-0.31	-0.13	0.63	0.55	0.71
	10-50	0.78	0.20	0.41	0.62	0.58	0.87	0.83	0.09	0.39	0.20	0.19	0.86
	50+	0.63	0.53	0.63	0.68	0.79	0.55	0.46	-0.63	0.27	0.70	0.60	0.46

Notes: Correlations are weighted by Uruguayan employment. Based on 26 comparables 3-digit ISIC industries.

Sources: Censo Nacional Económico Industrial 1974 (Argentina); Censo Manufacturero 1978 (Uruguay); Censo Manufacturero 1979 (Chile).

Since the wage differentials do not control for labor quality, the high correlations may be explained by similar human capital of the workers across industries, and the high correlations only reflect the need for highly qualified workers in certain industries across countries. Unfortunately, we are unable to test this hypothesis because of the aggregate nature of the data. However, Lang, Márquez and Romaguera (1988) give evidence on this issue. They show that the correlations between Venezuela and Chile and between Venezuela and the U.S. are still high even after controlling for labor quality variables. Therefore, the high correlations are not likely to reflect the need for more qualified workers in certain industries.

Alternatively, the high correlations may be explained by the tendency of large establishments to pay higher wages. Our results show that the correlations are partially due to the establishment size effect. The correlation coefficients for establishments with over 50 workers are 0.89 between Uruguay and Argentina, 0.55 between Chile and Argentina and 0.46 between Uruguay and Chile. The correlations are still high for medium size establishments between Uruguay and Argentina, but considerably lower between Uruguay and Chile. This result may be explained by the different establishment size categories defined by the two countries; while Uruguay has two medium size categories, 10-19 and 20-49 workers, Chile only shows one category, 10-50 workers. Finally, the correlations for small establishments are high between Argentina and Chile and negative in all other cases.

As a conclusion, the international correlations are partially explained by the establishment size effect. The correlations controlling for size categories are lower than the overall correlations. It is striking that the correlations for the smallest size categories are positive only between Argentina and Chile and negative in the remaining cases.

4. The Wage Structure by Establishment Size

Previous studies have generally found moderate to large correlation among different establishment sizes. Krueger and Summers (1987) reported a correlation of 0.78 between firms employing 1-99 workers and more than 1,000 workers for the U.S. manufacturing sector. Romaguera (1989) found a relatively high correlation between large and medium size establishments and between medium and small size establishments, but a lower correlation between small and large establishments in the Chilean manufacturing sector.

Our results in Table 3 show that establishment size does have a positive impact on wages: the average wage in the industry increases as size increases. In fact, an average worker receives a salary more than twice as high in a firm employing 50 or more workers than in one employing only 2-4 workers. This situation reveals the large difference in salary prevailing between the modern sector and the rest of the economy. The analysis also reveals a similar wage dispersion across different sizes. All establishment sizes present similar variability in the wage paid to employees. This suggests some degree of segmentation even within similar groups of industries. Note also that high correlations between white and blue collar wages are shown in large establishment sizes. The wage structure across occupations presents more similarities in large establishments.

Table 4 shows correlations across occupations by establishment size. The results are somewhat striking. Production blue collar workers and other workers show a very different pattern of correlations. While the former group of workers shows negative to very low correlations across size, the latter shows very strong correlations across sizes. These results are suggestive of a more segment labor market for blue collar workers in small establishments than for the rest of workers.

TABLE 3

AVERAGE WAGE AND ESTABLISHMENT SIZE

	Establishment Size				
	2-4	5-9	10-19	20-49	50+
All Workers					
Average Wage	6.891	8.54	10.248	12.867	15.613
Standard Deviation	0.273	0.226	0.218	0.327	0.234
Nº Industries	(26)	(26)	(27)	(26)	(25)
Blue Collar					
Average Wage	6.155	7.974	8.3	9.458	12.425
Standard Deviation	0.28	0.235	0.229	0.247	0.186
Nº Industries	(26)	(27)	(25)	(26)	(24)
Other					
Average Wage	12.788	12.335	16.347	19.923	23.417
Standard Deviation	0.453	0.355	0.301	0.263	0.182
Nº Industries	(22)	(25)	(25)	(26)	(23)

Notes: Standard deviations and are weighted by total employment.
Occupational groups are: Blue collar workers involved in the production process and other workers.
Number of industries in parenthesis. Results are based on data taken from the 1978 manufacturing census. Average wage is measured in 1978 local currency.

Source: Censo Manufacturero 1978.

5. The Wage Structure across Occupations

One of the most important findings of the recent studies of wage structure is the high correlation of differentials across occupations[10]. In this section we explore the correlation between blue and white collar workers from 1981 to 1986. The results in Table 5 show a very high and increasing pattern of correlations between white and blue collar workers. The correlations are 0.565 in 1981, 0.672 in 1982, 0.619 in 1983, 0.692 in 1984, 0.670 in 1985 and 0.752 in 1986. They reflect tendency to a more similar wage structure in the more recent years. This tendency might have been due to the reestablishment in 1985 of collective bargaining. We conjecture that through collective bargaining blue collar workers might have pressed for wage adjustments that put theirs closer to white collar wages.

Finally, there is a substantial amount of dispersion in wages across occupations, and this has increased slightly over time. The standard deviations for white and blue collar workers are 0.241 and 0.283 respectively in 1981, 0.267 and 0.279 in 1982, 0.282 and 0.290 in 1983, 0.356 and 0.287 in 1984, 0.334 and 0.289 in 1985 and 0.338 and 0.303 in 1986. The dispersion has reversed over the years. Blue collar workers show greater dispersion until 1983 and lower dispersion than white collar workers after that year.

TABLE 4

CORRELATIONS OF WAGE DIFFERENTIALS ACROSS ESTABLISHMENT SIZE

Establishment Size	Blue Collar Workers				
	2-4	5-9	10-19	20-49	50+
2-4	1.000				
5-9	−0.436	1.000			
10-19	−0.244	0.229	1.000		
20-49	−0.222	0.203	0.868	1.000	
50+	−0.127	0.079	−0.135	0.289	1.000
Establishment Size	**Other Workers**				
	2-4	5-9	10-19	20-49	50+
2-4	1.000				
5-9	0.849	1.000			
10-19	0.671	0.893	1.000		
20-49	0.372	0.322	0.296	1.000	
50+	0.566	0.660	0.616	0.258	1.000

Notes: Occupational groups are: Blue collar workers involved in the production process and other workers. Correlations are weighted by total employment.
Results are based on 22 3-digit ISIC industries.

Source: Censo Manufacturero, 1978.

TABLE 5

WAGE STRUCTURE ACROSS OCCUPATIONS

Workers	Years					
	1981	1982	1983	1984	1985	1986
Correlation between white and blue collar Workers	0.565	0.672	0.619	0.692	0.67	0.752
Nº Industries	(65)	(67)	(66)	(67)	(67)	(66)
All Standard Deviation	0.319	0.308	0.332	0.353	0.341	0.352
Nº Industries	(65)	(67)	(66)	(67)	(67)	(66)
White Collar Standard Deviation	0.241	0.257	0.282	0.356	0.334	0.338
Nº Industries	(65)	(67)	(66)	(67)	(67)	(66)
Blue Collar Standard Deviation	0.283	0.279	0.290	0.287	0.289	0.304
Nº Industries	(65)	(67)	(66)	(67)	(67)	(66)

Notes: Standard deviations and correlations are weighted by total employment.
Occupational groups are: Blue collar workers involved in the production process and other workers.

Source: Censo Manufacturero, 1978.

As stated before, a high correlation across occupations is considered one of the most important findings of the literature on wage differentials. Similar pattern of correlations across occupations have been found in different countries showing different economic and institutional contexts. This finding does not support the compensating differentials or unobserved skill differences for the existence of wage differentials, but it suggests the existence of firms paying high wages across occupations. Our results in this section confirm this hypothesis.

IV. Correlations of Industry Characteristics

Section III has shown the existence of non-competitive features in Uruguayan manufacturing. Wage differentials exist across industries, they persist over time and they are positively correlated across establishment sizes and occupations. This evidence suggests a pattern of low –and high– wage industries, where all workers are lower or higher paid than similarly qualified workers in other industries. We already identified establishment size as an industry characteristics positively associated with the wage paid in the industry. In this section we take a deeper look at other industry characteristics associated with high –or low– paying industries.

1. Empirical Evidence on the effect of Wages of Industry Characteristics

There are a number of studies that examine the attributes of high and low-paying industries[11]. The main variables used in these studies are the extent of unionism, a measure of product market power, usually a concentration ratio or profit rate, plant and firm size, and different measures of capital intensity. We briefly summarize the empirical evidence and its implications for theory in this section.

The extent of union affiliation has been found positively correlated with wages of both union and nonunion workers. However, the estimates seem to be sensitive to the model specification and data set used in the estimation[12]. These findings have some theoretical implications since the union threat model states that firms would set wages of nonunion workers high enough to prevent their unionization. Factors such as monopoly rents or low costs of collective organization will facilitate the high wages.

Product market power measures are intended to detect the ability of the firm to pay. No strong results about the impact of this variable on wages have been found in the past. Some studies present problems in measuring the concentration or profit rate and others do not find significant results when labor quality controls are included. Theoretical models, however, give different explanations for a positive relationship between product market power variables and wages. A complementary between capital and unobserved skills is argued by competitive labor market models. Certain efficiency wage models state that worker productivity is related to a perception of fair wages by workers. This fair wage is given by the ability to pay of each firm.

A positive correlation between wages and firm or plant size has generally been reported in the empirical literature. The inclusion of this variable can be justified by several models of wage determination. For example, the shirking model predicts that firms will pay higher wages to avoid shirking by workers. Shapiro and Stiglitz (1984) argue that higher wages will arise where monitoring is costly. For empirical purposes costly monitoring has been assumed in large organizations. This variable has generally been found positively correlated with wages within industries. However, it does not explain inter-industrial wage differentials.

Finally, capital intensity has been reported to have a positive relationship with industry wages. But it has been questioned whether capital intensive industries do pay high wages or if wages in certain regions or for certain groups of workers lead firms to substitute capital for labor. On theoretical grounds, certain efficiency wage models predict that capital intensive firms face large losses if productivity decliness so they tend to pay higher wages. This argument is similar to that put forward above to explain the relationship between wages and firm size.

As a concluding comment, we would like to point out that results of past studies are quite sensitive to the specification and to the sample analyzed. The effects of industry characteristics on wages are not uniform across industries and multicolinearity represents a problem to isolate the effects of individual characteristics on wages.

2. Regression Analysis

The regression results reported in past studies seem to be sensitive to the specific sample and to the particular specification of the equation. In particular, multicolinearity between industry characteristics makes it difficult to isolate the effects of individual industry characteristics on wages. To deal with this problem we estimate a large number of specifications for six consecutive years, from 1981 to 1986 in order to find variables that perform consistently.

We have data on two worker characteristics (percent of blue collar workers and average hours of work by blue collar workers), a measure of capital intensity (electricity per worker), two measures of industry size (total employment and total sales), one measure of export intensity (exports over total sales), two measures of ability to pay (profits over total sales and a four-firm concentration ratio, available only for 1981)[13] and a measure of labor market characteristic (the percentage of union affiliation in the industry, available only for 1986). The sample sizes were as follows: 50 industries for 1981, 67 industries for 1982, 1984 and 1985, 66 industries for 1983 and 44 industries for 1986.

Before going to the results, a word of caution must be said about the regression analysis. The variables are defined at the industry level rather than at the firm level, making it more difficult to extract definitive conclusions for theory.

Table 6 shows a summary of the results of regressing the log of industry average wage for white and blue collar workers respectively. The first column corresponds to the total number of times that the variable is included in all six years, the second and third columns show the number of times that the coefficient turned out positive, and the last two columns indicate the number of times the variable turned out negative for both types of workers. The numbers in parentheses correspond to the number of times the variable was found significant at 5%.

The first worker characteristic variable, percentage of blue collar workers, performed much better in regressions for blue collar wage than in regressions for white collar wage. For blue collar workers, it turned out significant 90% of the time agains only 9% for white collar workers[14]. In turn, average hours worked by blue collar workers, also showed better results for blue collar workers. In this case the significance rate is 40% for blue collar workers and 17% for white collar workers.

Opposite results are obtained for the capital intensity variable, electricity per worker. This performed better for white collar workers than for blue collar workers. Here, it turned out significant 53% of the time against only 23% in blue collar wage regressions.

Among size measures, the employment variable does not present good results. We expected it to turn out positive but it came up more frequently negative, and it was

TABLE 6

SUMMARY OF REGRESSION RESULTS
DEPENDENT VARIABLE: AVERAGE WAGES

	No. included	Positive		Negative	
		White Collar	Blue Collar	White Collar	Blue Collar
Percent Blue Collar	73	7 (0)	0 (0)	66 (6)	73 (66)
Hours worked Blue Collar	73	24 (4)	70 (28)	49 (0)	3 (0)
Electricity per Worker	105	105 (56)	99 (24)	0 (0)	6 (0)
Employment	65	16 (4)	13 (0)	49 (33)	52 (38)
Total Sales	63	63 (53)	63 (53)	0 (0)	0 (0)
Exports/Total Sales	57	32 (3)	4 (0)	25 (1)	53 (16)
Profits/Total Sales	98	98 (40)	94 (22)	0 (0)	4 (0)
Four-Firm Concentration Ratio	18	18 (0)	18 (4)	0 (0)	0 (0)
% Industry Unionization	16	16 (0)	16 (11)	0 (0)	0 (0)

Notes: Summary of the accumulated regression results from 1981 to 1986.
Number in parenthesis shows significance at 5%.
Based on 4-digit ISIC industries. See text for sample size.

mostly significant when negative. This result is contradictory with the relationship wage-size found at the plant level in section 4. We conjecture that this may be explained by the aggregation problem mentioned above. On the other hand, total sales presented good results only for blue collar workers; the rate of significance was 84% in this case. For white collar workers the variable was only significant when negative.

The results for the variable exports over sales are not as expected. For white collar workers, this variable was only positive half of the time and it showed a very low level of significance, while for blue collar workers exports over sales almost always turned out negative and the rate of significance was, again, negligible.

For ability to pay measures, profits over sales performed much better than the four-firm concentration ratio. The significance rate was 41% for white collar workers and only 23% for blue collar workers. The four-firm concentration ratio was always positive, but only significant for blue collar workers (18%).

Finally, our labor market characteristic, the percentage of industry union affiliation, was only significant for blue collar workers, 69%. For white collar workers, it was always positive but never significant. This result was to some extent expected, since usually blue collar workers are more likely to be affiliated with union organizations[15].

Even though we recommend to take these results cautiously given the problems stated above, they have some implications for the efficiency wage models presented in Section II. The positive correlation between ability to pay measures and wages is suggestive of rent-sharing models. The fact that firms share profits with employees has a positive effect on worker morale that, in turn, affects productivity. The positive correlation between sales and wages may be suggestive of shirking models. If we argue that monitoring is costly in large establishments, then firms with large establishments pay higher wages to avoid shirking. Finally, the facto that our capital intensity variable, electricity per worker, turned out significant mostly for white collar workers is problematic for many models. Certain efficiency wage models predict that capital intensive firms face large losses if productivity declines, so they pay higher wages to avoid a slowdown in productivity.

V. Conclusions and implications for Theory

Despite the sharp contrast between the Uruguayan and U.S. economies, our results show strong similarities to those of past studies. Dickens and Katz (1987a, b), Groshen (1987, 1988), Krueger and Summers (1987, 1988) and Leonard (1988) have showed that wage differentials have been remarkably stable over long periods of time; and that they are similar across occupations and countries.

We find that wage differentials are substantial in Uruguayan manufacturing and larger than those reported for the U.S. economy. The differentials persist over a twenty-year period characterized by sweeping economic and political changes. The correlations of the wage structure do not diminish over time, reflecting an underlying pattern of differentials. The wage differentials show a change around 1984; after that year the correlations increased sharply. This change may be explained by the economic and institutional reforms implemented during the period of study.

The analysis of correlations across establishment sizes shows higher correlations between large and medium size establishments and between medium and small size establishments, but lower correlations are found between small and large sizes. This fact may be explained by differences in technology between large and small size establishments.

These results seem to support efficiency wage explanations for the existence of wage differentials. The fact that wage differentials persist over time suggests that they are not explained by transitory disequilibria, rather they reflect an underlying pattern of differentials with changes around 1984, probably explained by the economic and institutional changes already described.

We also found a high correlation among the wage structures of Uruguay, Chile and Argentina. The correlations are partially explained by the establishment-size effect since the overall correlations are higher than the correlations within each size category, and the correlations increase with establishments size. Correlations between small and larger establishment sizes are low and sometimes negative. An explanation for this fact is that technology greatly differs between small and large establishments.

The same explanation applies to the analysis of correlations across establishment sizes. It shows higher correlations between large and medium size firms and between medium and small size firms, but lower correlations are found between small and large size firms.

As predicted by sociological or rent-sharing models, we find that wage differentials between white and blue collar workers are strongly correlated. However, the correlations are partially explained by the establishment size effect.

Finally, the results of the estimations of the wage equations are also suggestive of efficiency wage theories. In particular, we find support for rent-sharing models, as ability to pay variables are positively correlated to average wages. Rent-sharing models argue that firms share profits with employees to improve worker morale that, in turn, affects productivity. Similarly, the positive correlation between sales and wages is suggestive of shirking models. This assumes that the cost of monitoring workers increases with size, then large establishments tend to pay higher wages to avoid shirking.

Notes:

1 More details on the economic reforms implemented during the period of study are found in Hanson and De Melo (1983, 1985) and Ramos (1986).
2 Shapiro and Stiglitz (1984).
3 Oi (1983).
4 See for example Bulow and Summers (1986).
5 However, this low correlation for Chile may be driven by the small sample used in the analysis.
6 Table A1 in the Appendix show wage differentials for each industry as the difference between the log of wage per capita in each industry and the employment-weighted average wage in all industries.
7 Slichter (1950) and Krueger and Summers (1987).
8 All correlations of wage differentials are calculated on 4-digit ISIC basis, except for the correlation between 1978 and 1987 which is calculated on a 3-digit ISIC basis.
9 Data on the Chilean manufacturing census was obtained from Romaguera (1989).
10 Dickens and Katz (1987b), Groshen (1987) and Krueger and Summers (1987).
11 Dickens and Katz (1987a) survey that literature.
12 Lewis (1983, 1986) reviews the union effect on wages.
13 Based on 1978 data.
14 The significance rate corresponds to the number of times that the variable turned out significant at 5% of confidence level over the number of times it turned out with the expected sign.
15 The results of the last two variables, the concentration ratio and the extent of union affiliation, may be driven by the small sample size. Dickens and Katz (1987a) also report a somewhat ambiguous relationship between wages and union affiliation: different results are obtained with different samples and regression specifications.

References

ABUHADBA, M. (1987). "The Uruguayan Labor Market: 1974-85. Responses to Economic Reforms", Wordld Bank, mimeo.
---------- (1990). *Theories of Wage Determination, Trade Liberalization and the Industry Wage Structure in Uruguay*, Boston University, Ph.D. Dissertation, unpublished.
AKERLOF, G. (1982). "Labor Contracts as Partial Gift Exchange", *Quarterly Journal of Economics*, vol. XLVII, Nº 4, November.
---------- (1984). "Gift Exchange and Efficiency Wage Theory: Four Views", *American Economic Review Papers and Proceedings*, vol. 74, May.
AKERLOF, G. AND J. YELLEN (1985). "Can Small Deviations from Economic Rationality Make a Significant Difference to Economic Equilibria?", *American Economic Review*, vol. 75, Nº 4.
---------- (1986). *Efficiency Wage Models of the Labor Market*, Cambridge University Press.
BUCHELI, M. AND M. ROSSI (1988). "Estructura Salarial Industrial del Uruguay: 1980-85", *SUMA*, 3 94).
BULOW, J. AND L. SUMMERS (1986). "A Theory of Dual Labor Markets with Application to Industrial Policy, Discrimination, and Deynestan Unemployment", *Journal of Labor Economics*, vol. 4, Nº 3.
CALVO, G. (1979). "Quasi-Walrasian Theories of Unemployment,", *American Economic Review Papers and Proceeding*, vol. 69, Nº 2, May.
------ (1985). "The Inefficiency of Unemployment: The Supervision Perspective", *Quarterly Journal of Economics*, vol. L. May.
CARMICHAEL, L. (1983). "Firma Specific Human Capital and Promotion Ladders", *Bell Journal*, vol. 14, Spring.
---------- (1989). "Efficiency Wage Models of Unemployment: One view", *Economic Inquiry*, vol. XXVIII, Nº 2.
CULLEN, D. (1956). "The Interindustry Wage Structure, 1899-1950", *American Economic Review*, vol. 46, Nº 3.
DICKENS, W. (1986). "Wages, Employment and the Threat of Collective Action by Workers", NBER working paper Nº 1856, March.

DICKENS, W. AND L. KATZ (1987a). "Inter-Industry Wage Differences and Industry Characteristics", in Lang, K. and Leonard, J. eds., *Unemployment and the Structure of Labor Markets*, Oxford: Brasil Blackwell.
DICKENS, W. AND L. KATZ (1986b). "Inter-Industry Wage Differences and Theories of Wage Determination", Harvard Institute of Economic Research, Discussion Paper Nº 1324, June.
DICKENS, W.; L. KATZ AND K. LANG (1986). "Are Efficiency Wages Efficient?", NBER Working paper Nº. 1935, June.
DICKENS, W.; L. KATZ; K. LANG AND L. SUMMERS (1989). "Employee Crime and the Monotoring Puzzle", *Journal of Labor Economics*, vol. 7, Nº 31.
DICKENS, W. AND K. LANG (1985). "A Test of Dual Labor Market Theory", *American Economic Review*, vol. 75, Nº 4.
---------- (1988a). "The Reemergence of Segmented Labor Market Theory", *American Economic Review Papers and Proceedings*, vol. 78, Nº 2.
DUNLOP, J. (1957). "The Task of Contemporary Wage Theory", in J. Dunlop ed. *The Theory of Wage Determination*. New York: St. Martin's Press.
GATICA, J.; A. MIZALA AND P. ROMAGUERA (1990). "Inter-Industrial Wage differentials in Brazilian Industry", CIEPLAN, mimeo.
GIBBONS, R. AND L. KATZ (1987). "Learning, Mobility and Inter-Industry Wage Differences", MIT, mimeo.
GROSHEN, E. (1987). "Sources of Wage Dispersion: The Contribution of Inter-Employer Differentials Within Industry", Federal Reserve Bank of Cleveland, mimeo.
--------- (1988). "Do Wage Differences Among Employers Last?" Federal Reserve Bank of Cleveland, mimeo.
HANSON, J. AND J. DE MELO (1983). "The Uruguayan Experience with Liberalization and Stabilization 1974-81", *Journal of Interamerican Studies and World Affairs*, vol. 25, Nº 4, November.
---------- (1985). "External Shocks, Financial Reforms and Stabilization Attempts in Uruguay during 1974-83", *World Development*, vol. 13, Nº 8, August.
HARRIS, J. AND M. TODARO (1970). "Migration, Unemployment and Development: A Two-Sector Analysis", *American Economic Review*, vol. LC, Nº 1, March.
HINTERMEISTER, A. (1988): "Tendencias del Mercado de Trabajo", *SUMA* 3 (4).
KAHN, C. AND D. MOOKHERJEE (1988). "A Competitive Efficiency Wage Model with Keynesian Feacture", *Quarterly Journal of Economics*, vol. CIII, Nº 4.
KATZ, I. (1986). "Efficiency Wage Theories: A Partial Evaluation", *NBER, Macroeconomics Annual.*
KATZ, L. AND L. SUMMERS (1989). "Industry Rents: Evidence and Implications", *Brookings Papers on Economic Activity.*
KRUEGER, A. AND L. SUMMERS (1987). "Reflections on the Inter-Industry Wage Structure", in Lang, K. and J. Leonard, eds., *Unemployment and the Structure of Labor Markets*, Oxford: Basil Blackwell.
---------- (1988). "Efficiency Wages and the Inter-Industry Wage Structure", *Econometrica*, vol. 56, No 2.
LANG, K. (1990). "Persistent Wage Dispersion and Involuntary Unemployment", *Quartely Journal of Economics*, forthcoming.
LANG, K. AND S. KAHN (1989). "Efficiency Wage Models of Unemployment: A Second View", *Economic Inquiry*, vol. XXVIII, Nº 2.
LANG, K.; G. MARQUEZ AND P. ROMAGUERA (1988). "Theories of Wage Determiation: Lessons from Chile and Venezuela", Boston Unversity, mimeo.
LAZEAR, E. (1981). "Agency, Earnings Profiles, Productivity and Hours Restrictions", *American Economic Review*, vol. 71, September.
LEIBENSTEIN, H. (1957). *Economic Backeardness and Economic Growth*, New York: Wiley.
LEWIS, H. (1983). "Union Relative Wage Effects: A Survey of Macro Estimates", *Journal of Labor Economics*, vol. 1, Nº 1.
------ (1986). "Unión Relative Wage Effects", in *Handbook of Labor Economics*, vol. II. North-Holland.
LEONARD, J. (1988). "Wage Structure and Profit-Sharing in the Electronics Industry", UC Berkeley mimeo.
MALCOMSON, J. (1981). "Unemployment and the Efficiency Wage Hypothesis", *Economic Journal*, vol. 91, Nº 364.
---------- (1984). "Work Incentives, Hierarchy, and Internal Labor Markets", *Journal of Political Economy*, vol. 92, Nº 3.

MANN, A. AND C. SANCHEZ (1985). "Labor Market Responses to Southern Cone Stabilization Policies: The Cases of Argentina, Chile and Uruguay", *Interamerican Economic Affairs*, Nº 38, Spring.
MANOVE, M. (1986). "Job Responsibility and Promotion: An Efficiency Wage Analysis," Boston University, mimeo.
MARQUEZ, G. (1989). "Wage Differentials in the Venezuelan Manufacturing Industry: Some Implications for Employment Policy", Boston University, mimeo.
MEDOFF, J. AND K. ABRAHAM (1981). "Are those paid more really more productive? The Case of Experience", *The Journal of Human Resources*, vol. XVI.
MELGAR, A. (1988). "El Mercado de Trabajo en el Uruguay: Recepción y reactivación", *SUMA* 3 (4).
MONTGOMERY, J. (1987). "Equilibrium Wage Dispersion and Inter-Industry Wage Differentials", MIT, mimeo.
MONTOLIU, M. (1986). "The Uruguayan Labor Market: An Analysis of Main Trends 1968-83", World Bank, mimeo.
MURPHY, K. AND R. TOPEL (1987). "Unemployment, Risk and Earnings: Testing for Equalizing Wage Differences in the Labor Market", in Lang, K. and J. Leonard, eds., *Unemployment and the Structure of Labor Markets*, Oxford: Basil Blackwell.
OI, W. (1983). "Heteregoneous Firms and the Organization of Production", *Economic Inquiry*, vol. XXI, Nº 2.
PAPOLA, T. AND V. BHARADWAJ (1970). "Dynamics of Industrial Wage Structure: An Inter-Country Analysis", *The Economic Journal*, vol. 80.
RAMOS, J. (1986). *Neoconservative Economics in the Southern Cone of Latin America, 1973-83*, The Johns Hopkins University Press.
ROMAGUERA, P. (1989). *Wage Differentials and Theories of Wage Determination: Evidence from the Chilean Economy, 1937-1987*", Boston University, Ph.D. Dissertation, unpublished.
ROSE, N. (1987). "Labor Rent Sharing and Regulation: Evidence from the Trucking Industry", *Journal of Political Economy*, vol. 95. Nº 6.
ROSEN, S. (1985). "Implicit Contracts: A Survey", *Journal of Economic Literature*, vol. XXIII, Nº 3.
SALOP, S. (1979). "A Model of the Natural Rate of Unemployment", *American Economic Review*, vol. 69, Nº 1.
SHAKED, A. AND J. SUTTON, (1984). "Involuntary Unemployment as a Perfect Equilibrium in a Bargaining Model", *Econometrica*, vol. 52, Nº 6.
SHAPIRO, C. AND J. STIGLITZ (1984). "Equilibrium unemployment as a Worker Discipline Device", *American Economic Review*, vol. 74, Nº 3.
SLICHTER, S. (1950). "Notes on the Structure of Wages", *Review of Economics and Statistics*, vol. XXXIII, Nº 1.
SOLOW, R. (1979). "Another Possible Source of Wage Stickness", *Journal of Macroeconomics*, vol. 1, Nº 1.
STIGLITZ, J. (1974). "Alternative Theories of Wage Determination and Unemployment in LDC's: The Labor Turnover Model", *Quarterly Journal of Economics*, vol. LXXXXVIII, Nº 2.
STIGLITZ, J. (1984). "Theories of Wage Rigidity", NBER Working Paper Nº 1441.
STIGLITZ, J. (1987). "The Causes and Consequences of the Dependence of Quality on Price", *Journal of Economic Literature*, vol. XXV, March.
TAYLOR, J. (1980). "Aggregate Dynamics and Staggered Contracts", *Journal of Political Economy*, vol. 88, Nº 1.
WEISS, A. (1980). "Job Queves and Layoffs in Labor Markets with Flexible Wages", *Journal of Political Economy*, vol. 88, Nº 3.
------ (1989). "Efficiency Wage Models of Unemployment", Boston University, mimeo.
WEISS, L. (1966). "Concentration and Labor Earnings", *American Economic Review*, vol. 56, Nº 1.
WEITZMAN, M. (1989). "A Theory of Wage Dispersion and Job Market Segmentation", *Quanterly Journal of Economics*, vol. CIV, Nº 1.
YELLEN, J. (1984). "Efficiency Wage Models of Unemployment", *American Economic Review*, vol. 74, Nº 2.

Appendix

TABLE A.1

WAGE DIFFERENTIALS IN MANUFACTURING
FOUR-DIGIT ISIC INDUSTRIES

ISIC	Industry	1981	1982	1983	1984	1985	1986	1987
3111	Slaughtering, preparing and preserving meat	−0,051	−0.120	−0.025	−0.201	−0.177	−0.052	−0.019
3112	Manufacture of dairy products	0.327	0.159	0.218	0.313	0.362	0.356	0.323
3113	Canning and preserving of fruits and vegetables	−0.231	−0.109	−0.091	−0.128	−0.123	−0.252	−0.451
3114	Canning, preserving and processing of fish	−0.570	−0.773	−0.657	−0.626	−0.531	−0.507	−0.499
3115	Manufacture of vegetable and animal oils and fats	0.210	0.192	0.117	0.036	0.083	0.054	0.133
3116	Grain mill products	0.071	0.076	0.202	0.188	0.125	0.040	0.018
3117	Manufacture of bakery products	−0.215	−0.242	−0.284	−0.363	−0.295	−0.403	−0.410
3118	Sugar factories and refineries	0.190	0.192	0.253	0.252	0.345	0.288	0.362
3119	Manufacture of cocoa, chocolate and sugar confectionery	−0.184	0.086	0.159	0.164	0.112	0.074	−0.022
3121	Manufacture of food products nec	0.302	0.383	0.499	0.625	0.444	0.412	0.388
3122	Manufacture of prepared animal feeds	0.164	−0.115	−0.084	−0.175	−0.174	−0.162	−0.213
3131	Distilling, rectifying and blending spirits	0.348	0.215	0.253	0.176	0.332	0.235	0.217
3132	Wine industries	0.188	0.192	−0.032	−0.096	−0.021	−0.018	0.003
3133	Malt liquors and malt	0.296	0.308	0.358	0.407	0.491	0.473	0.434
3134	Soft drinks and carbonated water industries	0.278	0.326	0.465	0.512	0.518	0.498	0.589
3140	Tobacco manufactures	0.813	0.865	0.900	1.127	0.823	0.756	0.735
3211	Spinning, weaving and finishing textiles	−0.055	−0.189	−0.081	0.116	0.052	0.100	0.095
3212	Manufacture of made-up textile goods	−0.177	−0.151	0.027	−0.113	0.206	0.048	0.053
3213	Knitting mills	−0.863	−0.617	−0.567	−0.542	−0.534	−0.599	−0.598
3214	Manufacture of carpets and rugs	−0.477	−0.419	−0.466	−0.378	−0.351	−0.562	−0.621
3215	Cordage, rope and twine industries	−0.436	−0.274	−0.437	−0.435	−0.326	−0.318	−0.210
3219	Manufacture of textiles nec	0.144	0.231	0.222	0.308	0.310	0.322	0.306
3220	Manufacture of wearing apparel	−0.314	−0.318	−0.392	−0.370	−0.351	−0.354	−0.335
3231	Tanneries and leather finishing	−0.075	−0.009	−0.011	0.038	0.132	0.160	0.113
3233	Manufacture of products of leather and leather substitutes	−0.416	−0.337	−0.101	−0.344	−0.159	−0.262	−0.364
3240	Manufacture of footwear, except vulcanized or moulded rubber or plastic footwear	na	−0.502	−0.522	−0.484	−0.530	−0.591	−0.592
3311	Sawmills, planing and other wood mill	−0.078	−0.365	−0.435	−0.239	−0.468	−.342	−0.519
3312	Manufacture of wooden and cane containers	−0.798	−0.801	na	na	na	na	na
3319	Manufacture of wood and cork products nec	−0.068	−0.419	−0.410	−0.574	−0.672	−1.173	−1.170
3320	Manufacture of furniture and fixtures	−0.225	−0.359	−0.291	−0.530	−0.506	−0.576	−0.565
3411	Manufacture of pulp, paper and paperboard	0.215	0.103	0.143	0.397	0.382	0.367	0.304
3412	Manufacture of containers and boxes of paper and paperboard	−0.001	−0.282	−0.167	−0.056	−0.200	−0.187	−0.115
3419	Manufacture of pulp, paper and paperboard articles nec	0.060	0.076	0.081	0.257	0.183	0.225	0.091
3420	Printing, publishing and allied industries	0.162	0.250	0.176	0.096	0.056	0.054	0.100
3511	Manufacture of basic industrials chemicals except fertilizers	0.431	0.324	0.378	0.455	0.457	0.476	0.486
3512	Manufacture of fertilizers and pesticides	0.692	0.589	0.713	0.801	0.655	0.545	0.540
3521	Manufacture of paints, varnishes and lacquers	0.379	0.474	0.509	0.569	0.593	0.585	0.670
3522	Manufacture of drugs and medicines	0.690	0.724	0.839	0.845	0.840	0.773	0.724
3523	Manufacture of soap and cleaning preparations, cosmetics and other toilet preparations	0.319	0.445	0.365	0.391	0.357	0.239	0.340
3629	Manufacture of chemical products nec	0.323	0.286	0.393	0.347	0.321	0.310	0.279
3530	Petroleum refineries	0.361	0.391	0.379	0.301	0.468	0.337	0.307
3551	Tyre and tube industries	0.434	0.344	0.368	0.407	0.361	0.533	0.620
3559	Manufacture of rubber products nec	0.423	0.327	0.294	0.296	0.257	0.410	0.472
3560	Manufacture of plastic products nec	0.020	0.011	−0.057	−0.098	−0.114	−0.122	−0.093
3610	Manufacture of pottery, china and earthenware	−0.076	0.039	0.261	0.139	0.198	0.145	0.081
3620	Manufacture of glass and glass products	0.107	0.057	0.111	0.094	0.226	0.308	0.344
3691	Manufacture of structural clay products	0.195	0.263	0.170	0.017	−0.56	−0.140	−0.169
3692	Manufacture of cement, lime and plaster	0.349	0.318	0.281	0.255	0.367	0.288	0.286
3699	Manufacture of non-metallic mineral products nec	0.106	0.203	0.083	−0.113	−0.092	0.030	−0.051
3710	Iron and steel basic industries	−0.074	0.112	0.158	0.205	0.185	0.128	0.172
3720	Non-ferrous metal basic industries	−0.087	−0.002	−0.075	−0.410	−0.159	−0.197	−0.126
3811	Manufacture of cutlery, hand tools and general hardware	0.082	−0.064	0.059	0.072	−0.099	−0.154	−0.130
3812	Manufacture of furniture and fixtures primarily of metal	−0.190	−0.079	−0.153	−0.339	−0.314	−0.377	−0.317
3813	Manufacture of structural metal products	0.020	0.018	−0.026	−0.292	−0.358	−0.427	−0.323

TABLE A.1 (End)

WAGE DIFFERENTIALS IN MANUFACTURING
FOUR-DIGIT ISIC INDUSTRIES

ISIC	Industry	1981	1982	1983	1984	1985	1986	1987
3819	Manufacture of fabricated metal products except machinery and equipment nec	0.075	0.087	0.028	−0.014	0.007	−0.026	0.002
3822	Manufacture of agricultural machinery and equipment	na	0.066	−0.008	−0.259	−0.116	−0.203	−0.182
3823	Manufacture of metal and wood working machinery	0.131	na	na	na	na	na	na
3824	Manufacture of special industrial machinery and equipment	0.327	0.265	0.118	0.130	0.147	−0.048	0.235
3825	Manufacture of office, computing and accounting machinery	na	na	na	0.769	0.659	0.552	0.563
3829	Machinery and equipment except electrical nec	0.146	0.002	0.002	−0.009	−0.050	0.157	0.211
3831	Manufacture of electrical industrial machinery and apparatus	0.322	0.307	0.288	0.181	0.252	0.206	0.203
3832	Manufacture of radio, TV and communication equipment	−0.105	0.046	−0.077	0.255	0.141	−0.103	−0.101
3833	Manufacture of electrical appliances and housewares	0.194	0.189	0.120	0.134	0.176	0.166	0.147
3839	Manufacture of electrical apparatus and supplies nec	0.072	0.240	0.163	0.145	0.080	0.039	0.076
3843	Manufacture of motor vehicles	0.347	0.350	0.544	0.559	0.511	0.757	0.484
3844	Manufacture of motorcycles and bicycles	na	0.235	0.251	−0.171	−0.218	−0.251	−0.223
3851	Manufacture of professional and scientific, measuring and controlling equipment, nec	na	−0.223	−0.312	−0.291	−0.510	−0.414	−0.314
3902	Manufacture of musical instruments	−0.835	−0.811	−0.704	−0.543	−0.785	na	na
3903	Manufacture of sporting and athletic goods	−1.076	na	na	na	na	na	na
3909	Manufacturing industries nec	−0.267	−0.189	−0.269	−0.331	−0.268	−0.260	−0.251
	Weighted standard deviations	0.319	0.308	0.332	0.353	0.341	0.352	0.351

Note: nec.: not elsewhere classified.