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Informal labor contracts: A solution or a problem?

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40

DISCUSSION PAPER

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**Ricardo Barros
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Federal Government of Brazil

**Secretariat of Strategic Affairs of the
Presidency of the Republic**
Minister Roberto Mangabeira Unger



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DISCUSSION PAPER

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SUMMARY

1. INTRODUCTION
 - 1.1. Three Major Characteristics of Brazilian Labor Markets
 - 1.2. A Hypothesis
2. THE ROLES OF INFORMAL LABOR CONTRACTS IN THE FUNCTIONING OF BRAZILIAN LABOR MARKETS
3. RESEARCH STRATEGY AND OBJECTIVES
4. EMPIRICAL PRELIMINARIES
 - 4.1. Data Source and Universe of Analysis
 - 4.2. Definition of Variables
5. METHODOLOGY
 - 5.1. Preliminaries
 - 5.2. Are Positive Wage Gaps Evidence of Segmentation?
 - 5.3. From Multivariate Analysis to Standardized Univariate Analysis
6. EMPIRICAL RESULTS
7. THEORETICAL FRAMEWORK
 - 7.1. Introduction
 - 7.2. Types of Covariation
 - 7.3. Basic Description of the Model
8. DEGREE OF INFORMALITY
 - 8.1. Temporal Evolution
 - 8.2. Regional Disparities
 - 8.3. Degree of Informality by Educational Levels
 - 8.4. Degree of Informality by Age Groups
9. WAGE GAP
 - 9.1. Temporal Evolution
 - 9.2. Regional Disparities
 - 9.3. The Wage Gap by Educational Level
 - 9.4. The Wage Gap by Age Group

10. CONCLUSIONS

REFERENCES

INFORMAL LABOR CONTRACTS: A SOLUTION OR A PROBLEM?*

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1. INTRODUCTION

1.1. Three Major Characteristics of Brazilian Labor Markets

Brazilian labor markets have three important characteristics. The causes and roots of these characteristics are, however, not well understood. First, Brazilian labor markets have already proved to have a surprisingly large capacity of absorbing labor. The rate of growth of the labor force has remained above 3% per year and the rate of growth of economic activity, although of the same magnitude, has experienced large fluctuations.¹ Despite these facts unemployment has remained at very low levels at all times as seldom more than 5% of the labor force has been unemployed.²

A large inequality in labor earnings revealed or generated by Brazilian labor markets is a second major characteristic. The Gini coefficient associated with the distribution of labor earnings in Brazil was above 0.6 in 1988 and has been increasing continuously from 1986 to 1989 [see Bonelli and Sedlacek (1989) and Ramos and Trindade (1991)]. This level of inequality is very large even when compared to other Latin American countries which tend already to be more unequal than other countries in the world. For instance, the inequality in Mexico, Colombia and Peru measured by the Gini coefficient is already below 0.5 and decreasing [Reyes(1988), Rodriguez(1991), CEPAL(1990a,b)]. In Costa Rica and Venezuela the Gini coefficients are already below 0.4 [Cepal (1990 c, 1991)]. As a matter of fact, Brazil has the largest degree of inequality among all countries for which reliable statistics on income distribution are available.³

The third major characteristic of Brazilian labor markets is that only approximately 55% of the occupied labor force is made of employees who have a formal labor contract, with the behavior of the labor market in the 1980s revealing no evidence that this degree of formalization is expected to increase. Actually, during the 1980s the degree of formalization decreased slightly. The other half of the occupied labor force is

¹The economically active population increased from 47.5 million in 1981 to 61.0 million in 1989.

²The highest unemployment rate during the 1980s was in 1983, 4.9%.

³Reliable statistics on income distribution are available for more than 40 countries.

made of employees who do not have formal labor contracts (22%), self-employed workers (19%) and employers (4%) (see Table 1). Therefore, only 72% of the employees have a formal labor contract which endows them with a series of legal rights and obligations. The remaining 28% work without a formal labor contract without necessarily paying taxes or contributions to the social security system (see Table 1). In Brazil, to hire a permanent worker without a formal labor contract is illegal but certainly not strictly enforced by the government.

Table 1
Composition of the Labor Force
Metropolitan Brazil
1988

Category	Proportion (%)	
Unemployed	5	
Occupied	95	
Employer	4	
Self-Employed	19	
Employee	77	
With Formal Contract		72
Without Format Contract		28

Source: PNAD-1988 [IBGE (1990)].

1.2. A Hypothesis

A hypothesis commonly mentioned about the functioning of labor markets in Brazil is that this third characteristic - the large degree of informality - is the cause of the first two - the small unemployment rate and the large degree of inequality. The argument in a very simplified form is the following: Since a large fraction of the labor force would accept jobs without formal labor contracts at relatively low wages, unemployment can be held at low levels while inequality and poverty are being generated.

The major objective of this study is to search for empirical evidence in favor and against this hypothesis. This hypothesis is at the center of the discussion of whether informal labor contracts are a solution to labor absorption and unemployment or a problem to the extent they generate poverty and inequality. If informality brings flexibility to the labor market, it may be a solution for unemployment and labor absorption in economies with a fast growing labor force. However, if informality means labor market segmentation, it is a labor market problem to the

extent that segmentation is a source of inequality and poverty.

To the extent that jobs with informal labor contracts offer equally productive workers lower wages than what they would get in jobs offering formal contracts, labor market segmentation will be prevalent and inequality will be generated. This type of inequality will be particularly undesirable for at least two reasons. First, social welfare will be very sensitive to the fact that equally productive workers are receiving different wages. Since this type of inequality would not be related to merit, it would be a major violation of the ideal of equal opportunity. Secondly, the unequal payment of equally productive workers may be an important source of allocative inefficiencies and pervasive incentives to individual labor supply.

In the next section we elaborate on the possible roles of informal labor contracts in the functioning of Brazilian labor markets. We focus on under which conditions the non-strict enforcement of the Law - a behavior implicitly followed by the Brazilian government - is a desirable or undesirable strategy for workers currently holding jobs with and without formal contracts.

2. THE ROLES OF INFORMAL LABOR CONTRACTS IN THE FUNCTIONING OF BRAZILIAN LABOR MARKETS

The fact that the Law requiring all employees to have a formal labor contract is not strictly enforced has received considerable attention and raises many important questions. Overall the most important question is whether or not workers really prefer jobs offering a formal labor contract to those which do not offer a formal contract. In other words, is it true that equally productive workers receive higher wages in jobs offering formal contracts than in jobs not offering formal contracts? If we define labor market segmentation as the situation in which there are equally productive workers receiving different wages, then an affirmative answer to this question is equivalent to recognizing the existence of segmentation in the labor market.

At this point it is important to differentiate this question from a related second question which is more intimately related to whether or not a worker would like to have a formal labor contract. This related question can be formulated as follows: If workers were faced with the option - given by the government to workers and firms - of choosing whether to have a formal labor contract or not in the job they currently

hold, which would they prefer? It may well be true, mainly if the Law imposes undesirable restrictions on workers and firms, that workers with formal contracts could renegotiate their contracts and be better off with informal contracts than with their original formal contracts.

Hence, it is perfectly conceivable that these two questions have opposing answers. Workers may not prefer to have a formal contract in their current jobs, and at the same time, they may prefer jobs which offer formal contracts. The latter preference is merely a consequence of the fact that jobs offering formal contracts are usually those that also offer better labor contracts with higher wages, better working conditions etc. In this case, workers do not want formal contracts *per se*. However, since, due to other reasons, either technological or organizational, some firms offer better contracts and because it happens that these firms are the same firms offering formal contracts, workers would prefer jobs with formal contracts even though they do not really care much about whether the contract itself is formal or not. In other words, they prefer better contracts, not necessarily formal contracts, but, since better contracts tend to be formal, it may appear that workers have preference for formal contracts.

In summary, the legislation is not necessarily the source or cause of differences between formal and informal labor contracts. The differences possibly originate in some other sources of heterogeneity among firms. Since firms offering formal contracts are probably the same firms offering better contracts, it may occur that a formal labor contract becomes an indicator in the labor market of a good labor contract. Workers would at the same time declare to prefer jobs offering formal contracts, but when holding a job without formal contract, they may very well prefer the legislation not to be strictly enforced.

There exists no consensus about whether Brazilian workers indeed prefer formal labor contracts *per se*. On the one hand, some labor market analysts believe that the restrictions imposed by the Brazilian labor legislation are so strict and inappropriate that every worker and firm would benefit from disobeying it.

On the other hand, other analysts believe that most workers, if faced with the option of having a formal contract or not in their current jobs, would prefer to have a formal contract. In this case we would say that workers demand formal contracts but some firms do not offer or cannot afford it. Note that in this case the

workers preference for formal contracts is implicitly conditional on their jobs still being offered after the requirement of a formal labor contract is imposed.

So, even if workers prefer formal labor contracts in their current job, it is still questionable whether or not workers currently in jobs without a formal labor contract would be better off if the Law were strictly enforced. The answer to this question depends on what would be the effect of a more strict enforcement of the Law on those jobs which were previously offering no formal contract.

On the one hand, a consequence of a policy of strict enforcement of the Law could be the elimination of these informal jobs. This jobs could become economically unfeasible, and consequently they would not be offered if the Law must be obeyed. In this case workers previously occupying these jobs would not be better off by the implementation of such policy.

Under this view, the legislation is perceived as benefiting workers who can get jobs with formal contracts but, at the same time, the legislation is perceived as unrealistic as far as a large number of existent informal jobs are concerned. Since, an active enforcement of the Law would eliminate these informal jobs, those workers who currently hold these jobs would become unemployed and consequently worse off instead of better off. In this case each worker in isolation would prefer to have a job with a formal contract, however, workers currently without a formal labor contract, as a group, would not prefer a more active enforcement of the Law by the government, since, from the point of view of this group, a more active enforcement would lead to unemployment instead of better jobs.

On the other hand, the impact of strictly enforcing the Law could be the conversion of jobs previously not offering formal contracts into better jobs now offering formal contracts. In this case, the welfare of workers occupying informal jobs would be improved by a more active enforcement of the Law. In this case the labor legislation would be appropriately accomplishing its goals - to put bounds on potential contracts which could be signed between firms and workers and so avoiding the exploitation of the labor force and creating an harmonic relationship between capital and labor. By this view the legislation indeed would help to avoid the exploitation of workers by firms and it should, in order to benefit workers, be more strictly enforced.

3. RESEARCH STRATEGY AND OBJECTIVES

Fortunately, most household surveys and surveys of the labor force in Brazil have information on whether or not each employee has a formal labor contract.⁴ In this study we use extensive information, covering the period from 1981 to 1989, from a major Annual Household Survey, the PNAD (Pesquisa Nacional por Amostra de Domicílios).⁵

Our main objective is to use this large body of information to shed some light on the desirability of jobs without labor contract relative to jobs offering formal contracts. We also investigate the desirability of a stricter enforcement of the Law requiring all labor relations to be ruled by a formal contract.

As a research strategy, we proceed in three steps: First, we divide the labor market into a large number of compartments. Secondly, we compute for each compartment a) the fraction of employees who are working without a formal labor contract (degree of informalization); b) the median wage gap between employees with and without formal labor contracts; and c) the unemployment rate. Thirdly, we investigate what can be learned about the desirability of informal labor relations from the variability of these three variables (degree of informalization, wage gap, and unemployment rate) across labor market compartments.

⁴The actual information available is on whether or not an employee has a formal labor contract registered in his/her working notebook. A serious problem is that most government workers do not even have a working notebook, since their labor contracts follow a different legislation and are not required to be registered in a working notebook. The information available does not differentiate workers in non-governmental firms working without a labor contract from government employees. We use information on occupation, sector of economic activity and contribution for the social security system from other items in the questionnaire to identify and isolate public servants from employees without a formal labor contract. The procedure we use is described in Section 4.2.

⁵Other household and labor surveys which have similar information and could be used in conjunction with the PNAD are the Decennial Demographic Census and the Brazilian Monthly Employment Surveys - PME (Pesquisa Mensal de Emprego).

The subsequent sections of this study are organized as follows: The next section describes the data set, the universe of analysis and the main concepts used in the study. Section 5 describes the division of the labor market into compartments, their main characteristics, the standardization methodology we use, and conditions under which our estimates can be used to test for segmentation in the labor market. Section 6 simply presents our estimates for the degree of formalization, wage gap and unemployment rate by compartment. Section 7 introduces a theoretical framework which we use to help in interpreting the variations and covariations of these three variables across compartments. Using this framework, the estimates reported in Section 6 are analyzed in the two subsequent sections. Section 8 analysis our findings relative to the degree of formalization and its relation to unemployment rate. Section 9 investigates the findings relative to the wage gap between jobs with and without formal contracts and its relation to the degree of formalization and unemployment rate. Section 10 presents a summary of the main conclusions.

4. EMPIRICAL PRELIMINARIES

4.1. Data Source and Universe of Analysis

Data Source: This study is based on nine annual national household surveys covering the period from 1981 to 1989. These surveys, which are called PNAD (Pesquisa Nacional por Amostra de Domicílios), are part of a larger set of household surveys collected by IBGE (Instituto Brasileiro de Geografia e Estatística). PNAD is an annual national⁶ survey, collected in September of each year based on a probabilistic sample of households. The sampling scheme is complex. More specifically, this survey is based on a three-stage stratified sample of households with sampling rates varying across geographical areas from 1/400 to 1/50. Given the size of the Brazilian population, these sampling rates generate very large samples. Each year, PNAD interviews around 0.5% of the Brazilian households, a number which corresponds to more than 50 thousand households.

⁶Only the rural areas of Northern Brazil are not included in the sample.

Universe of Analysis: To avoid difficulties involved in analyzing a heterogeneous market such as the Brazilian labor market, we restrict our universe of analysis into four dimensions. First, we limit the analysis to the nine major Brazilian Metropolitan Areas. From North to South they are: Belém, Fortaleza, Recife, Salvador, Belo Horizonte, Rio de Janeiro, São Paulo, Curitiba, and Porto Alegre. Secondly, we limit the universe to the urban segment of these metropolitan areas and exclude from the analysis all persons who declare to be working in non-urban activities.⁷ Thirdly, due to the very nature of the analysis, we limit the universe to **employees** with or without a formal labor contract. We study only employees in the private sector. All employees we could identify as working for the government were excluded from the analysis.⁸ Notice that also, all self-employed workers and employers were excluded. Finally, we limit the analysis to males who have never completed even one year of college education, i.e., all individuals in our sample have 11 years or less of completed schooling.

Overall, this universe is composed of 12.5 million workers in 1988 which corresponds to approximately 20% of the Brazilian labor force in that year. The total sample size, for the nine years in our analysis, is slightly above 200 thousand observations. For each year the sample size varies from 15 thousand to almost 30 thousand observations.

4.2. Definition of Variables

Formal Labor Relations (F):⁹ We classify an employee in our universe as having a formal contract when he/she declares to have a formal labor contract registered in his/her working notebook. Otherwise, the worker is classified as not having a formal labor contract. This classification procedure works appropriately since we have already restricted our universe of analysis to **non-government employees**. So government employees,

⁷Only 1.4% of the universe of workers in metropolitan Brazil are engaged in non-urban activities.

⁸We use three criteria to identify government workers: sector of activity, occupational category, and social security contribution status. Using this procedure 8.3% of all workers were identified as government workers.

⁹These letter in parenthesis indicate how each variable will be denoted in this study.

self-employed workers and employers have already been excluded.

Wages (W): To measure wages we use labor earnings standardized by hours worked. Specifically, the wage of each worker is defined as the ratio between the monthly labor income he receives in his main job and the number of hours he declares to usually work per week in this job.

Temporal and Regional Disaggregation (T,R): We investigate individually all nine years from 1981 to 1989 and all nine major Brazilian metropolitan areas: Belém, Fortaleza, Recife, Salvador, Belo Horizonte, Rio de Janeiro, São Paulo, Curitiba, and Porto Alegre.

Individual Characteristics (E,A): With respect to education the population is divided into four categories according to the number of completed years of schooling:¹⁰ a) none; b) 1 to 4 years; c) 5 to 8 years; and d) 9 to 11 years. It should be remembered that all workers with more than 11 years of schooling were excluded from the sample. With respect to the age in years, the population is divided into five categories: a) 10 to 25 years; b) 26 to 35; c) 36 to 45, (d) 46 to 55; and e) more than 55.

Table 2 presents, for workers with formal contracts, the median log-wage of each educational category relative to the median log-wage among workers with no schooling. This table indicates that in our universe as elsewhere [see Lam and Levison (1991), Ramos (1991) and Reis and Barros (1991) and references cited there] wages increase monotonically and very rapidly with years of schooling.¹¹

¹⁰The number of years completed of schooling is an information which is not directly available from the questionnaire. It can, however, be constructed from four other basic questions on education using an algorithm described in Barros and Ramos(1991).

¹¹The results in Table 2 are the wage differentials after controls have been introduced for age and region of residence. The results, however, are not very sensitive to the inclusion of these controls. In this particular subject see Barros and Ramos (1992).

Table 3 also presents how the median log-wage varies across age groups for workers with formal contracts. All median log-wages are measured relative to the median log-wage of the youngest group. This table reveals the usual inverted U-shape with wages achieving a peak at the 45-55 years age group.¹²

Table 2
Median Log-Wage Differentials by Educational Categories

Category	Differential
1 to 4	0.25
5 to 8	0.53
9 to 11	1.10

Note: All differentials are relative to the group with no schooling. They were obtained using as controls region of residence and age.

Table 3
Median Log-Wage Differentials by Age Groups

Category	Differential
26 to 35	0.48
36 to 45	0.71
46 to 55	0.75
more than 55	0.67

Note: All differentials are relative to the youngest age group. They were obtained using as controls region of residence and education.

¹²All wage differentials in Table 3 are obtained after controls have been introduced for education and region of residence. In contrast to the results in Table 2, the results in Table 3 are very sensitive to the inclusion of these controls. If these controls are not included, the wage profile peaks at a much earlier age group.

5. METHODOLOGY

5.1. Preliminaries

Let $\mathcal{P}$ be a super-population formed by all members of the Brazilian labor force in our universe of analysis and p be a worker in this population.¹³ Let $W_0(p)$ and $W_1(p)$ be two hypothetical log-wages associated to worker p . On the one hand, $W_0(p)$ is the log-wage that worker p would have if he/she had a job without a formal labor contract. On the other hand, $W_1(p)$ is the log-wage that worker p would have if he/she had a job with a formal labor contract. So, if $W_1(p) - W_0(p) \neq 0$ for a group of workers, we would say that the labor market is segmented. Unfortunately, for each worker p only one of the hypothetical log-wages, $W_0(p)$ and $W_1(p)$, can be observed. Therefore the difference $W_1(p) - W_0(p)$ can never be computed. This is the major source of difficulties in testing for segmentation in the labor market.

To establish formally the relationship between the pair of hypothetical log-wages and the observed or realized log-wage, let $F(p)$ be an indicator that equals one if worker p has a formal contract and zero otherwise. Note that we only observe $W_1(p)$ for workers with formal contracts, $F(p)=1$; whereas only $W_0(p)$ can be observed for those working without formal contracts, $F(p)=0$. Therefore, if $W(p)$ denotes the observed log-wage of worker p then

$$W = W_1 \cdot F + W_0 \cdot (1-F)$$

Next, let $T(p)$, $R(p)$, $E(p)$, and $A(p)$ be the year, the region of residence, the educational category, and the age category to which worker p belongs, respectively. As described in the previous section, in this study we consider: 9 years, 9 regions of residence, 4 educational categories, and 5 age groups. Each compartment of the labor market is determined by a combination of these categories. Therefore, there are a total of 1,620 compartments ($9 \times 9 \times 4 \times 5$). A typical compartment will be denoted by $c=(t,r,e,a)$.

For each of these 1,620 compartments we investigate three characteristics: a) the proportion of workers with formal labor relations in the compartment, $P[F=1|T=t,R=r,E=e,A=a]$; b) the median log-wage among workers in the compartment who do not have formal labor

¹³Remember that our universe of analysis involves the labor force for several years. So, if a given worker is present in our universe for more than one year, he/she will be represented by a different p in each year.

relation, $M[W|F=0, T=t, R=r, E=e, A=a]$; ¹⁴ and c) the median log-wage among workers in the compartment who have formal labor relation, $M[W|F=1, T=t, R=r, E=e, A=a]$. To simplify the notation we use

$$p(t, r, e, a) = P[F=1|T=t, R=r, E=e, A=a]$$

$$\Delta(t, r, e, a) = M[W|F=1, T=t, R=r, E=e, A=a] - M[W|F=0, T=t, R=r, E=e, A=a]$$

We refer to $p(t, r, e, a)$ and $\Delta(t, r, e, a)$ as the degree of formalization and the wage gap, respectively, in the compartment (t, r, e, a) .

We emphasize that investigating how the degree of formalization and the wage gap vary across compartments is the main objective of this study. Our plan is to investigate what can be learned about the desirability of informal contracts from the variability and correlation of these two variables, p and Δ , across compartments.

There are two methodological questions which we address in turn. The first is related to selection bias, i.e., to what extent we could interpret positive values for the wage gap, Δ , as indication of segmentation. The second question involves the fact that both p and Δ are four-dimension functions and although we want to investigate all four dimensions, we do not want to investigate all of them simultaneously. We should then describe what is the methodology we use to do this piecewise analysis.

5.2. Are Positive Wage Gaps Evidence Of Segmentation?

5.2.1. An Introduction

That wages are on average higher among workers who have formal contracts than among those who do not is a well-established feature of Brazilian labor markets [see Barros and Varandas (1987), and Camargo and Ramos (1988, chapter 3)]. This, in itself, is not necessarily an indication that labor markets in Brazil are segmented, i.e., that equally productive workers receive different wages depending on whether they have a formal contract or not. These wage differences may be explained by other differences between these two groups of workers. More precisely, workers with formal labor

¹⁴By definition, $\mu[W|F=0, T=t, R=r, E=e, A=a]$ is the median of the distribution of W conditional on $F=0, T=t, R=r, E=e$, and $A=a$, i. e., if $m = M[W|F=0, T=t, R=r, E=e, A=a]$ then $P[W \leq m|F=0, T=t, R=r, E=e, A=a] = 0.5$.

relations may be better educated, more experienced, and more prevalent in areas in which better jobs are offered. In summary, since it is not necessarily true that workers with and without formal relations are equally productive, wage differences among these two groups are not necessarily an indication of segmentation. Consequently, these overall wage differences may be of very limited use in evaluating the functioning of labor markets.

It was in part with this drawback in mind¹⁵ that we divide the labor market in 1620 compartments and compute the wage gap within each compartment. If age, education, and region of residence were the only characteristics of workers which could possibly make the distribution of productivity among workers with formal contracts different from the distribution among those who do not have formal contracts, then, as it is formally shown next, the controlled (within compartment) wage gap we compute, Δ , would indicate the wage gain of the median worker currently without a formal labor contract, provided he gets a job offering a formal contract. Therefore, if this gap is nonzero we would have found evidence of segmentation.

It is very important to note the double-if in the previous argument. If age, education and region of residence are the only confounding factors and if the gap we obtain after controlling for these three variables, called the controlled wage gap, is nonzero then we have evidence of segmentation. Notice that since we have no way of testing whether age, education and region of residence are the only important confounding variables, we also have no way of knowing how precise our statement of whether labor markets are segmented in Brazil will be.

Next we present a formal discussion of this hypothesis which ensures that the wage gaps we compute, Δ , are free of selection bias and, therefore, can be use to access segmentation.

¹⁵This is certainly only part of the reason why we have divided the labor market in compartments. The other reason is the fact that we are directly interested in the variation of the wage gap and degree of formalization across compartments.

5.2.2. A Formalization

5.2.2.1. The Wage Gap and the Identification Problem

Segmentation will exist in a compartment c , when $W_1(p) - W_0(p) \neq 0$ for a group of workers in the compartment. Or, conversely, segmentation would not exist if $W_1(p) - W_0(p) = 0$ for all workers in this compartments. Note that a necessary condition for $W_1(p) - W_0(p) = 0$ for all p such that $C(p) = c$ is $D(c) = 0$ where

$$D(c) = M[W_1|C=c] - M[W_0|C=c] \quad M[W|F=1, C=c] = M[W_1|F=1, C=c]$$

We base our tests for segmentation on this necessary condition, $D = 0$. Unfortunately, since only one of the two hypothetical wages are observed for each worker, without further knowledge, it is impossible to test whether D is zero or not. This difficulty arises from the fact that neither $M[W_1|C=c]$ nor $M[W_0|C=c]$ could be estimated from a random sample of workers in compartment c . Since, although we may have a random sample of workers at the compartment level, our sub-sample of workers holding jobs with a formal contract is not necessarily a random sample (they may be better motivated, more intelligent etc.). Formally, for each compartment, our sector-specific sample median log-wages will be consistent estimators of

entra fórmula

and

$$M[W|F=0, C=c] = M[W_0|F=0, C=c]$$

respectively. Since, in general

$$M[W_1|F=1, C=c] \neq M[W_1|C=c]$$

and

$$M[W_0|F=0, C=c] \neq M[W_0|C=c]$$

It follows that generally

$$\Delta(c) = M[W|F=1, C=c] - M[W|F=0, C=c]$$

and

$$D(c) = M[W_1|C=c] - M[W_0|C=c]$$

are not identical. In other words, positive values for Δ , the wage gap we compute within each compartment, do not necessarily imply positive values for $\mathcal{D}$, which is a sufficient condition for segmentation.

5.2.2.2. Knowing All Confounding Variables

If we knew that $C=(T, R, E, A)$ were all confounding variables we could estimate $\mathcal{D}$ immediately. In this case $\mathcal{D}=\Delta$. This fact follows immediately from the definition of a complete set of confounding variables. Hence let us start with this definition: C forms a complete set of confounding variables when, for all possible values of c , conditional on $C=c$, the distribution of the wage pair (W_0, W_1) is the same among workers with and without formal labor contracts. In other words, among workers with the same characteristics C , the distribution of productivity among workers with formal contracts and without labor contracts is the same. Formally, we are assuming that the joint distribution of (W_0, W_1, C, F) is such that conditional on C , (W_0, W_1) and F are independently distributed, i.e.,

(Assumption 1) $(W_0, W_1) \perp F \mid C$.

This assumption implies that

$$M(W_1 \mid F=1, C=c) = M(W_1 \mid C=c)$$

and

$$M(W_0 \mid F=0, C=c) = M(W_0 \mid C=c)$$

Hence, if Assumption 1 holds, $\Delta(c)=\mathcal{D}(c)$ for all c . In summary, when Assumption 1 holds there is no selection bias once we condition on C . This assumption is implicitly assumed to hold everywhere in this study.

5.3. From Multivariate Analysis to Standardized Univariate Analysis

5.3.1. Preliminaries

In this section we describe how the variability and covariation of the degree of informality and the wage gap in each of the four dimensions involved in our analysis can be individually, as opposed to simultaneously, investigated in a consistent fashion.

Suppose that time, T , is the dimension we wish to investigate. So, we want to investigate how the degree of formalization and the wage gap have varied over time. Moreover, we want to determine whether, over time, the wage gap tends to be larger or smaller in

periods in which the degree of formalization is low. In other words, we want to know how these two variables covary over time.

Once, we have estimated Δ and P for each of our 1,620 compartments, we could perform 180 (9x4x5) temporal analysis of this sort, one for each choice of the triple (r,e,a) . In other words, our data permits us to conduct a temporal analysis for each choice of region, educational category, and age group. Since we are not interested at this point in the peculiarity of each of these 180 temporal analysis, but only on the main features they may have in common, we have opted to investigate only the average of these 180 temporal patterns. So, if we choose $\Lambda_1(r,e,a;t)$ as the weight at year t for the compartment (r,e,a) we would get the following temporal patterns for Δ and P

$$\Delta_1(t) = \sum_r \sum_e \sum_a \Delta(t,r,e,a) \cdot \Lambda_1(r,e,a;t)$$

and

$$p_1(t) = \sum_r \sum_e \sum_a p(t,r,e,a) \cdot \Lambda_1(r,e,a;t)$$

where $\Lambda_1(r,e,a;t)$ must be always non-negative and must satisfy

$$\sum_r \sum_e \sum_a \Lambda_1(r,e,a;t) = 1$$

in order to be an appropriated weighting scheme. Besides these two conditions the weighting scheme could in principle be arbitrary. However, imposing certain restrictions on the weights to be used has several methodological advantages. The nature and advantages of restrictions on the weights will be discussed next.

However, before we actually consider the choice of weights let us slightly generalize our notation. In the previous example, we were interested in temporal variations. Therefore, we would like to average out variations along other dimensions. We did this averaging using the weighting scheme Λ_1 to obtain a synthetic temporal evolution for the degree of informality P_1 and for the wage gap, Δ_1 . Suppose now we want to investigate regional variations and average out the other three dimensions. In this case we use Λ_2

as the weighting scheme, with the properties that $\Lambda_2(t, e, a; r)$ must be always non-negative and must satisfy

$$\sum_t \sum_e \sum_a \Lambda_2(t, e, a; r) = 1$$

Based on these weights we define our synthetic regional variations via

$$\Delta_2(r) = \sum_t \sum_e \sum_a \Delta(t, r, e, a) \cdot \Lambda_2(t, e, a; r)$$

and

$$p_2(r) = \sum_t \sum_e \sum_a \Delta(t, r, e, a) \cdot p_2(t, e, a; r)$$

Synthetic variations along the other two dimensions are defined similarly. The weighting systems for these other two dimensions are denoted by Λ_3 and Λ_4 and the respective synthetic patterns by (Δ_3, p_3) and (Δ_4, p_4)

5.3.2. The Advantage of Invariant Weights

Consider, without any loss of generality, the expression for Δ_1 .

$$\Lambda_1(r, e, a; t) = P[R=r, E=e, A=a | T=t]$$

In this expression the weighting scheme $\Lambda_1(.;t)$ is allowed to vary with t . There is, however, a strong inconvenience in this choice for a weighting scheme. The inconvenience is derived from the fact that if the wage gap, Δ , varies with either r , e , or a , then Δ_1 will depend on the weights system Λ_1 . Hence, if the weights $\Lambda_1(.;t)$ are really variable with t then the synthetic wage gap, Δ_1 , would vary with t even in cases in which the wage gap, Δ , does not vary with t . This is certainly an undesirable feature to built-in the synthetic gap. It could be avoided by assuming that $\Lambda_1(.;t)$ does not vary with t .

Note that a natural choice for weights would be the distribution of population across compartments in each year, i.e.,

$$\Delta_1(t) = \sum_r \sum_e \sum_a \Delta(t, r, e, a) \cdot \Lambda_1(r, e, a; t)$$

By imposing the restriction that $\Lambda_1(.;t)$ must be time-invariant we eliminate this very natural choice. It is still valid however to use as weights the marginal (average over time) distribution of workers across regions, educational categories, and age groups. In other words a valid choice for Λ_1 will be

$$\Lambda_1(r, e, a; t) = P[R=r, E=e, A=a]$$

In the next section, we are going to show that this choice also has its inconveniences.

5.3.3. The Advantage of Product Weights

Consider the case for the wage gap. The argument is the same for the degree of informality. Assume the synthetic wage gap for each year, $\Delta_1(t)$, has been computed. We now want to estimate an overall gap, which we denote by $\tilde{\Delta}_1$. To define $\tilde{\Delta}_1$ as an average of the year-specific synthetic gaps would be a natural choice, i.e.,

$$\tilde{\Delta}_1 \equiv \sum_t \Delta_1(t) \cdot \lambda_1(t)$$

where λ_1 is a system of weights.

Since we are also computing synthetic wage gaps by region, Δ_2 , by educational category, Δ_3 , and by age groups, Δ_4 . We could find estimates for an overall gap from all these other three dimensions, by taking appropriately weighted averages. Let these weighted averages be denoted by $\tilde{\Delta}_2$, $\tilde{\Delta}_3$, $\tilde{\Delta}_4$ and defined as

$$\tilde{\Delta}_2 \equiv \sum_r \Delta_2(r) \cdot \lambda_2(r)$$

$$\tilde{\Delta}_3 \equiv \sum_e \Delta_3(e) \cdot \lambda_3(e)$$

$$\tilde{\Delta}_4 \equiv \sum_a \Delta_4(a) \cdot \lambda_4(a)$$

where λ_2 , λ_3 and λ_4 are three appropriated weighting systems.

It would be natural to restrict these weighting systems in such a way that all estimates for the overall wage gap coincide, i.e., a desirable result would be

$$\tilde{\Delta}_1 = \tilde{\Delta}_2 = \tilde{\Delta}_3 = \tilde{\Delta}_4$$

Perhaps surprisingly, this requirement imposes no restrictions on the choices of the weighting systems $\lambda_1, \lambda_2, \lambda_3$ and λ_4 . However, it does impose severe restrictions on the choice of the previous weighting systems used to generate the synthetic wage gaps, $\Lambda_1, \Lambda_2, \Lambda_3$, and Λ_4 . Specifically, in order to have $\tilde{\Delta}_1 = \tilde{\Delta}_2 = \tilde{\Delta}_3 = \tilde{\Delta}_4$ it is necessary and sufficient that the following restrictions on $\Lambda_1, \Lambda_2, \Lambda_3$, and Λ_4 hold:

$$\Lambda_1(r, e, a; t) = \lambda_2(r) \cdot \lambda_3(e) \cdot \lambda_4(a)$$

$$\Lambda_2(t, e, a; r) = \lambda_1(t) \cdot \lambda_3(e) \cdot \lambda_4(a)$$

$$\Lambda_3(t, r, a; e) = \lambda_1(t) \cdot \lambda_2(r) \cdot \lambda_4(a)$$

$$\Lambda_4(t, r, e; a) = \lambda_1(t) \cdot \lambda_2(r) \cdot \lambda_3(e)$$

Therefore, all choices of weights are determined by the choice for the weighting systems $\lambda_1, \lambda_2, \lambda_3$, and λ_4 . A natural choice for them, which is the one used in this study, is to let them be identical to the marginal distributions of T, R, E, A, i.e.,

$$\lambda_1(t) = P[T=t],$$

$$\lambda_2(r) = P[R=r],$$

$$\lambda_3(e) = P[E=e],$$

and

$$\lambda_4(a) = P[A=a].$$

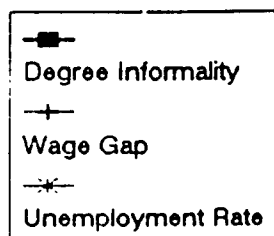
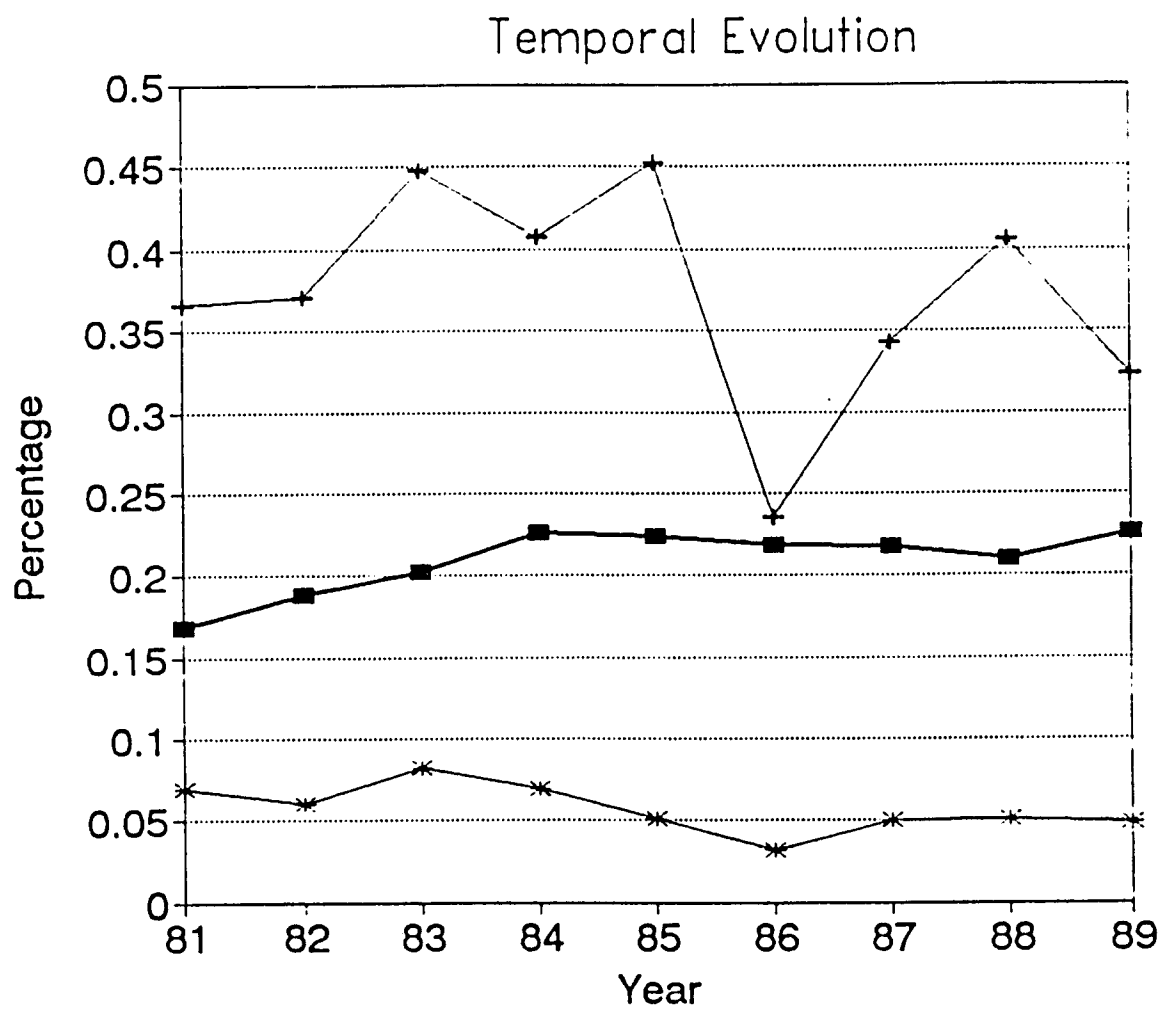
6. EMPIRICAL RESULTS

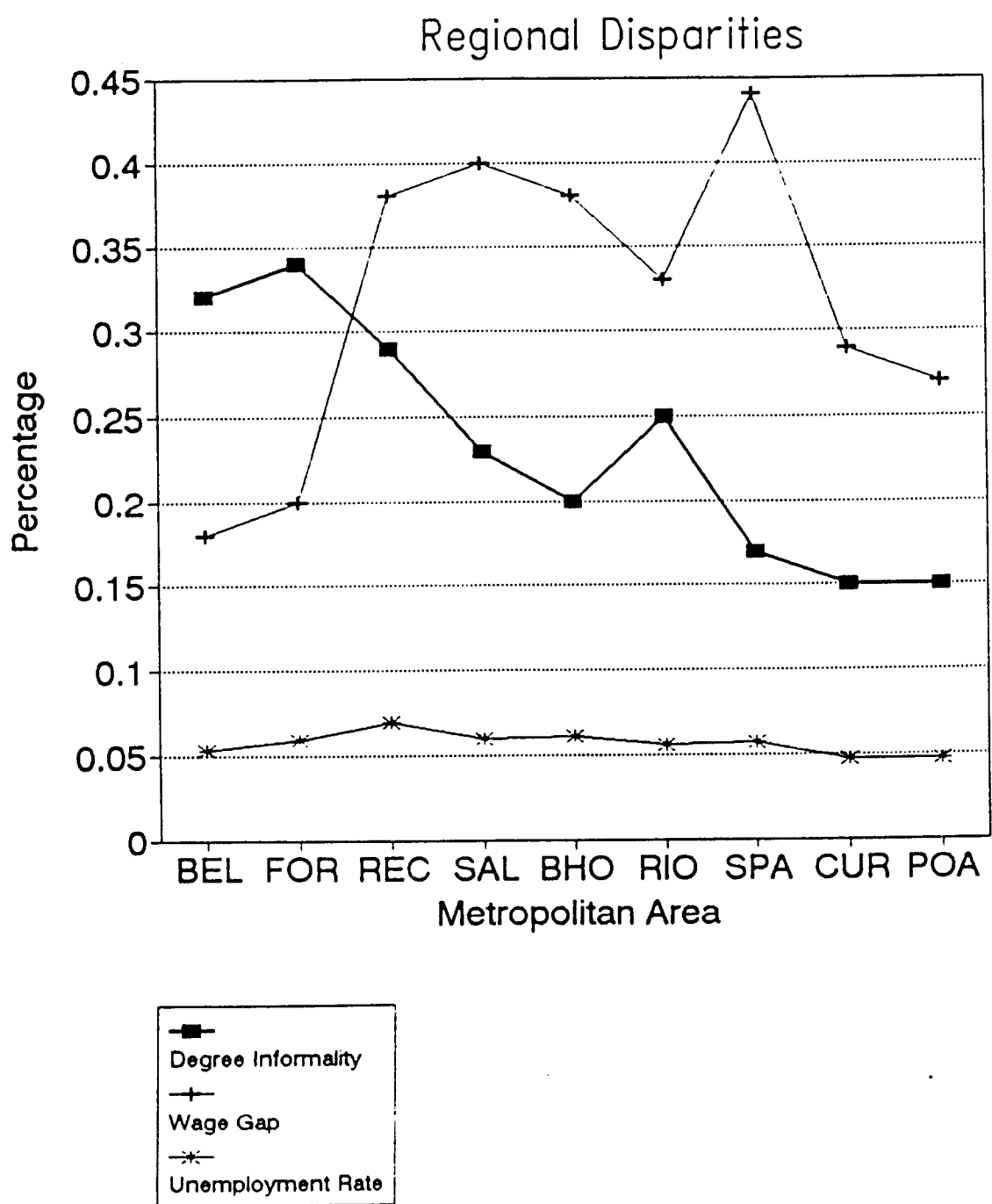
In this section we merely report the estimates for the degree of formalization, wage gap, and unemployment rate which we have obtained using the sample and the standardization methodology described in the previous section. These estimates are presented in Table 4 and are analyzed in Sections 8 and 9.

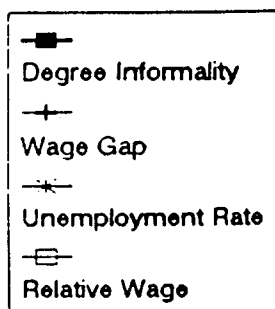
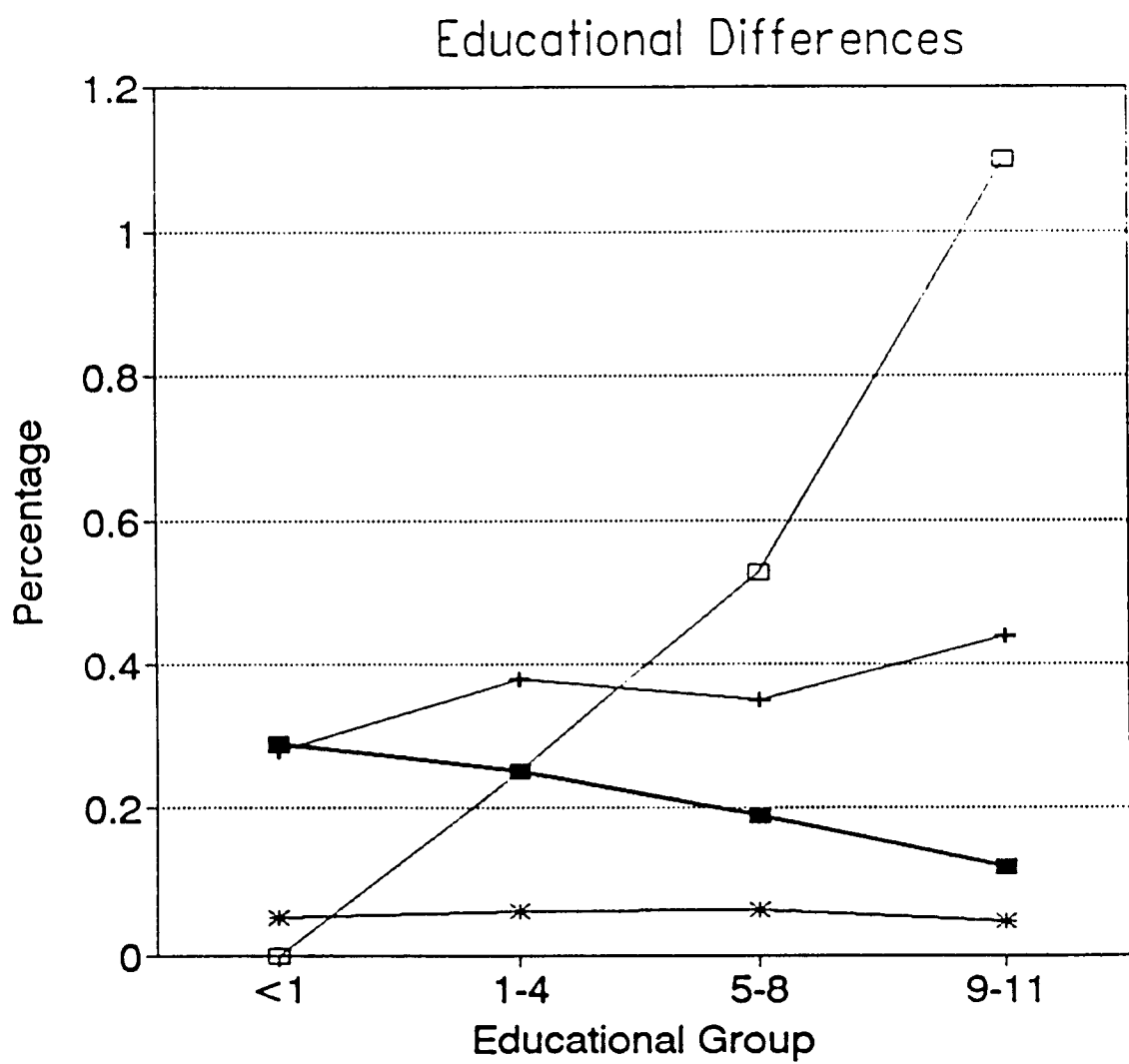
In the next section we introduce a theoretical framework aimed to facilitate the analysis of the variability and covariation of the degree of formalization, wage gap and unemployment rate across compartments.

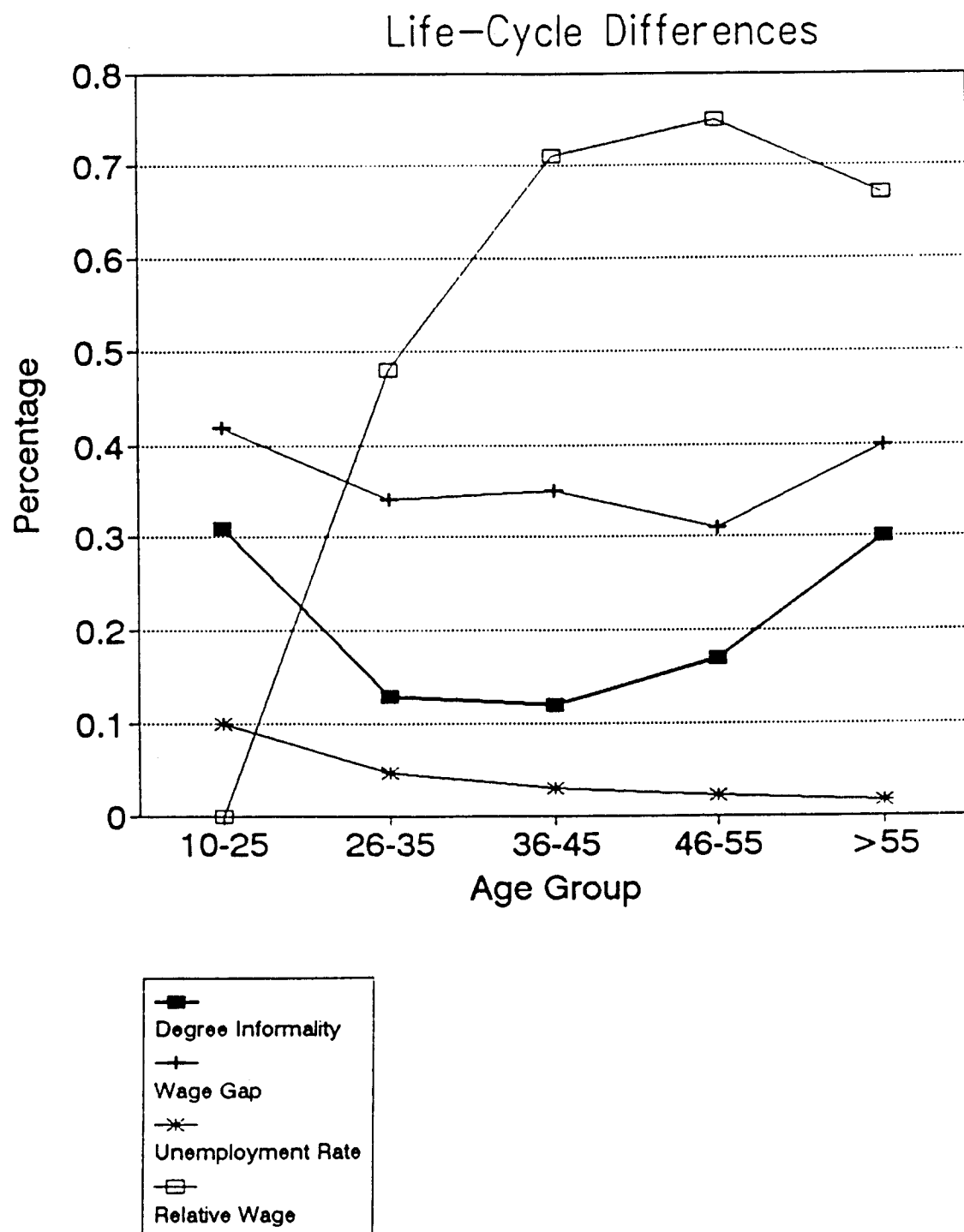
Table 4 *Degree of Formalization and Wage Gap
Across Compartments*

Compartment	Degree of Formalization	Wage Gap	Unemployment Rate
<i>Years</i>			
1981	0.83	0.37	0.069
1982	0.81	0.37	0.060
1983	0.80	0.45	0.083
1984	0.77	0.41	0.069
1985	0.78	0.45	0.051
1986	0.78	0.23	0.032
1987	0.78	0.34	0.050
1988	0.79	0.41	0.051
1989	0.77	0.32	0.048
<i>Metropolitan Areas</i>			
Belém	0.68	0.18	0.054
Fortaleza	0.66	0.20	0.059
Recife	0.71	0.38	0.070
Salvador	0.77	0.40	0.059
Belo Horizonte	0.80	0.38	0.061
Rio de Janeiro	0.75	0.33	0.056
São Paulo	0.83	0.44	0.057
Curitiba	0.85	0.29	0.047
Porto Alegre	0.85	0.27	0.047
<i>Educational Categories</i>			
None	0.71	0.28	0.052
1 to 4	0.75	0.38	0.060
5 to 8	0.81	0.35	0.062
9 to 11	0.88	0.44	0.045
<i>Age Groups</i>			
10 to 25	0.69	0.42	0.100
26 to 35	0.87	0.34	0.048
36 to 45	0.88	0.35	0.030
46 to 55	0.83	0.31	0.021
more than 55	0.70	0.40	0.015
Overall	0.79	0.37	0.057









7. THEORETICAL FRAMEWORK

7.1. Introduction

Without knowing the nature of the shocks which induce different labor market conditions across compartments, it is impossible to predict how the degree of formalization, wage gap, and unemployment rate will covary.

For example, consider a simple two sector model for a segmented labor market. There exists a protected and an unprotected sector. In the protected sector, variations in the demand for labor generate very small variations in wages, but almost one-to-one variations in the amount of labor employed. In the unprotected sector, variations on demand and supply have a non-trivial impact on both wages and employment.

Consider the effect on the degree of formalization and wage gap of an increase in the demand for labor in the protected sector. An increase in demand in the protected sector would increase employment in this sector without affecting wages by a significant margin. The increase in employment in the protected sector would reduce the supply of labor to the unprotected sector, reducing employment and increasing wages in the unprotected sector. Since employment has increased in the protected sector and decreased in the unprotected, the degree of formalization would increase. Finally, since wages remained practically constant in the protected sector but have increased in the unprotected, the wage gap between sectors would be reduced.

Therefore, in this model if shocks in the demand for labor in the protected sector were the source of variation across compartments, then the degree of formalization and the wage gap would display a inverse covariation.

In this same model the situation would be totally different if the source of variation were shocks in the demand for labor in the unprotected sector. In this case an increase in demand for labor in the unprotected sector would increase the wages and the employment in this sector. Wages and employment in the protected sector would remain constant since the protected sector affects but is not affected by what may occur in the unprotected segment. As a consequence of the increase in employment and wages in the unprotected sector, both the degree of formalization and the wage gap will decrease. Hence, in this case the degree of informality and wage gap would move in the same direction.

As this example intends to show, in order to interpret the covariation between wage gap, degree of formalization and unemployment rate, we must know the origin of the shock and have a theoretical framework able to identify its implications. In the following section, we develop such framework.

7.2. Types of Covariation

According to our empirical strategy, all we observe are variations in the degree of formalization, p , the wage gap, Δ , and the unemployment rate, r , across the compartments we have divided the labor market. Accordingly, whenever we choose a dimension to investigate, there are four possibilities for the covariation of these three variables. These possibilities called P1-P4 are described in Table 5.

Table 5

<i>Pattern</i>	<i>Description</i>
<i>P1</i>	<i>p, Δ, and r co-vary</i>
<i>P2</i>	<i>p and Δ co-vary and r anti-vary</i>
<i>P3</i>	<i>p and r co-vary and Δ anti-vary</i>
<i>P4</i>	<i>Δ and r co-vary and p anti-vary</i>

In possibility P1 the movements of all three variables are in the same direction. If all variations in these variables are of this type, then all pairwise rank correlations among these three variables would be one. In possibility P2 the degree of informality and the wage gap always move in the same direction, while the unemployment rate is always moving in the opposite direction. The other two possibilities can be described in a similar form.

In this section we investigate a theoretical framework aimed to model differences across compartments and, therefore, capable of indicating which type of differences across compartments can generate each of these four possible patterns for the covariation of the three observables p, Δ, r . This theoretical model is aimed to help the interpretation of the variation of these three observables across compartments.

7.3. Basic Description Of The Model

7.3.1. Basic Assumptions

The model is based on five major assumptions:

1) **The Isolation Hypothesis:** Labor in different compartments are perfect imperfect-substitutes. This hypothesis ensures that equilibrium in each compartment can be investigated in isolation from potential shocks in other compartments.

2) **Perfect Inelastic Supply:** The supply of labor to each compartment is assumed to be perfectly inelastic.

3) **Homogeneity Hypothesis:** The quality of labor is permitted to vary freely across compartments, but, all workers in the same compartment are assumed to have the same quality. This hypothesis can, to some extent, be easily relaxed.

4) **Market Segmentation:** The wage and employment in the formal sector are fixed, i.e., they do not respond either to the unemployment rate or to the wage paid in the informal sector.

5) **Equilibrium Unemployment:** We obtain unemployment in our model via a Todaro type of equilibrium unemployment. To find jobs in the formal sector, workers need to be unemployed, i.e., workers in the informal sector would never receive an offer to work for a firm in the formal sector. To the extent that wages in the formal sector are higher than in the informal sector, a fraction of the labor force will be unemployed waiting for a formal job. In this model all workers in the informal sector are indifferent between working in the informal sector and being unemployed, i.e., the wage in the informal sector is equal to the expected wage of an unemployed person. Workers are, therefore, assumed to be risk neutral.

7.3.2. The Model

We use capital letters to denote exogenous variables, small letters for endogenous variables and greek letters for functions. The model has five exogenous variables and six endogenous variables. The model is made of two behavioral equations, one identity, and three definitions.

Behavioral Equations: The two behavioral equations are the demand and the supply for informal labor. The demand for informal labor, i , is given by

$$i = I \cdot \lambda(w)$$

where w is the wage in the informal sector, λ is a decreasing function (assumed to be differentiable, for simplicity) and I is an exogenous shifter influencing the demand for labor in the informal sector. The function λ is rescaled such that $\lambda(S)=1$, where S is the fixed wage in the formal sector. For instance, one of the effects of the Cruzado Plan may have been an increase in I .

The supply of workers to the informal sector is the same equation which defines the number of workers who will choose to remain unemployed, u . As mentioned before, it is an arbitrage condition which establishes that the wage in the informal sector should be equal to the expected wage for the unemployed, i.e.,

$$w = \frac{T \cdot F}{T \cdot F + u} \cdot S$$

where S is the wage level in the formal sector, F is the employment in the formal sector and T is the separation rate (the proportion of employees in the formal sector who get fired per unit of time).

The Identity: The model has one identity. It requires the total labor supply, L , which is exogenous, be divided between the formal sector, informal sector and unemployment.

$$L = F + i + u$$

The Definitions: The last remaining elements to close the model, are the definitions of our three variables of interest: Degree of formalization, , wage gap, , and unemployment rate, r . These variables are defined as follows:

$$p \equiv \frac{F}{i + F}$$

$$\Delta \equiv 1 - w/S$$

$$r \equiv u/L$$

7.3.3. The Sensitivity of the Observables (P, Δ, r) to Variations in the Exogenous Variables (L, F, I, T, S)

By differentiating our six equations model we can obtain the elasticity of each of our three observed endogenous variables (P, Δ, r) with respect to each of the five exogenous variables (L, F, I, T, S). A total of 15 elasticities can be obtained. For instance,

$$\frac{L}{P} \cdot \frac{\partial P}{\partial L} = \frac{(1-P) \cdot e}{r - \Delta(1-r)(1-P)e}$$

where e is the elasticity of the demand for labor in the informal sector

$$e \equiv \frac{W}{\lambda} \cdot \frac{\partial \lambda}{\partial W}$$

Table 6 reports all 15 elasticities. Since all elasticities have same denominator

$$r - \Delta(1-r)(1-P)e$$

Table 6 actually only reports the numerator of the expression for each elasticity. Since the denominator of all of them is positive and since e is negative, the signs of all elasticities are given by the signs of their respective numerators. A summary of the sign of these elasticities is presented in Table 7.

Based on Table 7 we can identify which of the four empirical patterns P1-P4, introduced in the beginning of this section (Table 5), are generated by movements in each of our five exogenous variables.

For example, if variations across metropolitan areas were only due to variations in the size of the labor force, L , then we should observe:

- a) (Δ and r co-vary): Regions with higher wage gaps would also be regions with higher unemployment rate.
- b) (P and Δ anti-vary): The degree of formalization is higher in regions where the wage gap is smaller.
- c) (P and r anti-vary): The degree of formalization is higher in regions where the unemployment rate is smaller.

Table 6

To Variations in	Elasticity of		
	Degree of Formalization (p)	Wage Gap (Δ)	Unemployment Rate (r)
Labor Force (L)	$(1-p)e \cdot \Delta$	$1-\Delta$	$(1-r)(\Delta(1-p)e+1)$
Formal Empl. (F)	$(1-p)(r-\Delta \cdot e)$	$-(1-\Delta)[1-(1-r)(1-p)]$	$-(1-r)[(\Delta(1-p)e+p)]$
Formal Wage (S)	$-(1-p)r \cdot e$	$-(1-r)(1-\Delta)(1-p)e$	$-(1-r)(1-p)e$
Separ. Rate (T)	$-(1-p)r \cdot \Delta \cdot e$	$-r(1-\Delta)$	$-(1-r)(1-p)\Delta \cdot e$
Informal Emp. (I)	$-r(1-p)$	$-(1-\Delta)(1-r)(1-p)$	$-(1-r)(1-p)$

Table 7

To Variations in	Elasticity of		
	Degree of Formalization (p)	Wage Gap (Δ)	Unemployment Rate (r)
Labor Force (L)	-	+	+
Formal Empl. (F)	+	-	if $e < p/(\Delta(1-p))$
Formal Wage (S)	+	+	+
Separ. Rate (T)	+	-	+
Informal Empl. (I)	-	-	-

From Table 5, we can classify the co-variation pattern induced by variation in the total labor force as P4. As a matter of fact, based on Table 7, we can identify the type of co-variation induced by variations in each of our exogenous variables. The result in Table 8 indicates that there is no exogenous variable in our model that could possibly generate a pattern P2. In other words, it is not conceivable in our model to have the degree of formalization and the wage gap moving in the opposite direction of the unemployment rate. In our model the unemployment rate must co-vary either with the wage gap or with the degree of formalization. Moreover, Table 8 indicates that variations in the labor force and in the employment in the formal sector have the same implications as far as our three observed variables are concerned. Similarly, variations in the rigid wage in the formal sector and in the demand for informal workers are also empirically indistinguishable. Both imply that our three observed variables should co-vary.

Table 8

<i>Variation in</i>	<i>Observed Pattern</i>
<i>Labor Force (L)</i>	<i>P4</i>
<i>Formal Empl.(F)</i>	<i>P4</i>
<i>Formal Wage (S)</i>	<i>P1</i>
<i>Separ. Rate (T)</i>	<i>P3</i>
<i>Informal Empl.(I)</i>	<i>P1</i>

In the following two sections, we use this framework to interpret the variability and covariation of the degree of formalization, wage gap, and unemployment rate over time and across regions, educational levels and age groups.

8. DEGREE OF INFORMALITY

According to Table 4, the average degree of formalization is 79% for our universe of analysis - prime age males without college education in metropolitan Brazil. If we enlarge this universe to include all employees in metropolitan Brazil, the degree of formalization decreases slightly to 72%.¹⁶ Hence, since employees represent approximately 70% of the labor force, only 15 to 20% of the labor force is composed of employees hired without a formal labor contract. This fact has an immediate but very important consequence: Since virtually all measures of poverty in metropolitan Brazil indicate that more than 30% of workers are poor [Rocha (1988)], jobs offering informal labor relations can not be the major source of poverty. Actually, if all workers without a formal contract were poor, they would account for at most one-half of all poverty. Moreover, as shown by Velloso (1988) and Reis (1989), a considerable fraction of workers without formal contracts are not poor, so one must have among the poor, in absolute terms, as many workers with formal contracts as without formal contracts.

Moreover, as revealed by Table 4, the unemployment rate relative to our universe of analysis in Metropolitan Brazil is very small, 5%. If we consider the entire metropolitan labor force the unemployment rate is still about the same. Hence, the proportion of workers without formal labor contracts, 20%, is four times greater than the proportion unemployed, 5%. In summary, Table 4 reveals that the Brazilian metropolitan labor market is characterized by small rates of unemployment coupled with a relatively larger degree of informality. Therefore, it is conceivable that the cause for the low unemployment rate is precisely the large degree of informality. As a matter of fact, there exist no evidence against the view that a more strict enforcement of the law obliging all jobs to have a formal contract would not increase the unemployment rate.

¹⁶This degree of formalization is based on PNAD-1988.

8.1. Temporal Evolution

In this section we investigate the temporal evolution of the degree of informality and the unemployment rate over the 1980's. The objective is to search for evidence which would support the hypothesis that jobs with informal labor relations are important and attractive alternatives to unemployment, in particular, in periods in which the formal economy is working below its potential capacity. In other words, we want to investigate to what extent an elastic supply of jobs without formal labor contracts in the absence of significant unemployment benefits could be an explanation for the constant low rate of unemployment in metropolitan Brazil and its weak sensitivity to the level of economic activity in the modern sector. If this hypothesis is correct, one should observe two patterns: First, the degree of formalization must be lower when the unemployment rate is higher. Secondly, the degree of formalization must be more volatile than the unemployment rate.

Table 4 presents the 1981-1989 temporal evolution of the degree of formalization and unemployment rate for non-college educated men in metropolitan Brazil. From this table we can observe the following patterns:

Degree of formalization: Quite surprisingly, this table reveals a declining degree of formalization of labor relations over time. This declining degree of formalization is not, however, monotonic. First, the degree of formalization declines 6 percentage points from 1981 to 1984. Secondly, it recovers 40% of this decline (i.e., two percentage points) from 1984 to 1988. Finally, the degree of formalization declines two percentage points from 1988 to 1989. Overall the degree of formalization was 6 percentage point lower at the end of the decade (1989) than at the beginning (1981). With respect to volatility, the difference between the lowest and highest values is 6 percentage points and the standard deviation is 1.8 percentage points.

Unemployment rate: The unemployment rate was on average two percentage points higher in the first half of the 1980s than in the second half. It reaches its highest value, 8.3%, in 1983 and its lowest value, 3.2%, in 1986. Therefore, the difference from the lowest to the highest rate is five percentage points. The standard deviation for the period is 1.4 percentage points.

Contrasting the behavior of the degree of formalization and unemployment rate, three conclusions can be reached. First, looking only to the beginning and to the end of the period we observe a decline in the

unemployment rate in two percentage points and an increase in the degree of informality in six percentage points. Since this decade was a period of weak economic growth for the modern sector, the relative expansion of jobs not offering formal labor contracts with a concomitant reduction in the unemployment rate is strong evidence in favor of viewing informal labor relations as an important source of employment which is becoming increasingly more attractive than unemployment. The concomitant decrease in the degree of formalization and unemployment rate is evidence that the sector offering informal labor relations suffered positive shocks during the 1980s which have increased its demand for labor (increasing I).

Secondly, to look at the cyclical behavior of the degree of informality and unemployment rate during this decade we remove the trend from its temporal evolution. The original and de-trended series are reported in Table 9. This table reveals facts not entirely compatible with viewing employment without formal contract as a buffer during periods of higher unemployment. If this view were correct, informality would be higher in periods of higher unemployment. But, as Table 9 reveals, the degree of formalization and the unemployment rate was not very synchronized during this decade. While the unemployment rate reached a neat peak in 1983, the degree of formalization was still very high in this year. In fact, the degree of informalization reaches its peak in 1984. To summarize the relationship between the cyclical pattern of the degree of formalization and the unemployment rate we compute their rank correlation over the period 1981-1989 for the de-trended series. The correlation turns out to be zero, indicating that periods of higher unemployment are not necessarily associated to periods of a higher degree of informality. One possible reconciliation is the possibility that informality reacts to increases in unemployment with a one-year lag. Under this hypothesis the increase in informality from 1983 to 1984 was the cause of the decline in the unemployment rate observed in the same period.

Finally, the hypothesis that jobs offering informal labor relations function as an employment buffer would predict that informality should fluctuate over time more than unemployment rates. This prediction encounters only very weak support in the experience of the Brazilian metropolitan labor market during the 1980s. The standard deviation for the degree of informality, 1.8, is only slightly larger than for the unemployment rate, 1.4. Likewise, the range of variation of both variables is very similar: 6

percentage points for the degree of informality and 5 percentage points for the unemployment rate.

Table 9
Temporal Evolution of the Degree of Formalization and Unemployment Rate

Year	Degree of Formalization		Unemployment Rate	
	Original (o/o)	De-Trended (o/oo)	Original (o/o)	De-Trended (o/oo)
1981	83	12	6.9	2
1982	81	-1	6.0	-5
1983	80	-8	8.3	20
1984	77	-24	6.9	10
1985	78	-15	5.1	-6
1986	78	-3	3.2	-23
1987	78	6	5.0	-2
1988	79	21	5.1	2
1989	77	12	4.8	2

8.2. Regional Disparities

Table 4 presents the degree of formalization by metropolitan area. This table reveals a degree of formalization which is increasing from North to South.¹⁷ It is lower than 70% in Belém and Fortaleza and above 85% in Curitiba and Porto Alegre. São Paulo has a degree of formalization (83%) close to Curitiba and Porto Alegre, whereas Recife has a level (71%)

¹⁷Rio de Janeiro is the only major exception. Rio has a degree of informality much higher than the other metropolitan areas in the Southeast: São Paulo and Belo Horizonte.

close to Fortaleza and Belém. The remaining areas, Salvador, Rio de Janeiro and Belo Horizonte, have intermediate levels of formalization, i.e., between 75% and 80%. In summary, the regional disparities relative to degree of formalization follow a very neat pattern: the formalization increases steadily from North to South.

To the extent that the degree of "modernity" and "development" increases from North to South,¹⁸ the concomitant increase in the degree of formalization of labor relations is, certainly, strong evidence in favor of viewing jobs without formal labor contract as an anachronism of Brazilian labor markets. Under this view, formal labor contracts are the desirable future; informal labor arrangements are the undesirable past.

One plausible explanation for the regional differences in labor market conditions across Brazil are differences in the relative size of the formal sector (F/I according to our theoretical model). According to this hypothesis, the relative supply of jobs offering formal labor contracts would be higher in the South and lower in the Northeast. The consequences would be, in addition to a higher degree of formalization in the South than in the Northeast, a lower unemployment rate and a large wage gap in the South.

The estimates in Table 4 permit to verify the appropriateness of this hypothesis. In this section, we contrast the implications of this hypothesis for the regional pattern of the unemployment rate with the pattern which is actually observed. A similar test using regional variations in wage gap is presented below in Section 9.2.

This hypothesis predicts lower unemployment rates for regions with higher degrees of formalization. We indeed observe lower unemployment rates in the South (Curitiba and Porto Alegre) than in the Northeast (Fortaleza, Recife and Porto Alegre). Moreover, the regional rank correlation between the degree of formalization and unemployment rate is negative, -0.5, and not too low. These facts support the hypothesis that regional disparities in labor market conditions in Brazil are a consequence of regional differences in the relative potential size of the formal sector (F/I). Note that in our theoretical model the potential relative size is the degree of formalization which would prevail if the

¹⁸This is a very commonly used assertion, which lacks, however, a clear definition and empirical support.

informal jobs were paying the same institutional wage (S) being paid in formal jobs. Moreover, notice that in this case, the unemployment rate would be zero.

Hence, if we define the degree of modernity of a labor market by the potential relative size of the formal sector (F/I), then what we have shown up to now could be summarized as follows: Modernity increases from North to South and as a consequence both, the degree of informality and the unemployment rate, are lower in the South than in the North.

Finally, note that the evidence is inconsistent with the idea of regional differences in unemployment rate explained by the strength of the informal sector (high values for I). If this were the source for regional differences, then modernity would require a shrinking informal (unprotected or traditional) sector. Therefore, under this hypothesis, modernity would bring unemployment. Hence, it would imply increasing unemployment rates from North to South, however, as already mentioned, we observed the opposite pattern (see Table 4). For example, Recife is the area with the higher unemployment rate over the 1980s and Porto Alegre the one with the lowest rate. Therefore, this hypothesis can be clearly rejected.

8.3. Degree of Informality by Educational Levels

Table 4 presents the degree of informality by educational level and age group. The degree of formalization clearly increase with education. It increases from 71% among those who have never been in school to 88% among those who have entered high school but not college. Since productivity and wages tend to increase with education (see Section 4.2, for the relationship between wages and education) we come to the conclusion that segments of the labor market with better qualified workers tend to have more formalized labor relations. To illustrate and summarize this fact we compute the rank correlation between the degree of formalization and the level of wages across educational levels. The result is a perfect and positive correlation, 1.0. This fact can be taken as an indication that formal labor relations are preferable and that they are the inevitable future to the extent to which the educational level of the labor force is expected to increase over time.

The common explanation for the increasing degree of formalization with education is an increasing relative supply of formal jobs (increasing values of F/L) with education. This explanation has implications for how the unemployment rate and the wage gap should vary with

education. It implies that both should be decreasing with education. The relationship between the wage gap and education will be investigated in Section 9.3. Here, we discuss the relation between the unemployment rate and education level. This relationship has an inverted U-shape (see Table 4). It increases smoothly to reach a peak at the upper-primary level (5-8 years of schooling). Then it decreases sharply to reach its minimum value of 4.5% among workers with some high-school education (9-11 years of schooling). This inverted U-shape pattern clearly rejects the hypothesis that difference in labor market conditions across educational levels is due to upward shifts in the demand for labor in the formal sector (increases in F/L).

The concomitant lower unemployment rate and degree of formalization among less-educated workers can be better explained by assuming that informal labor market opportunities decrease (I/L decrease) with education. In other words, among the less-educated, informal labor market opportunities are important alternatives to unemployment.

8.4. Degree Of Informality by Age Groups

The pattern of the degree of formalization across age groups is not monotonic and is therefore less straightforward to interpret. Similarly to wages, formalization also displays an inverted U-shape. However, the age pattern for the degree of formalization differs from the wage-age profile with respect to the point at which the maximum occurs. Wages achieve a peak at the 45-55 age group whereas formalization achieves a peak early on at the 35-45 age group. The fact that the degree of formalization peaks earlier generates a non-perfect rank correlation between wage levels and degree of formalization across age groups. The rank correlation is 0.8.

The fact that the degree of formalization tends to peak before wages is an important finding. It may be indicating that at least for a fraction of experienced workers it may be better to have an informal labor contract than a formal one. Under this hypothesis formalization decreases with age between the age groups of 35-45 and 45-55 as a consequence of the preferences of workers for informal labor contracts. Of course, an alternative possibility is that employers offering formal contracts have preferences for younger workers. Under this alternative hypothesis, the earlier decline in the degree of formalization is just an earlier indication of the declining preference of firms for older workers.

Although, it remains for future research to obtain direct evidence on this hypothesis (Do older workers prefer to work without formal labor contracts?), the analysis of the behavior of the unemployment rate across age groups can provide at least a partial answer: the unemployment rate is monotonically decreasing with age (see Table 4). In summary, since the 46-55 age group has a higher income and a lower unemployment rate than the 36-45 age-group, it seems reasonable to conclude that the increase in informality between these two age groups is, at least, in part demanded by workers. In other words, it is an interesting evidence of preference for informal labor relations. In Section 9.4 we are going to show that the wage gap also decreases with age between these two groups (see also Table 4), providing once again evidence in favor of increasing demand for informal labor contracts with age.

The amplitude of variation of the degree of formalization with age is 19 percentage points (69% for the younger group and 88% for the 35-54 age group). This amplitude is very similar to the variation across metropolitan areas (19 percentage points) and across educational levels (17 percentage points).

In all these cross-section cases the range is three times larger than the one verified over time from 1981 to 1989 (6 percentage points). In summary, except for the important case of the 46-55 age group, the degree of informality tends to be larger among less-experienced, older, and less-educated workers. This evidence is compatible with the view that jobs offering formal contracts demand prime-age and well-educated workers whereas those offering informal labor contracts demand less productive workers (those who are too young, too old, or less-educated).

9. WAGE GAP

The main question about the dichotomy between workers with and without formal contracts is to which extent would the wage of a worker without a formal labor contract increase if he/she could get a job offering a formal labor contract.

Table 4 indicates that, on average, among workers in the same age and educational group and metropolitan area, those with a formal labor contract have a

log-wage 0.37 higher, which is equivalent to a 45% wage increase¹⁹ relative to those without a formal labor contract. In other words, the average within-compartment wage gap is 45%. The overall gap obtained without controlling for region, age and education is much larger, 94%. This is a consequence of workers with formal contracts being better educated, more experienced and more likely to be residing in metropolitan areas outside the Northeast.

If Assumption 1 is correct,²⁰ that is if each and every labor market compartment workers with and without formal labor contracts are equally productive, then, on average, workers in jobs without a formal labor contract could earn wages 45% higher if they could find a job with a formal labor contract.

If this were the case, all workers individually would prefer jobs offering formal labor contracts. However, even in this case, jobs offering no formal contract are not necessarily undesirable since they may be a better alternative than unemployment. Workers in such jobs know that some other equally productive workers are occupying jobs with formal labor contracts and earning higher wages. Hence, they would desire to move to these jobs offering formal contracts, but, they would not necessarily acknowledge a more strict governmental enforcement of the labor legislation. Informal workers' potential preference for no government action may be derived from a perception that more governmental intervention will lead to the elimination of their jobs and not to the conversion of their current informal jobs into formal jobs, and nor to the creation of extra formal jobs elsewhere.

9.1. Temporal Evolution

The 1981-1989 temporal evolution of the wage gap is presented in Table 4. This table reveals that from 1981 to 1982 the wage gap remains constant. It increases from 1982 to 1983 and then remains constant up to 1985. From 1985 to 1986 there is an enormous decline in the gap from 0.45 to 0.24. 1985 and 1986 are the years with, respectively, the largest and smallest gap during this decade. From 1986 to 1988 the gap increases continuously reaching 0.41 in 1988. From 1988 to 1989 the wage gap declines again. Overall, the wage gap declines 0.04 over the decade.

¹⁹ $100 \times [\text{Exp}(0.37) - 1] = 45.$

²⁰See Section 5.2.2.2.

It is very surprising how unrelated are the temporal evolutions of the degree of formalization and the wage gap. As a matter of fact, the rank correlation between them is 0.0, indicating the nonexistence of any synchronized movement. If we de-trend these two time series the rank correlation becomes negative, but still very small, -0.4. Note that, as shown in Section 8.1, the cyclical movements in the degree of formalization were also quite non-synchronized with the movements in the unemployment rate. However, there is some evidence that the unemployment rate and the wage gap have synchronized temporal patterns. Their temporal rank correlation is 0.7.

In summary the wage gap and the unemployment rate seem to covary, whereas the degree of formalization follows a completely unrelated pattern. What sort of shocks would generate this type of pattern? As discussed in the theoretical section, one possibility is a balanced combination of shocks in the demand for labor in the formal and informal sectors.

In fact, a possible reading of the events in 1983 and 1986 are the following: In 1983 both sectors were negatively affected. This led to a decrease in employment in both sectors with a concomitant decrease in wages in the sector offering only informal contracts, since only in this sector are wages flexible. As a consequence, the wage gap and the unemployment rate increase with the degree of formalization remaining approximately constant. The situation in 1986 was exactly the reverse. Employment increased in both sectors with a reduction in unemployment. The wage in the sector offering informal contracts was flexible and so it increased leading to a decrease in the wage gap.

Therefore, a consistent explanation for the temporal pattern of the unemployment rate, degree of formalization and wage gap, over the 1980s, seems to require two components. First a structural relative improvement of the unprotected sector over the decade. Second, cyclically synchronized shocks affecting the demand for labor in both sectors. The first feature would explain the concomitant decline in unemployment rate, wage gap and degree of formalization observed considering the beginning and the end of the decade. The second feature would explain the covariation of the unemployment rate and the wage gap as well as the lack of fluctuation of the degree of formalization around its trend during the decade.

9.2. Regional Disparities

Table 4 presents estimates for the wage gap disaggregated by metropolitan area. The wage gap is lower, around 0.2, in Belém and Fortaleza, which are the areas with larger degrees of informality. There are three areas with intermediate levels, that have wage gaps of approximately 0.3: Rio de Janeiro, Curitiba, and Porto Alegre. Hence, the two areas with the smaller degree of informality, Curitiba and Porto Alegre, have intermediate levels of wage gap. The remaining areas (Recife, Salvador, Belo Horizonte, and São Paulo) have very large wage gaps between 0.35 and 0.45. The largest wage gap is for São Paulo, 0.44.

If we assume that differences across regions are originated in different levels of demand for labor by the protected or modern sector, F , then we should expect regions with higher degree of formalization to have lower wage gaps. Under this assumption, Porto Alegre, Curitiba and São Paulo should have smaller wage gaps, whereas Belém and Fortaleza should be the areas with larger wage gaps. The evidence, however, could not be more against this assumption since São Paulo has the largest wage gap and Belém and Fortaleza the smallest. Moreover, if this hypothesis were valid the rank correlation between wage gap and degree of formalization across regions would equal -1. The actual rank correlation is 0.37.

This positive correlation indicates that the evidence is more compatible with an explanation of regional disparities based on differences in the demand for labor in the informal sector. Under this hypothesis the Northeast areas have a larger informal sector (high values for I) which would induce a larger degree of informality and a smaller wage gap. If this hypothesis were correct, however, the unemployment rate would be lower in the Northeast and higher in the South, i.e., this hypothesis implies a negative correlation between wage gap and unemployment rate. The actual rank correlation between these two variables is, though, very positive, 0.5.

Therefore, there seems to exist no simple explanation for the regional disparities in labor market conditions in Brazil. Notice, however, that if we exclude from the analysis the two Northern areas, Belém and Fortaleza, the correlation pattern becomes compatible with the hypothesis of increasing modernization from North to South. As a matter of fact, after these two areas are eliminated, the wage gap, the unemployment rate, and the degree of informality, all decrease from North to South. The rank correlation among all three becomes

positive: 0.4 between informality and the wage gap, 0.8 between informality and the unemployment rate, and 0.6 between the wage gap and the unemployment rate. So, at least, among this subset of metropolitan areas, the explanation of regional differences in labor market conditions based on an increasing degree of modernity (increasing values for F/I) from North to South is fully supported.

Finally, in explaining regional disparities it is important to notice the role of migration flows. Migration towards an area (like the flows towards Rio de Janeiro and São Paulo) tends to lower the degree of formalization (as we observe for Rio de Janeiro) and increase the wage gap (as we observe for São Paulo).

9.3. The Wage Gap by Educational Level

Table 4 presents estimates for the wage gap by educational level. This table reveals that the gap increases with educational and that this growth is far from continuous. It is very prominent at the lower and higher levels of education, while being completely absent at intermediate levels.

The fact that the gap is increasing with education, and therefore also with the level of wages, dismisses immediately the frequently evoked hypothesis that formal labor contracts protect mainly the less-educated segments of the labor force. Moreover, this fact corroborates another hypothesis commonly evoked in the segmented labor markets literature which states that the wage gains from education are larger for workers with formal contracts than for workers with informal contracts. Finally, this increasing gap with education coupled with the fact that the degree of formalization also increases with education is clear evidence that the relative supply of jobs with formal contracts is increasing (F/L increases) with education.

9.4. The Wage Gap by Age Group

The wage gap by age group is presented in Table 4. This table reveals a U-shape pattern. The wage gap is larger for the youngest and oldest groups. It reaches a minimum at the 46-55 age group. Except for the 46-55 age group, which is a major and important exception, the wage gap pattern closely mirrors the pattern for the degree of informality.

The age pattern for the wage gap leads to the opposite conclusions that we obtained investigating the educational patterns. In the case of education, the wage gap was larger for the better educated and

therefore better paid group of workers. Here, in the case of age, the wage gap is larger for workers with lower wages, i.e., the youngest and the oldest workers. Hence, looking at the age pattern we find evidence that formal contracts indeed tend to protect preferentially the less productive workers. To have a formal contract is more important for the older and younger worker than for prime-age worker.

An important and unexpected consequence is that we find evidence that the experience-wage profile should be steeper in informal jobs than in formal jobs. Therefore, the commonly evoked hypothesis that informal jobs are worse because they provide no on-the-job training and so no chance of wage increase with experience seems to be rejected.

10. CONCLUSIONS

This paper investigates the desirability of informal labor contracts in metropolitan Brazil. On the one hand, we searched for evidence that formal contracts bring flexibility to the labor market and so are a solution to unemployment and labor absorption problems. On the other hand, we searched for evidence that informal labor contracts are a source of segmentation and so part of the serious inequality problem in Brazil.

Based on nine national household surveys covering the period from 1981 to 1989, we followed a research strategy made of three steps: First, we divided the labor market into a large number of compartments. Secondly, we computed for each compartment a) the fraction of employees who are working without a formal labor contract (degree of informalization); b) the median wage gap between employees with and without formal labor contracts; and c) the unemployment rate. Thirdly, we investigated what can be learned about the desirability of informal labor relations from the variability and covariation of these three variables (degree of informalization, wage gap, and unemployment rate) across labor market compartments.

Following this research strategy we arrived to seven conclusions which are summarized below:

1 - We showed that the degree of informality is close to 20%. This level is on the one hand too low for being the major reason for poverty in metropolitan Brazil. But, on the other hand, it is large enough to explain the observed low rates of unemployment.

2 - We showed that overall, workers with formal contracts earn twice the wages of workers without formal contracts. However, we show that one half of this wage gap is explained by differences between workers with and without formal labor contracts with respect to education, age and region of residence. Therefore, if workers with same age and education who reside in the same metropolitan area were on average equally productive, then the metropolitan labor market of Brazil would be segmented with a randomly drawn worker in a job without formal labor contract experiencing a 50% wage increase if he/she could find a job with formal contract.

3 - The degree of formalization has been decreasing over time. It was 6 percentage points lower in 1989 as compared to 1981. The hypothesis that jobs offering informal contracts operate as a buffers does not seem to encounter support in the temporal patterns for the unemployment rate and degree of formalization. If this hypothesis were valid these two variables should be strongly negatively correlated and the variability in the unemployment rate should be smaller. In fact, they are not correlated and have an equal degree of variability.

4 - Except for the deviating pattern of Belém and Fortaleza, the degree of informality, wage gap and unemployment rate decrease from the Northeast to the South indicating that more modern labor markets do not need larger informality to reduce unemployment and inequality. In other words, informality does not seem to be the most important solution to unemployment since unemployment rates tend to be higher in areas with higher degrees of informality.

5 - The degree of formalization and the wage gap increase with education. The fact that the wage gap increases with education has two implications. First, it reveals that formal contracts protect more the well-educated than the less-educated. Secondly, it indicates that education is more valuable in the formal than in the informal sector.

6 - We encounter some indication that at least for a fraction of experienced workers it may be better to have an informal labor contract than a formal one. More specifically, for workers in the late forties and earlier fifties wages are increasing and the unemployment rate and the wage gap are decreasing. Since the degree of informality is already increasing in this age range, we consider this extra informality as demanded by workers.

7 - Finally, we showed that the wage gap is larger for the youngest and the oldest workers. This fact has two important consequences: First, it is clear evidence in favor of the view that these two groups are the ones which benefit the most from the legislation; and secondly, it provides evidence that the experience-wage profile for younger workers should be steeper in informal jobs than in formal jobs. Therefore, the commonly evoked hypothesis that informal jobs are worse because they provide no on-the-job training and therefore no chance of wage increase with experienced seems to be rejected.

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