ISSN: 1466-0814

# ASSESSING THE STABILITY OF THE INTER-INDUSTRY WAGE STRUCTURE IN THE FACE OF RADICAL ECONOMIC REFORMS

Jorge Saba Arbache#*, Andrew Dickerson* and Francis Green*

February 2001

**Abstract**

We assess the stability of the wage structure in an economy experiencing substantial economic changes. We find that the structure of inter-industry wage differentials remained remarkably stable in Brazil in the face of major shocks.

**JEL Classification:** J31

**Keywords:** wage structure, inter-industry wage differentials, Brazil

**Acknowledgements:** Funding for this paper was provided by the UK Economic and Social Research Council, Grant Number R000223184.

**Correspondence Address:** Professor Jorge Arbache, Instituto de Ciências Humanas/Eco, Universidade de Brasília, Caixa Postal 04302, Brasília DF 70910-900, BRAZIL. Tel: +55 61 3072498 Ext. 45; Fax: +55 61 3402311; email: jarbache@unb.br.

# University of Brasilia, Brazil
* University of Kent at Canterbury, UK

# ASSESSING THE STABILITY OF THE INTER-INDUSTRY WAGE STRUCTURE IN THE FACE OF RADICAL ECONOMIC REFORMS

## 1. Introduction

An intriguing finding in labor economics is the remarkable regularity that has been found in the pattern of inter-industry wage differentials. Slichter (1950) investigated hourly wages of males in US manufacturing from 1923 to 1946 and found a rank correlation of industry wages of 0.73. This long-term stability has been confirmed in several more recent studies of the US labor market (e.g. Krueger and Summers, 1987, 1988; Allen, 1995).[1] It has also been found that the wage structure is similar among countries with diverse institutions and political systems (Krueger and Summers, 1987; Katz and Summers, 1989; Gittleman and Wolff, 1993). These findings on inter-industry wage differentials drove Krueger and Summers (1987, p. 17) to conclude that "their pervasiveness suggests that they result from factors fundamental to the workings of capitalist economies which transcend the institutional setting in any particular time and place".

In this paper we investigate whether inter-industry wage stability also holds for an economy experiencing substantial economic change over a relatively short period of just two decades. Specifically, we examine the case of Brazil, which in the 1980s and 1990s experienced a major and rapid trade liberalization, radical market-oriented policy reforms, and high and variable inflation. These three shocks to the economy might be expected to affect both relative prices and wages and hence disturb traditional inter-industry wage differentials. The assessment of the Brazilian case therefore constitutes a new and strong test for the stability of the wage structure.

[1] There are some similar findings for countries in which labour markets and institutions are very different such as Sweden and Italy (e.g. Lucifora, 1993; Arai, 1994).

## 2. Brazilian Reforms and Shocks

Brazil's trade liberalization took place over a relatively short period of time, roughly from 1990 to 1994. The reductions in trade protection were widespread and substantial. Nevertheless, the reforms affected industries differentially – for example, the textile industry was strongly affected by new competition, and many firms went bankrupt. Liberalization followed a century-long era of import substitution strategies that left Brazil an especially closed economy by the end of the 1980s. With the incoming Collor government in 1990, serious liberalization began with the abolition of 'Anexo C', a list of about half of all industrial products which previously could not be imported. For the next three years, a tariff reform program and other liberalizing measures ensued. The impact was seen in the rapid rise in exports and even more so in imports. By 1996, the import penetration ratio had reached 11.5 percent – more than twice the figure for 1990 – and the quantum of imports had increased almost three times.

Second, the restrictive rules and laws which prevented internal and external competition in many sectors for a considerable period of time began to be removed in 1990. From the middle of the 1990s, the government granted concessions for ports, railways, motorways, power distribution, mining, banking, telecommunications among other sectors to national and multinational companies, stimulating competition. The privatization of state companies also became one of the central reforms of the period. The privatization program really accelerated in 1996, when it started to be used as a key policy aiming at keeping inflation stabilized and reducing fiscal deficits (Modiano, 2000). By 1998, the steel, chemical, fertilizer, petrochemical, electrical, telecommunications and mining among other industries had been privatized, and many sectors were undergoing privatization (Indicadores IESP, 1999). Deregulation of the labor market, removing restrictions on international investment, and the break-up of state monopolies, such as petroleum and gas extraction, also became important.

As one of the results of such reforms, the country became one of the main destinations of foreign direct investments (FDI). From 1990 to 1995, an average of 3.2 billion dollars came a year as FDI, but it jumped to an average of 21.270 billion dollars a year from 1996 to 1999. As a consequence, international capital took a major role in both green fields and privatization.

Third, throughout the 1980s and early 1990s Brazil experienced large and variable inflation, ranging up to 3,000 percent. Between 1986 and 1994, six stabilization plans based on freezing or controlling prices and wages and four currency changes were put forward in attempting to halt the accelerating rate of inflation observed since the beginning of the 1980s, but only the 1994 plan – the *Plano Real* – succeeded in breaking the indexation pattern and keeping inflation at comparatively low levels (Sachs and Zini, 1996). Although prices and wages were indexed in most of the period till 1994, varying union bargaining power and degrees of industrial concentration allowed relative wages and prices to change significantly, especially in the second half of the 1980s, thus potentially affecting the wage structure (Amadeo, 1993, 1994).

These three major shocks, on their own and even more so together, might be expected to have altered the structure of inter-industry wage differentials, as a result of adjustments caused by inter-sectoral shifts in labor demand or simply by disturbance of inertial wage relativities.

## 3. Data and Methodology

As well as the occurrence of these major economic shocks, the case of Brazil is also suitable for the study of wage structure stability because it has available a reliable and rich series of individual-level data. The Pesquisa Nacional por Amostras de Domicílios (PNAD) is

a series of nationally representative cross-section household surveys which have been carried out every year since 1976, excepting 1980, 1991 and 1994. They are conducted using a consistent methodology by the government's statistical agency, Instituto Brasileiro de Geografia e Estatistica (IBGE). We use data from 1981 until 1999, thus giving a series of nearly a decade each side of the initiation of trade reform. We restricted our analysis to employed individuals earning a positive wage, aged between 18 and 65 inclusive. This yields an average of almost 125,000 individuals per annum. We investigate 2-digit level industries totaling 31 sectors, covering manufacturing, agriculture, mineral extraction and the service sector. We estimate the inter-industry differentials from Mincerian wage equations using the procedure proposed by Haisken-DeNew and Schmidt (1997). Our primary concern is with the correlations across years of the estimates of the conditional industry wage premia.

## 4. Results

Table 1 presents the Pearson correlation coefficients of the inter-industry wage premia over the period 1981-1999. All coefficients are very high and statistically significant at the 1% level.[2] These results suggest that the wage structure seems to follow a pattern which is relatively little affected even by major shocks. Between 1981 and 1999, the correlation coefficient is 0.902. This stability applies both to the short term and to the whole period. Industries which used to pay high wages before openness, privatization, deregulation and deflation are still paying high wages and vice-versa, despite all the potential impacts these changes may have on relative prices and resource allocation. This is illustrated clearly in Table 2 which presents the inter-industry premia in rank order in 1981 together with the corresponding premia and their rank in 1999. The rank correlation coefficient between 1981

[2] Rank correlation coefficients for the inter-industry wage premia are similar in magnitude.

and 1999 is 0.930. As further evidence of the stability in wage structure, the overall dispersion (standard deviation) of the inter-industry wage differentials is also little changed over the period, being 0.189 in 1981 and 0.181 in 1999.

## 5. Conclusion

This paper examined the stability of the wage structure in a rapidly changing developing economy - Brazil in the 1980s and 1990s. Our results strongly support previous findings on the stability of the wage structure that pertain to developed countries over the long term. Whatever the reasons behind this phenomenon, industry affiliation seems to exert a major role on the wage structure.

## REFERENCES


Allen, S.G., 1995, Updated Notes on the Inter-industry Wage Structure, 1890-1990, *Industrial and Labor Relations Review*, 48, 305-321.

Amadeo, E.J., 1993, Do relative wages move together with relative prices?, *Revista Brasileira de Economia*, 47, 33-52.

Amadeo, E.J., 1994, Bargaining power, mark-up power, and wage differentials in Brazil, *Cambridge Journal of Economics*, 18, 313- 322.

Arai, M., 1994, An Empirical Analysis of Wage Dispersion and Efficiency Wages, *Scandinavian Journal of Economics*, 96, 31-50.

Gittleman, M. and E.N. Wolff, 1993, International Comparisons of Inter-Industry Wage Differentials, *Review of Income and Wealth*, 39, 295-312.

Haisken-DeNew, J.P. and C.M. Schmidt, 1997, Inter-Industry and Inter-Region Differentials: Mechanics and Interpretation, *Review of Economics and Statistics*, 79, 516-21.

Indicadores IESP, 1999, *Fundação do Desenvolvimento Administrativo*, 8, 43.

Katz, L.F. and L.H. Summers, 1989, Industry Rents: Evidence and Implications, *Brookings Papers on Economic Activity, Microeconomics*, 209-275.

Krueger, A.B. and L.H. Summers, 1987, Reflections on Inter-Industry Wage Structure, in: K. Lang, and J. Leonard, eds., *Unemployment and the Structure of Labor Markets*, Basil Blackwell, Oxford.

Krueger, A.B. and L.H. Summers, 1988, Efficiency wages and the Inter-Industry Wage Structure, *Econometrica*, 56, 259-193.

Lucifora, C., 1993, Inter-Industry and Occupational Wage Differentials in Italy, *Applied Economics*, 25, 1113-1124.

Modiano, E., 2000, Um balanço da privatização nos anos 90, in: A.C. Pinheiro and K. Fukasaku, orgs., A privatização no Brasil – O caso dos serviços de utilidade pública, (BNDES/OECD, Rio de Janeiro).

Sachs, J. and A. A. Zini, 1996, Brazilian Inflation and the Plano Real, *World Economy*, 19(1), 13-37.

Slichter, S.H., 1950, Notes on the Structure of Wages, *Review of Economics and Statistics*, 32, 80-91.

**Table 1**

**Pearson Correlation Coefficients of Inter-industry Wage Differentials: 1981-99**

| Year | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1992 | 1993 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1981** | 1.000 | | | | | | | | | | | | | | | | |
| **1982** | 0.989 | 1.000 | | | | | | | | | | | | | | | |
| **1983** | 0.979 | 0.983 | 1.000 | | | | | | | | | | | | | | |
| **1984** | 0.982 | 0.987 | 0.986 | 1.000 | | | | | | | | | | | | | |
| **1985** | 0.981 | 0.984 | 0.985 | 0.994 | 1.000 | | | | | | | | | | | | |
| **1986** | 0.967 | 0.965 | 0.963 | 0.966 | 0.968 | 1.000 | | | | | | | | | | | |
| **1987** | 0.968 | 0.979 | 0.975 | 0.973 | 0.974 | 0.969 | 1.000 | | | | | | | | | | |
| **1988** | 0.965 | 0.979 | 0.972 | 0.965 | 0.966 | 0.967 | 0.989 | 1.000 | | | | | | | | | |
| **1989** | 0.961 | 0.966 | 0.950 | 0.961 | 0.960 | 0.962 | 0.971 | 0.971 | 1.000 | | | | | | | | |
| **1990** | 0.925 | 0.945 | 0.919 | 0.922 | 0.933 | 0.943 | 0.951 | 0.956 | 0.953 | 1.000 | | | | | | | |
| **1992** | 0.937 | 0.964 | 0.943 | 0.940 | 0.942 | 0.904 | 0.955 | 0.959 | 0.941 | 0.943 | 1.000 | | | | | | |
| **1993** | 0.951 | 0.961 | 0.938 | 0.937 | 0.944 | 0.908 | 0.952 | 0.951 | 0.942 | 0.933 | 0.979 | 1.000 | | | | | |
| **1995** | 0.909 | 0.926 | 0.884 | 0.884 | 0.885 | 0.884 | 0.914 | 0.927 | 0.911 | 0.935 | 0.950 | 0.961 | 1.000 | | | | |
| **1996** | 0.901 | 0.918 | 0.874 | 0.881 | 0.876 | 0.867 | 0.897 | 0.907 | 0.893 | 0.915 | 0.947 | 0.949 | 0.981 | 1.000 | | | |
| **1997** | 0.907 | 0.928 | 0.892 | 0.884 | 0.888 | 0.862 | 0.917 | 0.920 | 0.904 | 0.925 | 0.967 | 0.963 | 0.976 | 0.971 | 1.000 | | |
| **1998** | 0.899 | 0.916 | 0.882 | 0.873 | 0.878 | 0.847 | 0.909 | 0.909 | 0.882 | 0.905 | 0.949 | 0.949 | 0.965 | 0.962 | 0.989 | 1.000 | |
| **1999** | 0.902 | 0.909 | 0.879 | 0.883 | 0.887 | 0.850 | 0.901 | 0.888 | 0.887 | 0.890 | 0.938 | 0.941 | 0.931 | 0.955 | 0.960 | 0.974 | 1.000 |

**Notes:**

1. Covariates are: experience, experience squared, 6 dummies for education level, work card (a dummy for employment with a formal labour contract) urban, gender. The inter-industry differentials are calculated using the methodology of Haisken-DeNew and Schmidt (1997).
2. All correlation coefficients are significant at the 1% level.

**Table 2**

**Industry Wage Premia and Rank in 1981 and 1999**

| | 1981 | | 1999 | |
|---|---|---|---|---|
| **2-digit industry** | *rank* | premia | *rank* | premia |
| petrol, gas and coal | *1* | 0.649 | *1* | 0.795 |
| financial institutions | *2* | 0.525 | *2* | 0.553 |
| petroleum refining | *3* | 0.523 | *4* | 0.425 |
| vehicles and parts | *4* | 0.458 | *3* | 0.438 |
| mechanic goods | *5* | 0.438 | *8* | 0.254 |
| electrical and electronics | *6* | 0.372 | *9* | 0.244 |
| pharmaceuticals | *7* | 0.339 | *7* | 0.301 |
| industrial services | *8* | 0.317 | *5* | 0.414 |
| metallurgic goods | *9* | 0.317 | *11* | 0.221 |
| chemicals | *10* | 0.301 | *10* | 0.222 |
| communications | *11* | 0.285 | *13* | 0.192 |
| public administration | *12* | 0.261 | *6* | 0.313 |
| mineral extraction | *13* | 0.260 | *19* | 0.085 |
| rubber | *14* | 0.251 | *12* | 0.196 |
| paper and publishing | *15* | 0.206 | *14* | 0.187 |
| plastics | *16* | 0.185 | *18* | 0.111 |
| transport | *17* | 0.145 | *15* | 0.177 |
| other manufacturing | *18* | 0.128 | *23* | 0.008 |
| footwear | *19* | 0.099 | *26* | -0.024 |
| commerce | *20* | 0.066 | *20* | 0.022 |
| company services | *21* | 0.060 | *17* | 0.145 |
| non-metallic goods | *22* | 0.054 | *25* | 0.001 |
| rental | *23* | 0.021 | *16* | 0.157 |
| food | *24* | 0.002 | *27* | -0.028 |
| construction | *25* | -0.022 | *21* | 0.021 |
| textiles | *26* | -0.048 | *28* | -0.090 |
| family services | *27* | -0.056 | *22* | 0.013 |
| wood and furniture | *28* | -0.087 | *24* | 0.003 |
| agriculture | *29* | -0.129 | *31* | -0.330 |
| clothing | *30* | -0.139 | *29* | -0.170 |
| other non-traded services | *31* | -0.423 | *30* | -0.196 |

**Note:**
1. See Table 1.