129
DISCUSSION PAPER
Originally published by Ipea in May 2004 as
number 1020 of the series Texto para Discussão.

SOME STYLIZED FACTS OF THE INFORMAL SECTOR IN BRAZIL IN THE 1980'S END 1990'S

Fábio Veras Soares

ipea

129

DISCUSSION PAPER

Originally published by Ipea in May 2004 as number 1020 of the series Texto para Discussão.

Brasília, January 2015

SOME STYLIZED FACTS OF THE INFORMAL SECTOR IN BRAZIL IN THE 1980'S AND 1990'S[1]

Fábio Veras Soares[2]

1. O presente texto, em língua Inglesa, não foi objeto de revisão editorial.
2. Técnico de Planejamento e Pesquisa do Ipea.

Federal Government of Brazil

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

ipea Institute for Applied Economic Research

A public foundation affiliated to the Secretariat of Strategic Affairs of the Presidency of the Republic, Ipea provides technical and institutional support to government actions – enabling the formulation of numerous public policies and programs for Brazilian development – and makes research and studies conducted by its staff available to society.

President
Sergei Suarez Dillon Soares

Director of Institutional Development
Luiz Cezar Loureiro de Azeredo

Director of Studies and Policies of the State, Institutions and Democracy
Daniel Ricardo de Castro Cerqueira

Director of Macroeconomic Studies and Policies
Cláudio Hamilton Matos dos Santos

Director of Regional, Urban and Environmental Studies and Policies
Rogério Boueri Miranda

Director of Sectoral Studies and Policies, Innovation, Regulation and Infrastructure
Fernanda De Negri

Director of Social Studies and Policies, Deputy
Carlos Henrique Leite Corseuil

Director of International Studies, Political and Economic Relations
Renato Coelho Baumann das Neves

Chief of Staff
Ruy Silva Pessoa

Chief Press and Communications Officer
João Cláudio Garcia Rodrigues Lima

URL: http://www.ipea.gov.br
Ombudsman: http://www.ipea.gov.br/ouvidoria

DISCUSSION PAPER

A publication to disseminate the findings of research directly or indirectly conducted by the Institute for Applied Economic Research (Ipea). Due to their relevance, they provide information to specialists and encourage contributions.

Discussion paper / Institute for Applied Economic

Research.- Brasília : Rio de Janeiro : Ipea, 1990-

ISSN 1415-4765

1. Brazil. 2. Economic Aspects. 3. Social Aspects. I. Institute for Applied Economic Research.

CDD 330.908

SUMÁRIO

SINOPSE

Dois fatos caracterizaram a evolução do setor informal no Brasil nas últimas duas décadas: o aumento na proporção de empregados sem registro em carteira e a redução no diferencial de salários entre trabalhadores registrados (com carteira) e sem registro (sem carteira). Neste trabalho, foi brevemente revisada a literatura sobre o setor informal em países em desenvolvimento e documentados tanto o aumento da informalidade quanto a redução do diferencial de salários. Adicionalmente, investigou-se quais fatores foram responsáveis pela redução no diferencial de salários e como tal redução contribuiu para a diminuição da desigualdade salarial entre 1981 e 1999. Entre os resultados encontrados, destacam-se: *i*) a coincidência entre esses dois fenômenos e as reformas pró-mercado do início dos anos 1990; *ii*) a redução do diferencial de salários formal/informal como o segundo fator mais importante para a redução da desigualdade de salários, após educação. Por que e como isso ocorreu ainda são questões abertas ao debate. Tais aspectos serão analisados em dois Textos para Discussão que serão publicados futuramente. Neste trabalho, tanto o impacto da abertura comercial sobre o setor informal como os efeitos da crescente indexação dos salários do setor informal ao salário mínimo serão estudados.

ABSTRACT

Two facts have characterized the evolution of the informal sector in Brazil during the last two decades: the increase in the proportion of non-registered workers and the diminishing wage gap between non-registered and registered workers. In this paper, we briefly review the literature on informal sector in developing countries and document both the increase of the informal sector and the fall in the wage gap in Brazil. Besides, we investigate which factors were responsible for the fall in the wage gap and how this reduction has contributed to reduce wage inequality between 1981 and 1999. Among our findings, we would highlight: *i*) the coincidence between these two movements and the market-oriented reforms of the early 1990's; *ii*) that the fall in the formal/informal wage gap has substantially contributed to the decrease in wage inequality. After education, the fall in the wage premium due to the possession of a work-card was the main responsible for bringing down wage inequality. Why and how it happened is an open debate. We will tackle this issue on two forthcoming papers were we investigate the role of the trade liberalization (Soares, 2004a) and the effects of the increasing indexation of informal sector wages to the minimum wage (Soares, 2004b).

1 INTRODUCTION

Brazil had 36 millions of private sector wage workers above the age of 10 years in 1999.[1] Out of that, 14 millions were in the informal sector, i.e, their job contract was not registered in their work card. The main concern of this paper and of other three related papers that will be published as Ipea discussion papers is to investigate several aspects of the informal (non-registered) sector in Brazil. In this paper, we aim to establish and analyze in depth some stylized facts such as the increase in the size of the informal sector during the 1980's and the 1990's and the fall in the wage gap between formal and informal workers in the mid-1990's. Therefore, it is mainly a descriptive paper on the evolution of the informal sector during the last 2 decades. The second paper will assess whether informal workers queue for formal jobs. The third and fourth papers will analyse the effect of policy changes on the informal sector. This is an issue that has not received much attention in the literature. In this regard, it investigates the impact of the trade liberalisation process of the early 1990's on the proportion of informal sector workers and on the wage gap between formal and informal workers, and the impact of minimum wage hikes on the transitions from formal and informal sectors to non-employment and from formal to the informal sector.

The size of the informal sector in Brazil – almost 40% of wage workers – is in itself something that demands an explanation. This figure means that a sizable portion of workers are not entitled to benefits such as the unemployment insurance and do not contribute to social security. This is both a social and a fiscal problem in a country that has been struggling to replicate the high growth rates witnessed until the 1970's. The challenge is to revive growth without falling back in the hyper-inflationary process that made it impossible to grow in a consistent basis from the early 1980's until middle 1990's, the so-called *lost decade*. The proportion of the informal sector increased 10% during these 15 years. It did so even in the manufacturing sector in which it used to be relatively unimportant.[2] Paradoxically, the wage gap between formal and informal workers also decreased between 1981 and 1999. Most of the reduction in the wage gap occurred after the market-oriented reforms (e.g. privatization, trade liberalisation, deregulation) of the early 1990's and after the enactment of the new Federal Constitution of 1988.[3] It is true that there were some episodical reductions in the wage gap (e.g. 1986 and 1990), but it was only from 1992 onwards that this reduction was not significantly reversed by changes in the business cycle or by the melting down of price and wage controls of unorthodox stabilization plans. The reduction in the wage gap between formal and informal workers helped to reduce slightly wage inequality, but the latter is still

1. This is the aggregate figure for the whole country (except the rural North region) and excludes public sector wage workers (4.9 millions), self-employed workers (16.8 millions) and domestic workers (5.9 millions). This data is published by the National Statistics Office, *Instituto Brasileiro de Geografia e Estatística* (IBGE). Website: http://www.ibge.gov.br/ and comes from the Annual Household Survey – Pnad.

2. Many commentators argue that the fall in the proportion of workers in manufacturing industry and the increase in the proportion of workers in the service industry are the main culprit for the increase in the proportion of informal workers. However, Ramos (2002) show that the proportion of informal workers increased within the manufacturing sector, so that changes in the sectoral structure of employment cannot be entirely responsible for this phenomenon.

3. The New Constitution created several new rights to formal workers and reduced the maximum workweek.

extremely high when compared to other similar countries.[4] Furthermore, the wage package of formal workers contains, besides the mandatory benefit associated with the registration, several fringe benefits that are not readily accessible to non-registered workers (e.g. transport and food vouchers), so that the actual inequality is likely to be higher than the one reported in the raw estimates. The productive attributes of non-registered workers improved over the last two decades, and this fact can explain part of the wage gap reduction, but not all of it. Another interesting change that occurred during this period was the fact that non-registered workers became over-represented among the minimum wage earners. In addition to that, there is some evidence that their wage increases were linked to minimum wage hikes.

The changes and stylised facts highlighted above raise some questions that we will try to answer in the forthcoming papers. Is it the case that 40% of wage workers choose to join the informal sector because they have comparative advantages in that sector? If so, how to explain that when asked whether or not they would accept a formal job offer, 70% of the informal workers say "yes"?[5] Was trade liberalisation the main culprit for the increase in informality observed in the early 1990's? Was trade liberalisation linked to the fall in the wage gap between formal and informal workers? Do minimum wage hikes increase transitions from the formal to the informal sector and from those sectors to non-employment?

At this point it is necessary to clarify the concept of informal sector we will be using. Throughout this paper we will be referring to the informal sector as the set of workers whose contract is not registered in his/her work-card (*carteira de trabalho*). According to the Brazilian legislation, registered workers are the ones whose labour contract is registered on their work-card. This registration entitles them to several wage and non-wage benefits such as 30 days of paid holiday per year, contribution for social security, right to request unemployment benefit in case of dismissal, monetary compensation if dismissed without a fair cause, maternity and paternity paid leave and so on. Differently, non-registered workers have informal contracts, which are illegal and not registered in their work-card; in general any benefit such as paid holiday must be agreed with the employer on a case-by-case basis. Moreover, non-registered workers do not have access to any of the government-administered benefits related to the labour market, such as unemployment benefit and severance payment.

It is important not to confound this classification with the *ILO* (International Labor Organization) or *ILO*-related definitions of the informal sector. In general, these definitions comprise non-professional self-employed, employers and employees in small firms with cut points varying from 5 to 15 employees and non-paid workers [Maloney (1997), Gong *et al.* (2000)]. Our classification of registered and non-registered workers is an institutional one, in which employers avoid some sort of regulation, in this case, compliance with the labour code. Other possible definitions in the institutional framework are: the lack of contribution for social security as in Verry and Araujo (1996) or working in the underground economy. We prefer the

4. According to the 2002 World Development Report published by the World Bank, Brazil Gini's index of 0.61 is among the highest in the world, comparable to Central African Republic (0.62), Sierra Leone (0.63) and Nicaragua (0.61), and well above Argentina (0.45) and Mexico (0.51).

5. See Pero and Urani (1994).

registered/non-registered classification because it allows us to concentrate on the labour market strictly defined, i.e., on employees who work for a firm and receive monetary payment. Differently to what happens when one puts together self-employed and small-firms owners, in which case managerial ability and entrepreneurial talent play a crucial role in the sector allocation decision, focusing on a sample of employee should reduce possible selectivity problems. Furthermore, it is widely recognised the difficulties in comparing wages of employees and earnings from self-employed and employers that, in general, contain more than their net remuneration.

This paper will not focus on how to correctly measure the wage differential between registered and non-registered workers. This issue will be dealt with in a forthcoming discussion paper (Soares, 2004c) where we will estimate an endogenous switching regression model for formal and informal sector so that we can assess the hypothesis that informal sector workers queue for formal jobs.

This discussion paper is divided in two parts. The first part briefly reviews the literature on informal sector in developing countries. The second part documents the stylized facts of the informal sector labour market in the last two decades.

2 THE LITERATURE ON INFORMAL SECTOR IN DEVELOPING COUNTRIES

As in most developing countries, the Brazilian labour market is characterized by sharp differences in the way its citizens are linked to it. This contrast is usually called "segmentation" or "dualism" and may refer among other factors to differences between the modern formal sector and the traditional urban sector, to differences between small and large firms, and to the wage differential between workers in the formal and in the informal sectors.

The first typology derives directly from the work of Fields (1975) – in the tradition of the development economics field – and treats the urban traditional sector or the "murky" sector as a buffer for unemployed workers who migrate from rural areas attracted by job opportunities in the urban formal labour market. The low unemployment rate observed in developing countries would be due to the fact that workers would stay in the "murky sector" while looking for job in the formal sector (queuing for it). The "murky sector" is comprised, according to this view, by small business that employ low skilled workers since formal employers prefer more educated workers.

The second approach challenges Fields's view of the informal sector as a "waiting stage" and sees the informal sector as the lower end of the distribution of firms in developing countries. This view was born by the *ILO* (1972) report on Kenya and it rejects the idea of the urban informal sector as a "waiting stage" to access a "good" formal job. It regards the informal sector as a permanent source of employment and income. This small-scale or technological-based definition of the informal sector led to the definition of informal sector for purposes of quantification as being comprised of self-employed workers, and employers, employees and non-

remunerated workers working in firms with less than a determined employment threshold that, in general, varies from 5 to 15.

The third approach is concerned about the wage differential between workers with similar productive characteristics but allocated in different sectors. Actually, this approach can be traced back to the literature on dual labour market in developed economies that tried to provide evidence that similar workers in different sectors are paid differently, so that the labour market could not be characterized as perfectly competitive. This theory, whose origin dates back to the work of Doeringer and Piore (1971), was afterwards embraced by the different theories of efficiency wages, so that their concept of primary and secondary labour market could be laid on solid microeconomic basis. Of course, several explanations for wage differential between individuals with similar productive characteristics are possible within the competitive framework such as compensating differentials, but the bulk of empirical evidence is not consistent with such hypotheses.[6] However, most of these earlier findings were challenged because they did not take into account unobserved heterogeneity among workers that might lead them to be more productive in one sector than in the other. Heckman and Sedlacek (1985), Heckman and Hotz (1986) and Magnac (1991) argue that the sector choice of a worker is based on his/her comparative advantage. A worker chooses to work in the sector in which he/she is more productive and hence where he/she is able to command a higher wage. This allocation process affects the comparison between wage equations from different sectors, since workers found in each sector are not randomly drawn from the population. Former empirical studies based on the comparison of two (or more) different wage equations that do not take into account the allocation process were plagued with selectivity bias.[7]

The three approaches presented above are not mutually exclusive. Several models blend elements of these three approaches to explain how the formal-informal sector dichotomy arises. Esfahani and Salehii-Isfahani (1989) build an efficiency wage model in its shirking version that encompasses characteristics of the three approaches described above. In their model, technological dualism is related to the dichotomy formal (large firms) and informal (small firms) and it leads to differences in the observability of effort by employers in different sectors. It is assumed that effort is less observable in the formal than in the informal sector, so that workers in small (informal) firms who are perfectly monitored are paid competitive wages, whereas workers in large (formal) firms who are not perfectly monitored are paid efficiency wages. Thus segmentation is generated due to both the cost of monitoring workers and technological dualism. Nevertheless, the wage differential between formal and informal sectors in this model is reduced to a "size" effect on wages. Rauch (1991) builds a model where the formal-informal sector dualism in the labour market is integrated with size dualism via the hypothesis that the minimum wage is only enforced on firms larger than a certain size. The size gap between formal and informal sector firms varies with the wage differential between formal and informal sector workers, which increases with hikes in the minimum wage. In this same vein, Fortin *et al.* (1997) build a model where formal-informal sector dualism arises

6. See for instance Krueger and Summers (1987) and the chapter 5 of Saint-Paul (1996) for a review of these studies.

7. See Dickens and Lang (1985) for an attempt to overcome this criticism and Heckman and Hotz (1986) for a critique of that attempt.

endogenously due to firms' heterogeneity and to the assumption that the marginal cost of tax and regulation evasion (e.g. not paying the minimum wage or other mandatory contributions) increases with the size of the firm. This model is also compatible with discontinuity in the size distribution of firms (the so-called missing middle) and with "waiting unemployment" as in Field's model.

These models are interesting in the sense that they offer a benchmark to understand the relationship between several characteristics of the informal sector and how changes in policies can affect the size of the informal sector and the wage differential between workers. However, the empirical literature has emphasized the wage differential studies and we are not aware of many papers that try to assess the effect of changes in policies[8] (e.g. labour law reform, trade liberalisation and minimum wage hikes) on the size of the informal sector or on the wage differential between formal-informal sector workers.

In table 1, we summarize some of the results of selected papers, emphasizing the way they define the informal sector, the methodology used and the key findings. Heckman and Hotz (1986) investigate the hypothesis of segmentation in Panama. Assessing whether low-wage workers have a lower return to education than high-wage workers, as predicted by the segmentation hypothesis, they found the opposite result, i.e, if there is any segmentation in the Panamanian labour market, it would favour low-wage workers. Even after re-estimating the model with the correction for the "sector-allocation choice", the results still indicate the presence of this "reverse" segmentation. Nevertheless, Heckman and Hotz were not convinced that the available tests would be enough to characterize the presence of segmentation. Among the reasons for this disbelief is the possibility of mispecification of the wage equation. The mispecification would lead to the rejection of equality of the parameters of the wage equations for the two groups even in the absence of segmentation. The main effect of Heckman's work in this area was to lead most of the subsequent research to adjust the estimation of the wage equation to tackle selectivity issues. For this reason most of the studies that investigate the hypothesis of segmentation against the hypothesis of comparative advantage in the sector allocation choice concentrate their analysis on sign of the Inverse Mills Ratio or on the correlation (ρ) between unobservables in the wage equation and unobservables in the "choice" equation. A positive correlation between the unobservables of the two equations would imply that workers selected themselves into formal and informal sector according to their comparative advantages.

The lack of pattern in the way the informal sector is defined across studies makes it difficult to compare the findings reported in Table 1. Some studies are worried basically about self-employment, others about unregulated (non-registered) workers, and others follow the *ILO* definition or some modification of that. Most studies use 2-step Heckman selection and try to correct the wage equation in order to properly evaluate the wage differential. However, not many go beyond the second step to investigate the role of wage differential in a structural framework as in a

8. Fortin *et al.* (1997) build in their paper a computable general equilibrium (CGE) model for Cameroon in order to simulate the effect of several reforms of the tax and regulation system on the informal sector. They find that an increase in the tax rate on profits, in the payroll tax, and in the government set wage rate increase the size of the informal sector.

switching regression model. In general, they only report the reduced form 'choice equation'[9] and the wage equations corrected for selectivity.

One interesting point is that some studies try to disentangle the hypothesis of comparative advantages from the hypothesis of managerial abilities. The idea is that self-employed workers should be positively self-selected because they have a special talent for business, while the same would not necessarily hold for wage workers regardless of their registered status (Yamada, 1996). Comparative advantage hypothesis would prevail only if we could not reject positive selection for all types of workers involved in the estimation process.

TABLE 1

Summary of studies on formal x informal wage differential and segmentation

Study	Country	Definition	Methodology	Key findings
Blau (1985)	Malaysia	Self-employed	2-step Heckman selection Model	Negative selection in rural areas and positive selection in urban areas.
Heckman and Hotz (1986)	Panama	Low income workers	2-step Heckman selection Model	Reverse segmentation.
Gindling (1991)	Costa Rica	Workers in small firms (5 employees or less)	2-step Heckman selection Model	No evidence of selection.
Barros *et al.* (1992)	Brazil	Non-registered and self-employed workers (separately)	Mobility Analysis	Movers to informal sector lose, movers to formal sector gain.
Yamada (1996)	Peru	Self-employed	3-step Heckman selection Model (endogenous switching regression model)	Positive selection for self-employed (managerial ability) and negative selection for non-registered workers.
Funkhouser (1997)	Guatemala	Workers in small firms (5 employees or less)	2-step Heckman selection Model	Positive selection for both formal and informal workers .
Marcoullier *et al.* (1997)	Peru, Mexico and El Salvador	Workers in small firms (5 employees or less) and non-professional self-employed.	2-step Heckman selection Model	Salvadorans and Mexican men: positive selection into the informal sector. No selection in Peru. Negative selection for Mexican women.
Maloney (1999)	Mexico	Workers and owners of small firms (16 employees or less)	Mobility analysis	No segmentation. Wage differential are not a good guide.
Saavedra and Chong (1999)	Peru	Non-registered and informal self-employed (separately)	2-step Heckman selection Model	Positive selection of non-registered workers.
Gong *et al.* (2000)	Mexico	Workers in small firms (16 employees or less)		Movers to informal sector lose, movers to formal sector gain.
Carneiro and Henley (2001)	Brazil	Non-registered workers	2-step Heckman selection Model (endogenous swithcihg regression model)	Positive selection for non-registered workers and negative selection for registered workers.
Gong and Van Soest (2002)	Mexico	Piece-workers and self-employed	Mobility Analysis	No segmentation for low-educated, but segmentation for high-educated workers. Probability of formal job increases with wage differential.
Tannuri-Pianto and Pianto (2002)	Brazil	Non-registered workers	2-step Heckman selection Model	Positive selection for non-registered workers and negative selection for registered workers. Probability of formal job increases with wage differential.
Pratap and Quintin (2001)	Argentina	Non-registered workers	Propensity Score Matching	No Evidence of Segmentation.

9. The reduce form 'choice equation' can be estimated as a probit, a logit or even a multinominal logit in the case of more than two sectors, e.g, Yamada (1996).

In the case of Brazil, very few studies have tried to control for selectivity bias while estimating the wage differential between formal and informal workers. Carneiro and Henley (2001) estimate an endogenous switching regression model for informal (non-registered) and formal (registered) workers and find evidence that informal sector workers allocate themselves into this sector due to comparative advantages, *i.e.*, the more likely the individual is to choose the informal sector, the higher his/her expected wage in that sector is. However, they fail to find this comparative advantage result for formal sector workers. Tanuri-Pianto and Pianto (2002) use a quantile regression framework and find that comparative advantages – i.e. unobservables that lead to selection into the informal sector have a positive effect on earnings – play an important role in the case of informal sectors workers at the bottom of the distribution, whereas at the top of the distribution the effect is negative. Similarly to Carneiro and Henley (2001), they find that unobservables that make formal (registered) sector workers more likely to join the formal sector lead them to earn less than what would be expected based on their observed characteristics, *i.e.*, they do not select themselves into formal jobs due to comparative advantages. They also show that the earning gap favouring formal sector workers in the bottom quantile of the distribution is higher than at the top and cannot be explained only by differences in attributes. Differently, the gap at the top of the distribution is mostly due to differences in attributes.[10]

One of the main criticisms of the cross-section studies on segmentation based on the analysis of the coefficient of the Inverse Mills ratio is that they usually rely on somewhat disputable exclusion restrictions in order to identify the sector allocation and wage equations separately.[11] Some authors have argued that the question of barriers to mobility into the formal sector appears to be an alternative way to settle the controversy on segmentation.[12] The studies surveyed by Behrman (1999) show that despite the relative high mobility between the two sectors, those who move from the informal sector to the formal sector have higher wage gains than the ones who move in the opposite direction. Gong *et al.* (2000) find that the probability of formal sector employment in Mexico increases with education level and that informal sector jobs are held by those with low family income, who cannot afford not to work at all. Differently, Maloney (1997) argues that the pro-cyclical feature of the informal urban sector in Mexico makes it hard to affirm that it behaves as a "cushion" for bad times as stated by the traditional view of segmentation in developing countries. Moreover, mobility patterns do not suggest a rigid labour market or one segmented along the formal/informal division (Maloney, 1999). Also using panel data for Mexico, Gong and Van Soest (2002) estimate a dynamic multinomial logit model with random effects for the choice of the sector, and two linear dynamic random effect equations for the wages in the two sectors. They find that the probability of formal sector employment strongly increases with wage differential. Their findings

10. These results are in sharp contrast with the studies of Gong and Van Soest (2002) for Mexico and Pratap and Quintin (2001) for Argentina, that found no evidence of segmentation.

11. Another criticisms refer to the assumption of the normality of the residuals in the participation equation and to the difficulty in measuring earnings in the informal sector, particularly, when it includes the self-employed and small employers.

12. See Maloney (1997) and Maloney (1999).

also suggest that for the lower educated workers, the dualistic view of the labour market is not a good description, since they would command higher wage in the informal sector than in the formal sector. However, the most educated would command higher wages in the formal sector. In the case of Brazil, Barros *et al.* (1992) consider the mobility among three occupational states: registered (formal), non-registered (informal) and self-employed, and conclude that there is segmentation in the Brazilian labour market. Transitions to the registered sector always mean wage gains, whereas transitions from the registered sector to the non-registered sector or to self-employment always mean wage losses.

Pratap and Quintin (2001) estimations differ from the other studies because they do not correct wage equations for selectivity bias, on the contrary, they assume that all selection is controlled for using observables. They apply propensity score matching techniques in order to assess the wage differential between formal and informal workers in Argentina.[13] Their aim is to tackle the second source of bias in the wage differential studies as highlighted by Heckman and Hotz (1986): the assumption that the wage equation in correctly specified. They do not find any evidence of segmentation between formal and informal sectors in Argentina.

3 FORMAL AND INFORMAL SECTOR IN BRAZIL: SOME STYLIZED FACTS

The literature on the informal sector in Brazil has basically three approaches. The first considers the informal sector as comprised of self-employed and small firm workers, the second considers informal sector as workers whose labour contract does not respect the labour code (non-registered), and the third puts together self-employed and non-registered workers. In this paper and in the forthcoming ones, we treat as informal sector only the second group. For this reason, we use the term registered and non-registered as synonymous with formal and informal sectors. In this section we will give an overview of what happened to these two groups of workers during the 1980's[14] and 1990's, in order to set the scene for the other three discussion papers.

3.1 DATA

The data used in this paper come from the Annual Household Survey [*Pesquisa Nacional por Amostra de Domicílios* (Pnad)] carried out by the Brazilian Statistics Office [*Instituto Brasileiro de Geografia e Estatística* (IBGE)]. We use data from 1981 to 1990, 1992, 1993 and from 1995 to 1999. There is no data for years when the national census is carried out, such as 1991, and in 1994 the survey was not conducted due to lack of funds. The representative sample consists of around 100.000 households covering the whole country with the exception of North rural area (Amazon area).

13. Informal workers are defined in their paper as workers who do not have access to some mandatory benefits.

14. For an excellent analysis of the changes in the informal sector - understood as self-employed plus non-registered workers - during the 1980's see Barros *et al.* (1993).

The main difficulty in working with the whole series of the Pnad is to filter the sample in order to disentangle non-registered workers from public (civil and military) servants for the period 1981 to 1988. As public servants do not have a registered work-card, they were classified as non-registered workers in the earlier surveys. Such problem did not happen in the surveys from 1989 onwards, because the individuals were directly asked whether they were public servants or not. In order to overcome this difficulty we filter possible public servants using the information on the worker's occupation and industry affiliation. To keep the consistency of the procedure, we ignored the actual information on the registration status available for the period 1989 to 1999 and applied the same filter we used for the 1981 to 1988 period.

3.2 SOME DESCRIPTIVE STATISTICS

One of the distinguishing features of the Brazilian labour market is the existence of a large number of workers whose job contract is not regulated by the legal labour code, i.e, they do not have a "signed work-card".[15] These contracts are informal and illegal but make up something around 40% of the "wage workers"[16] and seem to have increased since the early 1990's.

Table 2 shows the mean and the standard deviation for several variables separately for registered and non-registered workers[17] in three selected years: 1981, 1990 and 1999. Non-registered workers are more likely to be younger and less educated than registered workers, but these differences between the two groups have decreased over time, particularly, in relation to education. The average age of non-registered workers was 30(28) years in 1999(1981), whereas the registered average age was 33(31) years and the average years of schooling for non-registered workers was 5.9(3.1) and for registered, 7.8(6.2). Registered workers earned more than non-registered workers, but the gap narrowed considerably during the 1990's. The two groups used to work similar hours in 1981 and 1990, but in 1999 non-registered workers worked fewer hours than registered workers. However, the standard deviation of the working hours was much higher for non-registered workers. The presence of women increased in both groups, particularly, among the non-registered: in 1999 they represented 50% of the total non-registered workers. The regional distribution of the two groups remained quite stable over this period. Non-registered workers, however, seem to be over-represented in the Northeast.

The participation of the agricultural sector as a proportion of registered workers increased a lot between 1981 and 1999, while its participation in the non-registered sector (which was the largest in 1981) decreased. Surprisingly, the manufacturing and the productive service sectors increased their participation in the pool of non-registered workers and reduced it in the pool of registered. The retail sector, the social services, and the lodging, food and other services expanded their participation among both registered and non-registered workers, whereas the constructing sector squeezed their participation among registered and remained relatively constant

15. The possession of a "signed work-card" (registration) gives workers several rights in terms of access to job-related public funds (e.g. unemployment benefit) and also to legally mandatory fringe benefits (e.g. paid vacations).

16. Wage workers means remunerated employees.

17. This sample excludes self-employed, non-remunerated workers, and public servants.

among non-registered. Despite being less prevalent in metropolitan areas, the participation of non-registered workers in those areas increased during this period. Differently, the participation of registered workers decreased in metropolitan areas. It seems that there were two opposite movements in this period: the rural sector, due to changes in agriculture, became less "informal", and the urban sector, due to the increase in informality in several sectors, became less "formal".

TABLE 2

Descriptive statistics for selected years (1981, 1990 and 1999)

	1981		1990		1999	
	Non-registered	Registered	Non-registered	Registered	Non-registered	Registered
Years of schooling	3,07	6,17	3,82	6,87	5,85	7,78
	(3.15)	(4.12)	(3.40)	(4.16)	(3.63)	(3.86)
Gender (male=1)	0,65	0,72	0,63	0,68	0,49	0,61
	(0.48)	(0.45)	(0.48)	(0.47)	(0.50)	(0.49)
Age	28,01	31,06	28,28	31,86	30,26	32,87
	(13.96)	(11.06)	(13.83)	(11.06)	(12.68)	(10.78)
Experience (years)	18.94*	18,89	18,46	18,99	18,40	19,08
	(14.90)	(12.62)	(14.87)	(12.58)	(13.87)	(12.33)
Log hourly wage (R$ Sept. 1998)	-0,26	0,83	-0,36	0,60	0,04	0,67
	(0.81)	(0.85)	(0.88)	(0.91)	(0.81)	(0.76)
Hours	46,21	47,15	44,74	44,00	41,86	44,78
	(13.62)	(10.45)	(13.32)	(9.11)	(15.00)	(9.50)
Northeast	0,33	0,19	0,35	0,20	0,30	0,20
	(0.47)	(0.39)	(0.48)	(0.40)	(0.46)	(0.40)
North	0,06	0,06	0,08	0,07	0,08	0,04
	(0.23)	(0.24)	(0.28)	(0.26)	(0.28)	(0.20)
Southeast	0,35	0,45	0,30	0,44	0,34	0,43
	(0.48)	(0.50)	(0.46)	(0.50)	(0.47)	(0.50)
South	0,11	0,20	0,10	0,19	0,15	0,23
	(0.32)	(0.40)	(0.30)	(0.39)	(0.36)	(0.42)
Midwest	0,15	0,10	0,17	0,10	0,13	0,10
	(0.35)	(0.30)	(0.37)	(0.30)	(0.34)	(0.29)
Agriculture	0,35	0,03	0,27	0,05	0,19	0,06
	(0.48)	(0.18)	(0.45)	(0.22)	(0.39)	(0.23)
Manufacturing	0,09	0,35	0,12	0,33	0,11	0,27
	(0.29)	(0.48)	(0.32)	(0.47)	(0.31)	(0.44)
Constructing	0.11*	0,11	0,09	0,07	0,10	0,05
	(0.32)	(0.31)	(0.28)	(0.25)	(0.30)	(0.22)
Retail	0,08	0,14	0,10	0,16	0,11	0,17
	(0.27)	(0.35)	(0.30)	(0.37)	(0.31)	(0.37)
Lodging, food and other services	0,29	0,12	0,31	0,13	0,37	0,20
	(0.45)	(0.32)	(0.46)	(0.33)	(0.48)	(0.40)
Productive services	0,05	0,19	0,06	0,19	0,08	0,16
	(0.22)	(0.39)	(0.24)	(0.39)	(0.27)	(0.37)
Social Services	0,03	0,07	0,05	0,08	0,04	0,10
	(0.17)	(0.25)	(0.21)	(0.27)	(0.21)	(0.30)
Metropolitan area	0,31	0,63	0,30	0,55	0,43	0,55
	(0.46)	(0.48)	(0.46)	(0.50)	(0.50)	(0.50)
Race (white=1)			0,40	0,57	0,45	0,59
			(0.49)	(0.50)	(0.50)	(0.49)
Size (more than 10 = 1)			0,25	0,81	0,21	0,69
			(0.43)	(0.39)	(0.41)	(0.46)
Tenure (years)			2,96	4,79	3,12	4,78
			(5.98)	(6.02)	(4.95)	(5.63)
Union					0,02	0,24
					(0.12)	(0.43)
% earning less than mw	0,61	0,07	0,48	0,05	0,35	0,01
% earning the mw	0,01	0,04	0,06	0,09	0,13	0,08
% earning more than mw	0,39	0,90	0,47	0,86	0,53	0,91
N	38895	61840	27506	41261	25885	37706

Note: * indicates that the mean of the varaible is not statistically different between the two sample at 5% of significance

Data about race, unionization, tenure and size of the firm were only available in more recent surveys. White workers are predominant among registered workers, whereas non-white workers are predominant among the non-registered. However, the proportion of whites among non-registered workers increased from 1990 to 1999. Non-registered workers were more likely to be employed by small firms. In 1990, only 25% of non-registered workers worked in firms with more than 10 employees, this figure was down to 21% in 1999. This contrasts with the sample of registered workers: 81% of which worked in firms with more than 10 employees in 1990, however, in 1999 only 69% were in this situation. Non-registered workers had less seniority than registered workers and were extremely less likely to be unionized: only 2% of non-registered workers were unionized, whereas 24% of registered workers were unionized in 1999.

Overall non-registered workers have a significant disadvantage in terms of productive attributes. They are less educated, more likely to be employed in smaller firms and in low productivity sectors. They are also less likely to be unionized and more prone to be discriminated against since female and non-white workers are over-represented among them.

On the bottom of table 2 we report the proportion of workers whose wage was lower, equal and higher than the minimum wage. Non-registered workers exhibit a high degree of non-compliance, however, non-compliance decreased considerably during the period under investigation.[18] At the same time, there was a rise in the proportion of non-registered workers whose wages were equal to the minimum wage: 13% in 1999 compared to 1% in 1981.

Overall it seems that changes in the composition of the two groups between 1981 and 1990 may explain at least part of the fall in the wage differential between the two groups. In the next subsections we will analyze the effects of these changes more thoroughly.

3.3 CHANGES IN EMPLOYMENT STRUCTURE DURING THE 1980'S AND THE 1990'S

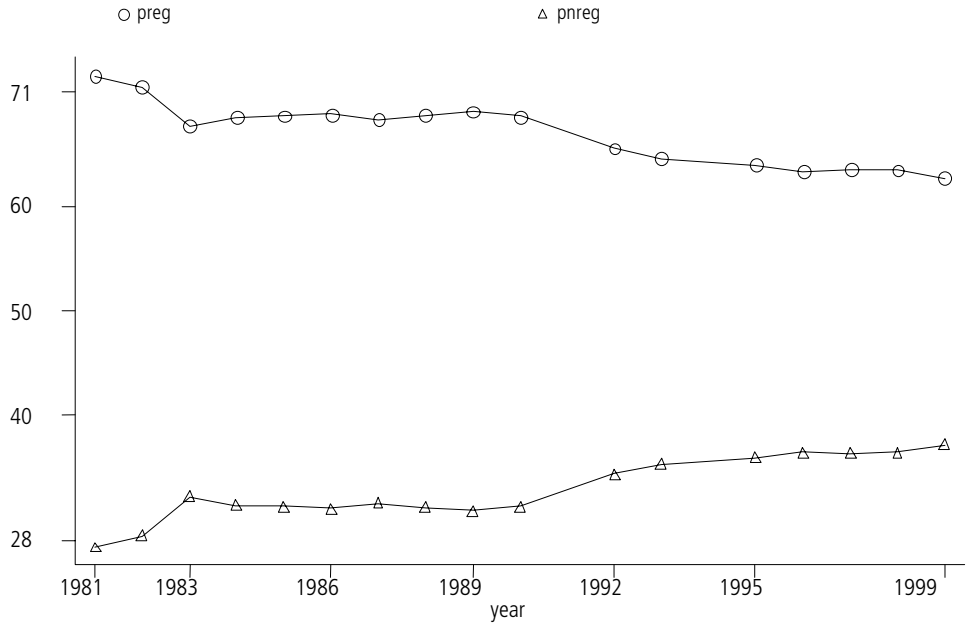
In the 1980's the proportion of registered workers in the occupied population followed very closely the behaviour of the business cycle. During the recession of the early 1980's it decreased sharply, but after 1984 as the economy recovered, it slightly increased. The recession of the early 1990's led to another reduction in the proportion of registered workers, but this time, even with the recovery of the economy after 1993, the proportion of registered workers did not react. In contrast, the proportion of non-registered had a counter-cyclical behaviour – as expected by the buffer interpretation of the informal sector – during the early 1980's, peaking in 1983 and reaching its lowest level in 1990. After that, the proportion of non-registered workers increased slightly and has remained rather constant since 1995.[19]

18. Notice that in 1999 the non-compliance among registered (non-registered) workers was down to 1% (35%), compared to 7% (61%) in 1981.

19. The increase in the number of self-employed seems to have accounted for the major part of the decrease in the proportion of registered workers. However, as the reduction over the period was higher for the proportion of registered workers than for non-registered workers, this led to a lower proportion of registered workers in the pool of employees.

The increase of the proportion of non-registered workers was more intense in the non-agricultural industries. In fact, the agriculture industry experienced an increase in the proportion of registered workers, in spite of its initial and still high level of non-compliance (see table 2). However, since the proportion of agricultural sector jobs has decreased continuously over time, the aggregate figure is dominated by the changes in the non-agricultural sector. Looking only at this latter group the proportion of non-registered workers increased from 30% in 1981 to 40% in 1999 (see figure 1), and the bulk[20] of this increase was concentrated after 1990, just after the country started the market-oriented reforms, such as the programmes of privatization and the process of trade liberalisation.

FIGURE 1
Proportion of registered and non-registered workers (in %) – 1981-1999

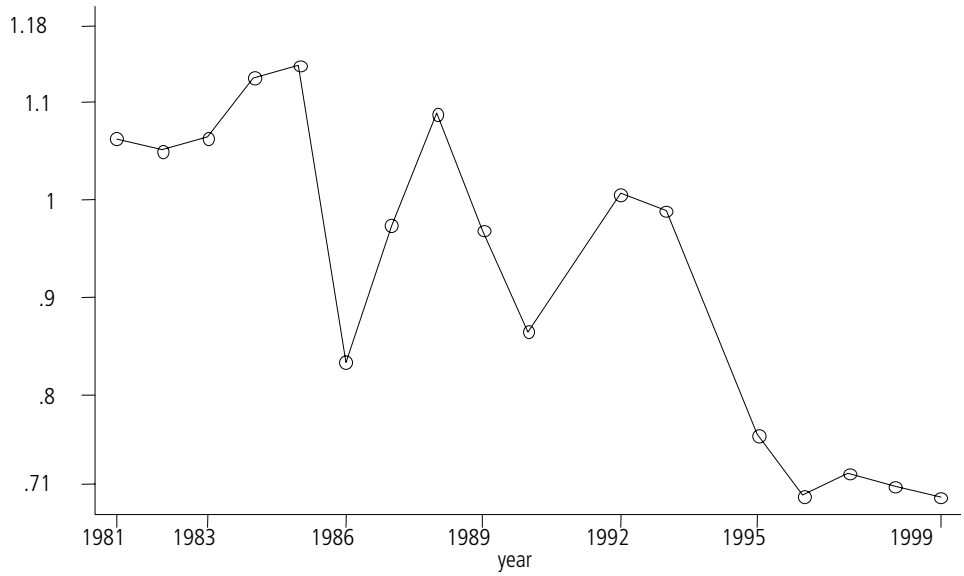


While the proportion of non-registered workers increased, the raw wage gap between registered and non-registered workers fell between 1981 and 1999. As shown in figure 2, in 1981 the raw ratio of log real hourly-wage between registered and non-registered workers was 1.08, but in 1999 it was down to 0.71.[21]. Many factors may have triggered such decrease: composition effects (due to the improvement of non-registered workers productive attributes in comparison to their registered counterpart), higher returns to attributes in the non-registered sector due to changes in the economic environment, and so on. In order to have a clear view of what happened with the wage gap once one controls for the observable characteristics of workers and firms, the following subsections will discuss the main results of a set

20. We are not taking into consideration here the isolated peak observed in 1983 due to the severe recession observed then.
21. It is true that there is a major dip in 1986, but this episodical movement can be explained by the effect of the unorthodox plan (Plano Cruzado) – which froze wages and prices - on the dynamics of the Brazilian labour market. As wages and prices in the informal sector are not easily controlled as wages and prices in the formal sector, the increase in the demand for non-tradables observed in that period benefited informal workers both in terms of employment and wages, leading to a sharp fall in the wage differential between formal and informal workers, see Camargo and Ramos (1988) for a discussion of this point.

of regressions for registered and non-registered workers and present some decomposition exercises for changes in average wages and changes in wage inequality.

FIGURE2
Wage premium for registered workers – 1981-1999



3.4 EVOLUTION OF WAGE DIFFERENTIAL BETWEEN REGISTERED AND NON-REGISTERED WORKERS

All regressions in this subsection are run for workers who worked at least 20 hours in the week immediately before the interview, had positive earnings, were not employed in farming activities, and were between 14 and 65 years. In order to check different patterns of segmentation according to gender we run separate regressions for men and women. In the same vein, wage equations for registered and non-registered workers are run separately so that we can follow the evolution of the gender wage gap and of the returns to skills for both groups.

The dependent variable in all specifications is the log of hourly real wage[22] and the regressors are group of years of schooling (illiterate – $yos1$, some primary – $yos2$, complete primary and some elementary – $yos3$, complete elementary and some secondary – $yos4$, complete secondary and some college – $yos5$, and complete college and post-graduation – $yos6$);[23] potential experience (*age – years of schooling – 6*); potential experience squared; dummies for four regions; dummy for metropolitan area and, when appropriated, dummies for gender; work-card (registration); size of the firm, tenure and race.

To assess the consistency and accuracy of filter used to separate public servants from non-registered workers we re-estimate the wage equations for the 1989-1999

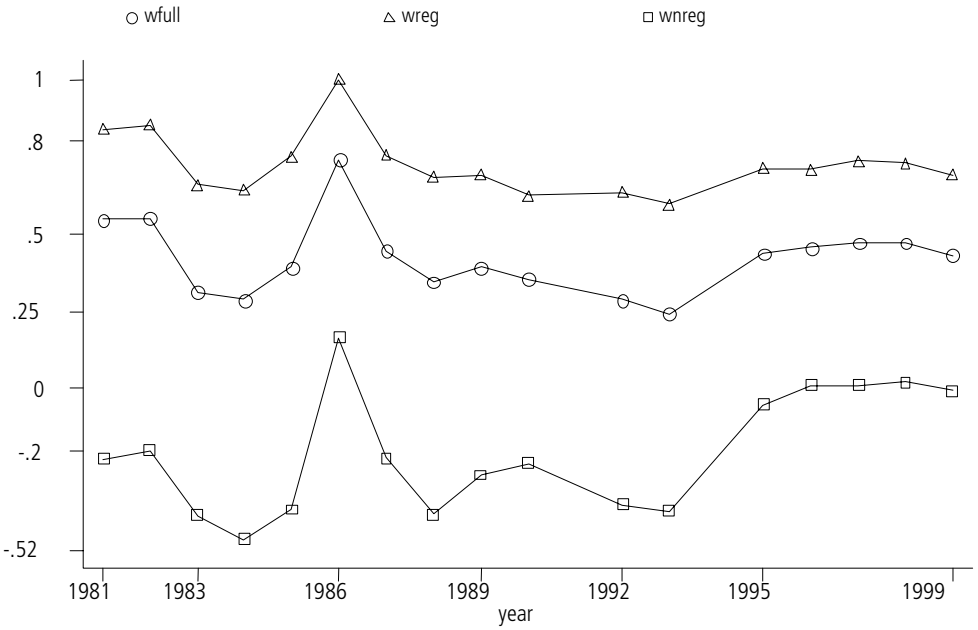
22. The nominal wages were deflated by the INPC (Consumer Price Index) based on September 1998.

23. We choose to enter the education variable as groups and not as a continuous variables in order to capture the non-linearities of the return to education and to have a clear picture of the evolution of the return for different groups.

period using the available information on the actual public servant status. The parameter estimates are quite close to the ones yielded by the filtered data, but the sample size turns out to be larger. This means that the filter underestimates the number of both non-registered and registered workers. It classifies some registered or non-registered workers as public servants, which yields a smaller sample of private sector employees. Another difference between the two samples is that for the 1989 to 1999 sample, it is possible to use a broader set of regressors, such as tenure, size and race variables[24]. It is worth mentioning that the "size of the firm" variable, which unfortunately has to be coded as a binary (more than ten = 1), has an important effect on the estimation. Once it is included in the regression, the magnitude of the coefficient for the dummy for a registered work-card is drastically reduced[25].

Figure 3 shows that the log hourly real wage for both registered and non-registered workers followed a similar path over time. The differences are concentrated in the period 1988-1993, when the average wage for the registered workers declined moderately, whereas the average wage for the non-registered increased from 1988 to 1990 and then decreased continuously until 1993. Despite sharing the same trend, the intensity with which each group's wage react to changes in the business cycle varied a lot. The wage recovery after 1993, for instance, was sharper for the non-registered than for the registered workers.[26] This pattern led the ratio of log real wage between registered and non-registered workers to decline from 1992 onwards as shown in figure 2.

FIGURE 3
Log hourly real wage rate – 1981-1999



24. Union information in only available for 1988 and from 1992 onwards.

25. The sample size of the specification that controls for size of the firm is lower than the others because we drop all "domestic servants" of the sample. This procedure is justified because almost all domestic servants would assume the value 0 (less than 10) for the variable firm size, which could bias the results.

26. The peak for both registered and non-registered workers observed in 1986 was due to the *Plano Cruzado*, an unorthodox stabilization plan, which froze wages and prices.

According to the regressions based on the filter-based sample, the 1990's witnessed a lower volatility of wage differential[27] when compared to the 1980's, in particular, the differential seems to have stabilised around 36% since 1995[28] (figure 4). This threshold contrasts sharply with the peaks observed in 1985, 1988 and 1992, when the wage differential reached something around 70%, after controlling for age, education, region, metropolitan area, potential experience and gender. However, the evolution of the controlled wage differential is quite similar to the one observed for the raw wage differential, in particular, the dips observed in 1986, 1990 and 1995 are not attenuated.

FIGURE 4
Wage differential between registered x non-registered (filter based) – 1981-1999

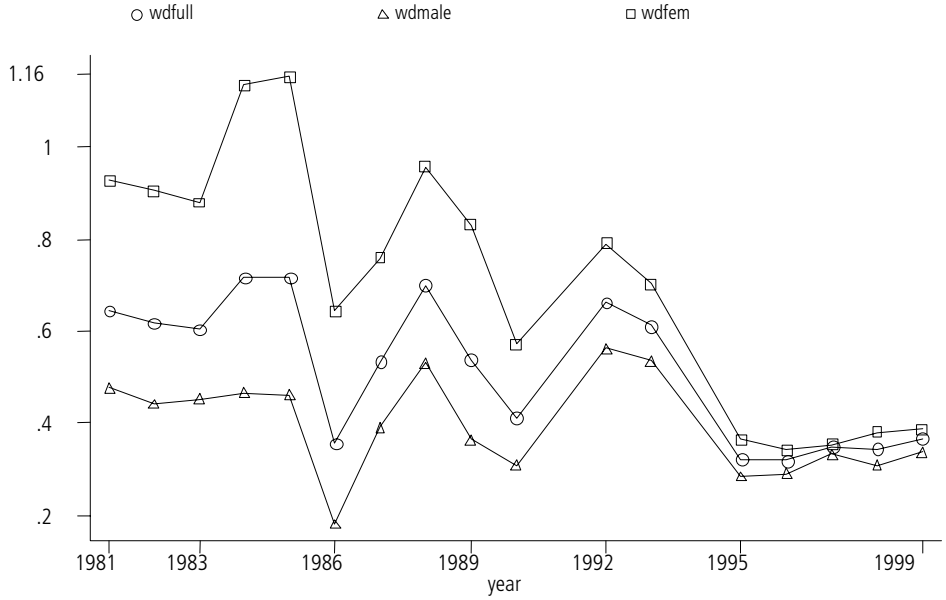
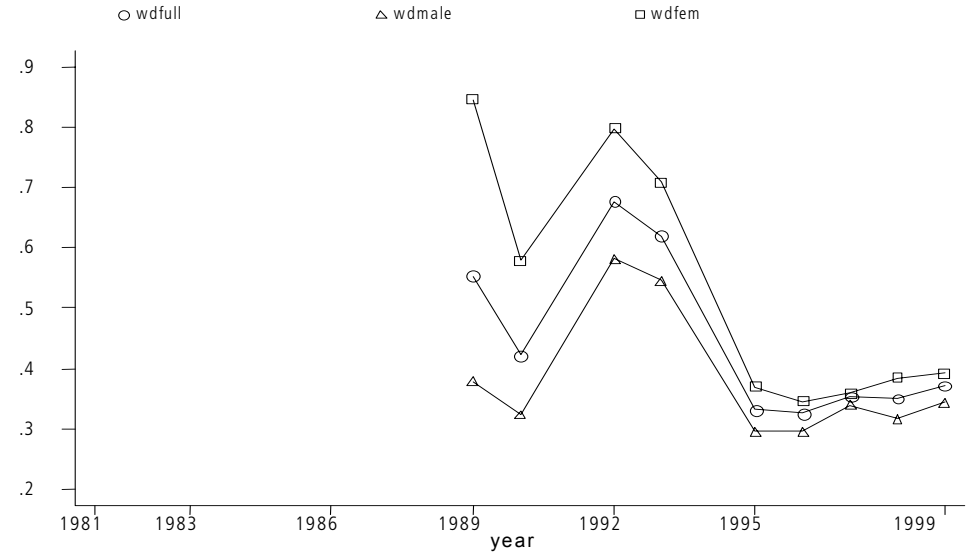


FIGURE 5
Wage differential between registered x non-registered (survey based) – 1989-1999

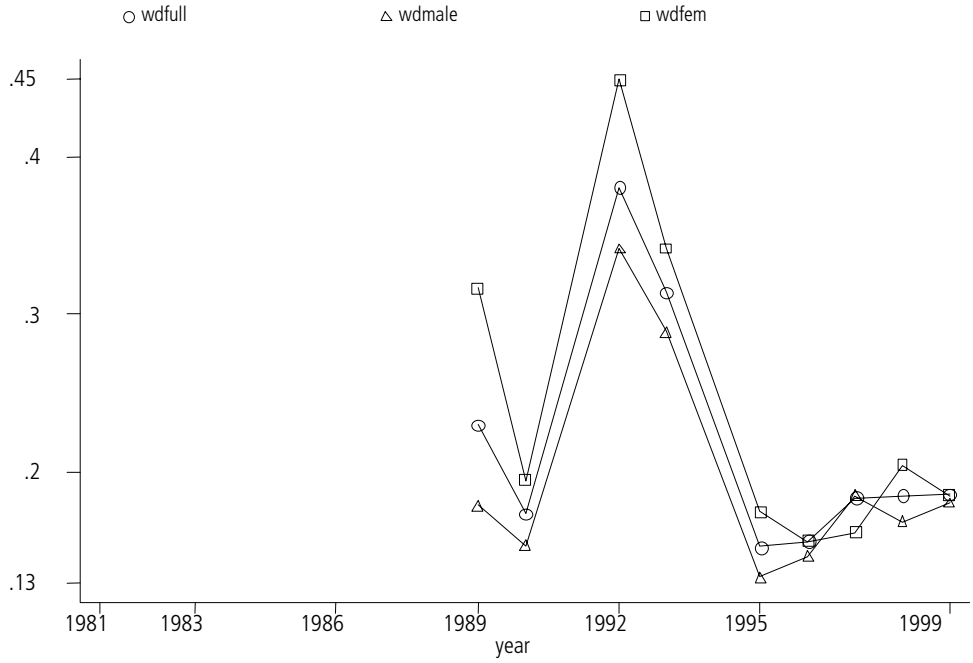


27. Wage differential is measured as the antilog of the coefficient of a dummy variable coded 1 for registered workers and 0 for non-registered workers.
28. This figure is half of raw wage differential that was around 70% since 1996 as shown in figure 2.

The second classification, which permits to control for self-declared public servants instead of using our occupation/industry filter, yields similar results to the ones presented above (see figure 5). The wage differential is somewhat smaller for more recent years in the survey-based classification, but the differences are very small to shed doubts on our filter-based classification.

The third set of results uses the same classification of the second, but exploits more controls that were made available only in the more recent surveys. As expected, the inclusion of size of the firm, tenure and race has a huge impact in the controlled wage differential. Figure 6 shows that the estimated wage differential is almost halved when one includes those variables. However, its pattern over time is exactly the same as shown on the previous results: a fall in 1990 and 1995 and a peak in 1992. According to this specification the wage differential would be around 18% in 1999.

FIGURE 6
Wage differential between registered x non-registered (survey based and more controls) – 1989-1999



As noticed in the previous subsection, the increase in the participation of women in both registered and non-registered sectors was one of the main changes observed during this period. Figures 7 to 9 show that the wage differential between male and female workers decreased substantially over time for both registered and non-registered workers. However, whereas the non-registered sector seems to have a higher wage gap in favour of male workers for the specifications with fewer controls (figure 7 and 8), in the specification with more controls (figure 9) the registered worker sample is the one that seems to have a higher wage gap in favour of male workers.

FIGURE 7

Wage differential between male x female (filter based) – 1981-1999

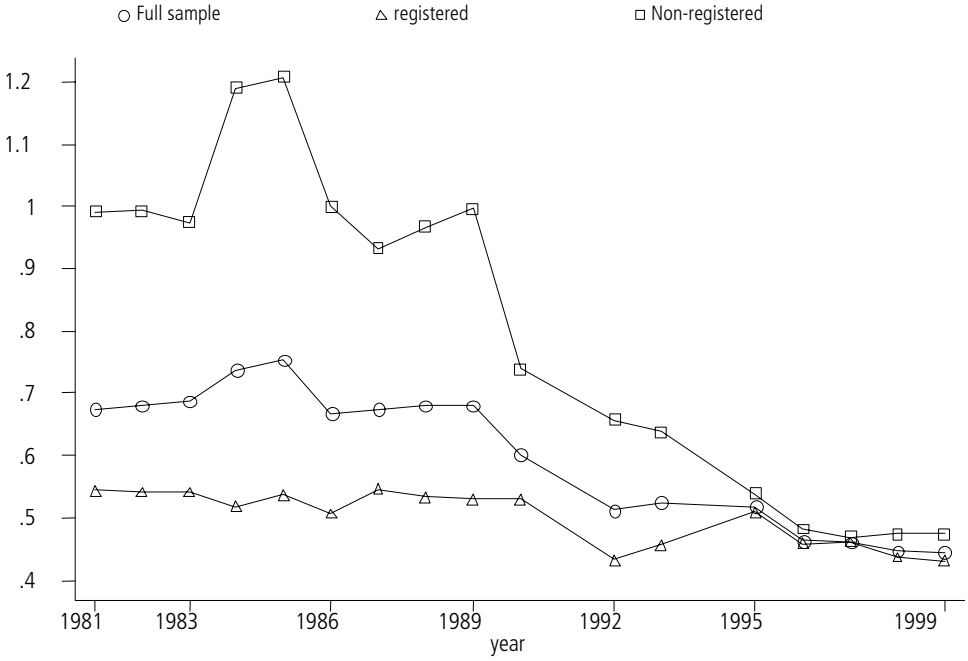


FIGURE 8

Wage differential between male x female (survey based) – 1989-1999

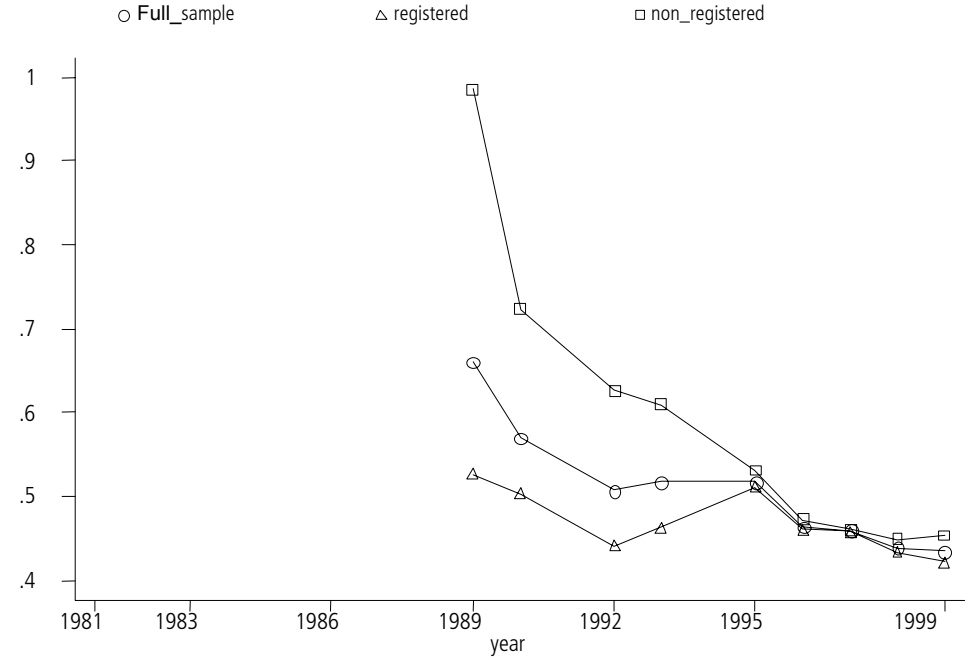
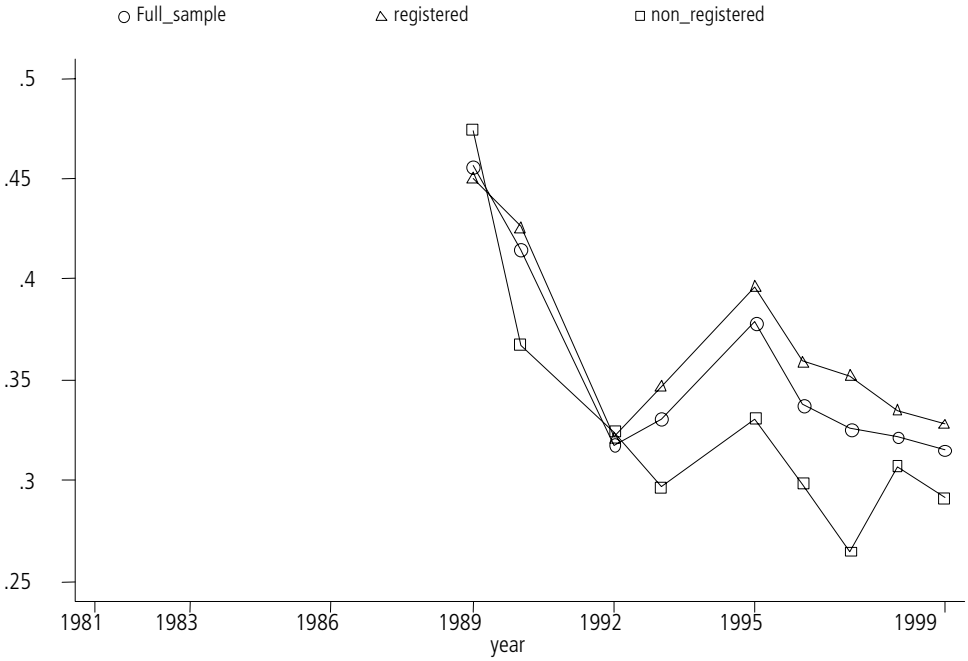


FIGURE 9

Wage differential between male x female (survey based and more controls) – 1989-1999



Two striking features are revealed by the two sets of Figures procedures considered above. First, the wage differential among female workers was considerably higher than among male workers. However, such discrepancy has diminished over time and at the end of the sample period both measures were quite similar. Second, the gender wage gap was higher for non-registered workers than for registered workers. But here again, there has been some convergence over time.

3.5 RETURNS TO EDUCATION FOR REGISTERED AND NON-REGISTERED WORKERS

The wage premium[29] for workers with complete college was quite stable during the early and middle 1980's. It peaked in 1988 and then started falling until 1992 to a level lower than the 1980's average. However, after 1992, the wage premium for college workers started increasing and achieved a level above the peak observed in 1988[30] (figure 10). Green *et al.* (2000) argue that such evidence is in line with the hypothesis that, somehow, the trade reform in the early 1990's has triggered an increase in the returns to education for high-skilled workers.[31]

29. These figures depict the wage premium for each education level over and above the group immediately below. For that reason, the reference group for the group some elementary education (yos2), i.e, the illiterate group (yos1) does not appear in the graphs.

30. The conditional wage differential between college workers and complete high school or some college was 176% in 1999. In 1992, this differential was around 132%, the lowest level in the sample.

31. There is still no strong evidence of the direct links between trade liberalisation and increase in returns to education in Brazil. We will discuss this hypothesis in one of the forthcoming papers in this series.

FIGURE 10

Relative returns to education (full sample) – 1981-1999

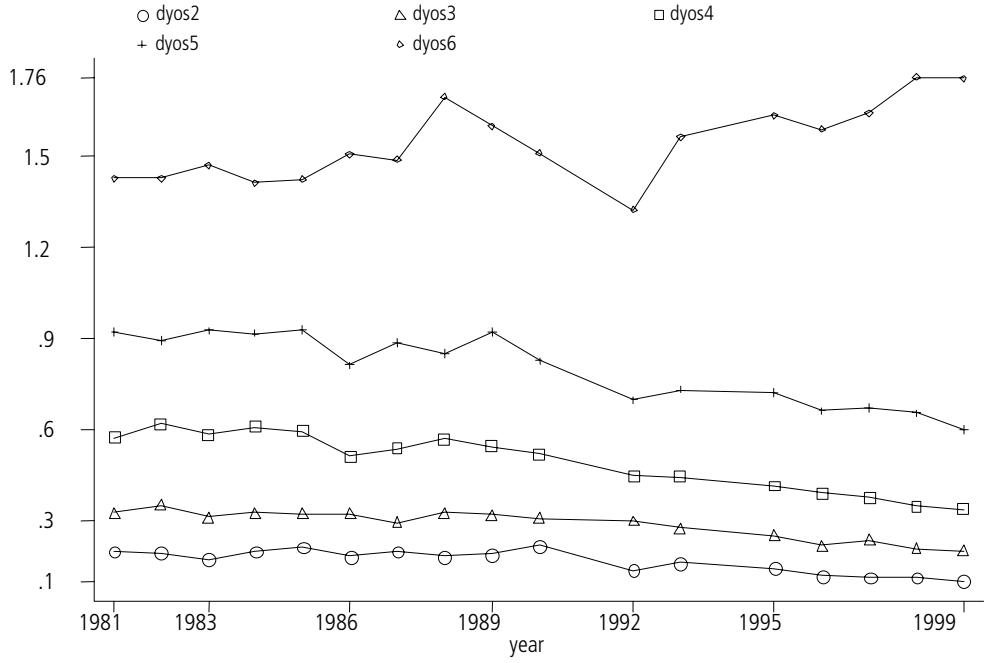


FIGURE 11

Relative returns to education (registered sample) – 1981-1999

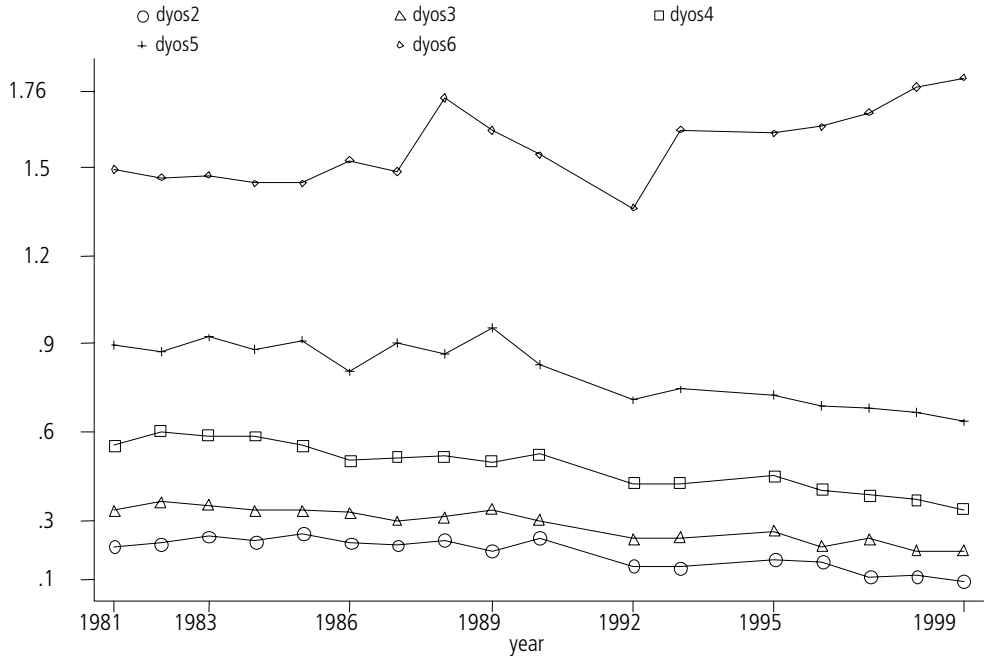
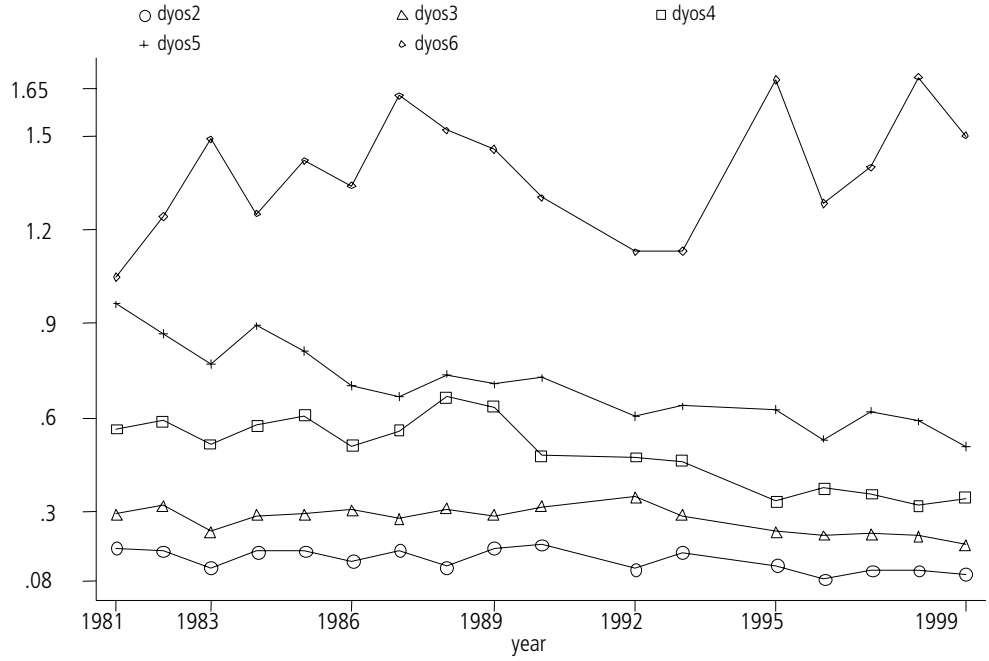


FIGURE 12

Relative returns to education (non-registered sample) – 1981-1999



The complete high school or some college group was the big loser in this period. Its wage premium, over and above the complete elementary and some high school group (yos5), witnessed the sharpest decrease among all groups. Surprisingly, the illiterate group gained some ground and managed to reduce its wage differential in comparison with the group with incomplete primary education. The relative good performance of the lower education group is also found by Green *et al.* (2000) for all occupied population (including self-employed and agricultural sector) for Brazil[32] and by Behrman *et al.* (2001) for a panel of 18 Latin American countries. These two papers also report the increase in the premium for college education relative to secondary education. Fernandes and Menezes-Filho (2000) using Brazilian data conclude that the fall in the relative returns to education for all groups – with the exception of the college group – was the main factor triggering the reduction in wage inequality between 1983 and 1997.

Looking now at the returns to education for registered and non-registered groups separately, one can see that the aggregate pattern is determined by the behaviour of the returns to education for registered workers (figure 11). The wage premium for non-registered workers (figure 12) with some college is somewhat more volatile than the one observed for their registered workers counterpart. Its premium over and above the group with secondary or incomplete college is lower, having oscillated within the range of 100% and 150%. Nevertheless, despite the lack of a continuous pattern, it seems that there has been an increase in their wage premium after 1993, one year after the increase observed for registered workers group.[33]

32. The authors attribute this result to the reduction in the supply of illiterate workers over time in Brazil.

33. Data not shown here reveal that for non-registered female workers with complete college the increase in the relative return to education for college workers after 1993 does not compensate the fall after 1987. The high returns observed in the early 1980's for this group may be due to its very small sample size. This appears to be the only major difference regarding gender pattern in returns to education.

The same picture is found when one looks at the sample from 1989 to 1999 using the self-declared public servant status filter to separate out public servants from the pool of non-registered workers. Similarly, the third specification – controlling for size of the firm, race and tenure – displays lower returns to education but does not show any relevant difference relative to the pattern observed in the former specifications.[34]

3.6 DECOMPOSING WAGE DIFFERENTIAL AND ACCOUNTING INEQUALITY FOR REGISTERED AND NON-REGISTERED WORKERS: 1981-1999

In this subsection we will evaluate how changes in the average wage for the full sample and also for registered and non-registered workers can be decomposed into changes in attributes and in returns to attributes through Oaxaca-Blinder decomposition. We will also decompose the wage gap between registered and non-registered workers into differences in attributes and in their returns. Additionally, we will use Juhn-Murphy-Pierce (1991) methodology to investigate the determinants of the narrowing in the wage gap.

As the fall in the wage gap between registered and non-registered workers may have triggered a decrease in the overall wage inequality, we will also investigate how changes into the wage premium for registered workers and in its size have affected inequality. We will apply Fields' (2002) method to decompose both the level of income inequality and how it changed over time for the full sample and for registered and non-registered workers separately. The measure of inequality used here is the log variance of the wages. Additionally, we will apply Juhn, Murphy and Pierce (1993) decomposition in order to look at inequality at different parts of the wage distribution. This is important because non-registered workers are over-represented on the lower tail of the wage distribution.

3.6.1 Oaxaca-blinder decomposition and the juhn-murphy-pierce (1991) extension

A simple Oaxaca-Blinder decomposition may shed some light in order to understand the different patterns in the evolution of the average wage for the full sample and for the registered and non-registered workers separately. The ratio of log hourly real wage decreased –0.092 log points between 1999 and 1981. A somewhat sharper decrease was observed for registered workers, –0.145 log points, whereas non-registered workers experienced an increase of 0.263 log points. Throughout the sample period the average wage of the non-registered workers increased more than the average wage of the registered in expansionary periods, such as 1981-1986 and 1992-1995, and decreased by a lower amount during recessions, such as 1987-1990. This different pattern led to a lower degree of segmentation as measured by the wage gap between registered and non-registered workers.

This pattern raises the question of whether non-registered workers have been improving their relative position due to changes in their observable attributes – a composition effect, probably caused by workers displaced from registered jobs getting

34. See figures A.1 to A.6 in the Appendix.

a non-registered one – or due to an increase in the returns of their observable attributes. A second point is which of these components was most important in driving the fall in the wage gap between registered and non-registered between 1981 and 1999.

As for changes over time, the Blinder-Oaxaca decomposition,[35] table 3[36] reveals that changes in the composition of the characteristics helped to improve the average earnings, whereas returns to these characteristics have exerted an opposite force for all three samples: pooled, registered and non-registered.[37]

TABLE 3
Oaxaca-Blinder decomposition: 1981-1999

	Δlwh	(A)			(B)		
		$\mathbf{X}_{99}*(\mathbf{b}_{99}-\mathbf{b}_{81})$		$\mathbf{b}_{81}*(\mathbf{X}_{99}-\mathbf{X}_{81})$	$\mathbf{X}_{81}*(\mathbf{b}_{99}-\mathbf{b}_{81})$		$\mathbf{b}_{99}*(\mathbf{X}_{99}-\mathbf{X}_{81})$
		Δconstant	Δreturns	Δmeans	Δconstant	Δreturns	Δmeans
Full sample	-0,091	0,334	-0,513	0,088	0,3342	-0,5545	0,1290
		-366%	563%		-366%	608%	
			196%	-96%		241%	-141%
Registered	-0,145	0,0542	-0,3324	0,1328	0,0542	-0,3896	0,1900
		-37%	229%		-37%	268%	
			191%	-91%		231%	-131%
Non-registered	0,263	0,5193	-0,4622	0,2061	0,5193	-0,5634	0,3072
		197%	-176%		197%	-214%	
			22%	78%		-17%	117%

As for the determinants of the average wage differential between the two groups, table 4 shows that regardless of the weight scheme[38] used in the calculation, the difference in attributes is more important in explaining the wage differential between registered and non-registered workers than differences in returns.[39] However, the different weight schemes give different results for the importance of each component on changes between 1981 and 1999, whereas in 1981 according to the weights used in panel A (panel B), 49% (40%) of the average wage differential between registered and non-registered workers was "explained" by differences in returns, in 1999 this proportion had decreased (increased) slightly to 46% (45%).

35. The specification for the full sample includes dummy for registered workers. The other regressors are the same as the ones used in our basic specification based on the occupation/industry filter.

36. In table 3, panel A brings the results using the mean of the attributes of 1999 as weight for the change in coefficients, and the returns of 1981 as the weight for changes in the mean of the attributes, whereas panel B brings the results using the mean of attributes of 1982 as weight for the change in coefficients, and the returns of 1999 as weight for changes in the mean of the attributes.

37. Actually only for non-registered workers the joint effect of changes in the constant and changes in return had a positive effect on average earnings, but all the positive effect came from a larger constant.

38. In panel A, the means of attributes for the registered sample were used as weight for the difference in the coefficients and the coefficients of non-registered worker equation were used as weight for the difference in attributes. In panel B we reverse the weights.

39. Verry and Araujo (1996) found similar results.

TABLE 4

Oaxaca-Blinder decomposition: segmentation 1981-1999

Segmentation	Δlwh	(A)			(B)		
		$\mathbf{X}_f^*(\mathbf{b}_f-\mathbf{b}_m)$		$\mathbf{b}_m^*(\mathbf{X}_f-\mathbf{X}_m)$	$\mathbf{X}_m^*(\mathbf{b}_f-\mathbf{b}_m)$		$\mathbf{b}_f^*(\mathbf{X}_f-\mathbf{X}_m)$
		Δconstant	Δreturns	Δmeans	Δconstant	Δreturns	Δmeans
1981	1,115	0,896	-0,352	0,570	0,896	-0,445	0,664
		80%	-32%		157%	-78%	
			49%	51%		40%	60%
1999	0,706	0,431	-0,108	0,384	0,431	-0,116	0,392
		61%	-15%		112%	-30%	
			46%	54%		45%	55%

Juhn, Murphy and Pierce (1991) expand the simple Oaxaca-Blinder decomposition in order to take into account changes in the residual distribution. Their approach allows one to decompose changes in the wage gap between the formal and informal sector into changes in the observable components and changes in the unobservable components. The wage equation for formal and informal workers can be written, respectively, as:

$$W_{fit} = X_{fit}\beta_{ft} + \sigma_{ft}\theta_{fit} \quad (1)$$

$$W_{iit} = X_{iit}\beta_{it} + \sigma_{it}\theta_{iit} \quad (2)$$

where σ_{ft} and σ_{it} are the within-group standard deviation of wages in the formal and informal sectors in year t and θ_{fit} and θ_{iit} are the standardised residuals of each wage equation: $\theta_{fit} = \varepsilon_{fit} / \sigma_{ft}$. The wage gap between formal and informal sector workers is:

$$D_t = \bar{W}_{ft} - \bar{W}_{it} = (\bar{X}_{ft} - \bar{X}_{it})\hat{\beta}_{ft} + \hat{\sigma}_{ft}\Delta\theta_t \quad (3)$$

where $\Delta\theta_t$ is the mean difference in the average standardized residual for workers in the formal and informal sector. Then, changes over time in the wage gap can be decomposed as:

$$\begin{aligned} D_t - D_{t-1} &= [(\bar{X}_{ft} - \bar{X}_{ft-1}) - (\bar{X}_{it} - \bar{X}_{it-1})]\hat{\beta}_{ft} \\ &+ (\bar{X}_{ft-1} - \bar{X}_{it-1})(\hat{\beta}_{ft} - \hat{\beta}_{ft-1}) \\ &+ \hat{\sigma}_{ft}[\Delta\theta_t - \Delta\theta_{t-1}] + \Delta\theta_{t-1}(\hat{\sigma}_{ft} - \hat{\sigma}_{ft}) \end{aligned} \quad (4)$$

The first term captures the effect of changes in the quantity of the observables, $X's$, the second term captures the effect of changes in the prices of the observables. The third term is called the "gap effect" and measures the effect of the changes in the relative position of informal workers in the formal wage distribution, i.e, it captures what would happen if the residual formal sector wage inequality were held constant between $t-1$ and t, but the percentile ranking of the informal wage residual had changed. If informal workers had moved up this distribution it can mean that they had increased their stock of unobserved characteristics or that they are less "discriminated" against. However, as being an informal sector worker is not the same as being "black" or "woman" in the labour market, since they do not have this

"permanent" and "immutable" characteristics, it is hard to talk about a lessen in discrimination. It is much more likely that there had been some change in demand that somehow makes their "unobservable" characteristics more valued in the labour market. The last term is the so-called "unobserved prices" effect and measures the change in the wage gap due to the changes in inequality among formal sector workers. It means that a rise in inequality (over time) would increase the wage gap between formal and informal sector workers, even if the percentile ranking of informal sector wage residual had not changed over this period.

TABLE 5
JMP decomposition of changes in the wage gap between formal and informal workers: 1981-1999

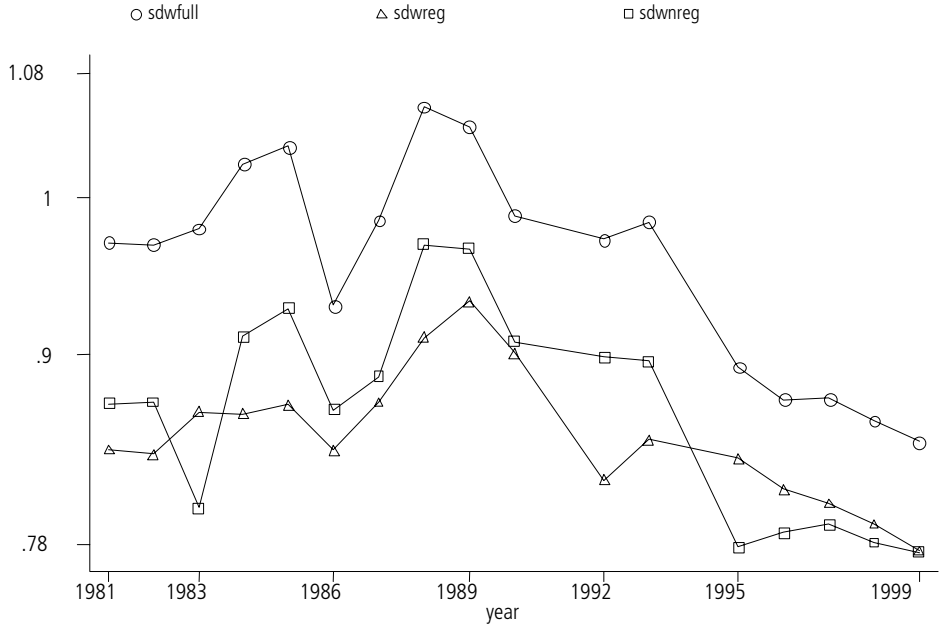
D_{99}	1,06409
D_{81}	0,69695
D_{99}-D_{81}	-0,3671
Observable	
Quantity	-0,0801
Prices	-0,081
Unobservables	
Gap	-0,1906
Unobservable price	-0,0154

The results of the JMP decomposition in table 5 show that all components contributed to the narrowing of the wage gap. However, most of the reduction in the wage gap was due to the "gap effect", 52%. According to our interpretation this is a sign that returns to observables and the improvement on the productive endowments of informal workers were much less important than changes in the economic environment either via demand shocks or supply shocks that are not readily observable. It is not clear what sort of unobservables could have triggered this result. Among the hypothesis that will be assessed in the next discussion papers are the impact of the trade liberalization and the minimum wage indexation of the informal sector wages.

Accounting for inequality and decomposing its changes

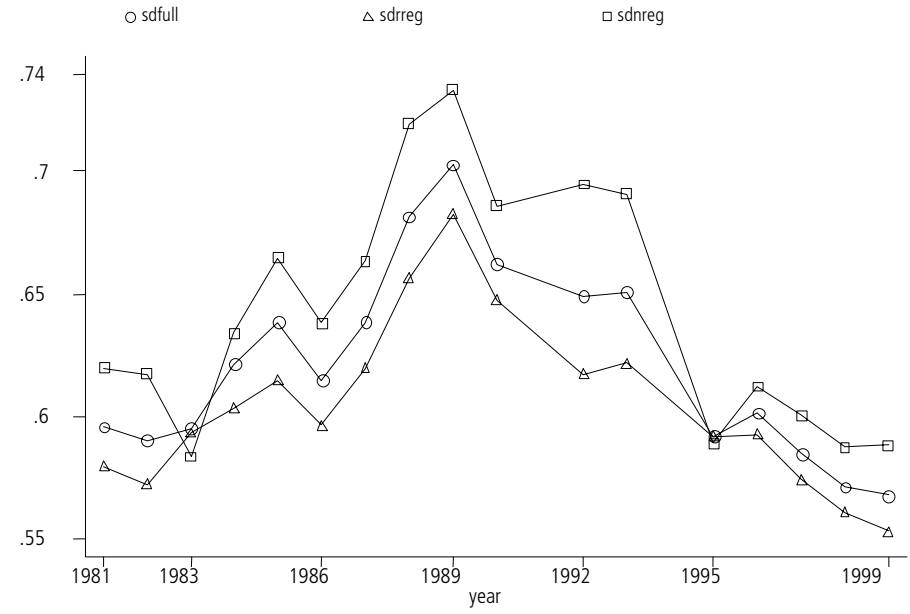
Figure 13 shows that the standard deviation for the log hourly real wage of registered workers used to be lower than the standard deviation for the non-registered workers (with the exception of 1983), but from 1995 onwards, the latter has fallen sharply and has remained lower than the standard deviation for registered workers. Given the fall in the wage gap between registered and non-registered workers and the decrease in the standard deviation of the non-registered worker's earnings (and also in a small scale for the registered workers), it is not surprising that the dispersion of log hourly real wage has diminished for the full sample.

FIGURE 13
Standard deviation of the log hourly real wage – 1981-1999



The standard deviation of the residuals of the wage regressions for both registered and non-registered workers increased during the 1980's and decreased during the 1990's (figure 14).[40] The fall was sharper from 1995 onwards when the hyper-inflationary process was controlled. Nevertheless, it is striking that the "unexplained" dispersion of the log wages is higher for non-registered than for registered workers over the entire period.

FIGURE 14
Standard deviation of the residuals – 1981-1999



40. Actually the graphs for the standard deviation of the log hourly real wage and for the standard deviation of the residual of the wage regressions are quite similar.

To assess the importance of falling wage differential through the 1980's and the 1990's for the overall reduction in the log variance of wages, we perform the following variance decomposition:

$$Var(w) = R * Var(w^R) + (1-R) * Var(w^{NR}) + R * (1-R) * (w^R - w^{NR})^2 \qquad (5)$$

where $Var(w)$ is the variance of the conditional log hourly wages, i.e,. the variance of the residual of the standard wage equation without controlling for the registered status (pooled sample); R is the proportion of registered workers, w^R and w^{NR} are the log hourly wage of registered workers and non-registered workers. It is worth noting that in the decomposition the difference $(w^R - w^{NR})$ was estimated as the value of the dummy coefficient for registered workers in a joint wage equation.

The first two terms in equation (5) may be thought of as measuring within-sector changes in the structure of wages, and the third as measuring between-sector changes due to the possession of a work-card.

TABLE 6
The effect of the decline in wage differential on the variance of log hourly earnings

1981-1999		1990-1999		1992-1999	
V(w) 1981	0,4070	V(w) 1990	0,4647	V(w) 1992	0,4833
V(w) 1999	0,3460	V(w) 1999	0,3460	V(w) 1999	0,3460
Counterfactual	0,3838		0,3518		0,3854
Contribution	62%		5%		29%

In order to measure the contribution of the falling wage differential between the two groups, we calculate some counterfactuals assuming that everything else has changed between the chosen baseline years and 1999, but the wage gap has remained constant. The difference between the actual value of the variance and the value given by the counterfactual is a measure of the importance of the falling wage gap for the fall of inequality as whole. Table 6 presents these calculations between 1981, 1990, 1992 (baseline years) and the final of the sample period 1999. The counterfactual shows what would have been the variance of the wages if the wage gap were the same as in the baseline year. The difference between the counterfactual and the actual measure, give us an estimate of the contribution of the falling wage gap to the decrease in the variance of log-hourly earnings. The estimates vary widely according to baseline year. But even for a year with a not very high wage gap such as 1990 (see figure 4), the reduction in wage differential was able to explain 5% of the decrease in the variance of earnings. As for the whole period, i.e., from 1981 to 1999, the fall in the wage gap explains 62% of the decrease in the variance of wages, which is quite a high contribution.

Fields (2002) puts forward a methodology designed to account for inequality and to decompose it into the contribution of the explanatory factors[41] of a standard semi-log regression. The decomposition of the log-variance of wage can be written as:

41. The explanatory factors include all the regressors and the residual of the wage equation.

$$s_j(lnw) = \frac{cov[a_j, Z_j]}{\sigma^2(lnw)} = \frac{a_j \sigma(Z_j) cor[Z_j, lnw]}{\sigma(lnw)} \quad (6)$$

where s_j is the 'relative factor inequality weight' of the explanatory factor j, a_j is the coefficient of the explanatory factor j in the wage equation[42], Z_j is the explanatory factor j, and $\sigma^2(lnw)$ is the variance of the log wage.

This decomposition allows one to account for the level of wage inequality in a particular country at a particular time, and for a specific group of workers. In order to account for "differences" in inequality over time or between groups, Fields (2002) proposes the following decomposition:

$$\Pi_j(I(.)) = \frac{s_{j,2} I(.)_2 - s_{j,1} I(.)_1}{I(.)_2 - I(.)_1} \quad (7)$$

where Π_j is the contribution of the explanatory factor j to the change in inequality as measured by the inequality index I(.) between period 1 and 2.[43]

Table 7 shows both Fields' decomposition in levels for 1999 and 1981, and the decomposition for changes between these two years. For the full sample the two most important factors explaining wage inequality in both years are the residual and education. The possession of the work-card (registered) is the third more important factor, but its contribution is rather modest when compared to the two other factors. The registered and non-registered samples display a similar pattern, but the residual seems to be more important for the non-registered than for the registered in order to explain the level of inequality.

As for changes in inequality, the first row in Table 7 shows that the inequality – as measured by the log variance of hourly real wages – fell for the full sample, and for both registered and non-registered workers. For the full sample the most important factor in reducing inequality was education (0.61),[44] the second most important was the possession of a work-card (0.38), and finally gender (0.28). The other factors played only a minor role in changes in inequality. Regional and the residual changes acted in the opposite direction and would have triggered more inequality. For the sample of registered workers, education is by far the most important factor, whereas for the sample of non-registered workers, the most important factor was gender. Thus, we can conclude that the possession of work-card was one of the main factors behind the fall in inequality between 1981 and 1999 after education.[45]

42. a_j is equal to **1** when the explanatory factor is the residual of the wage equation.

43. The index 1 and 2 also can indicate different groups of workers.

44. This result is in line with the ones presented by Fernandes and Menezes-Filho (2002).

45. The aggregate result for education is completely due to changes for education level below the complete college group. Changes in the relative factor of the latter were in direction of more inequality.

TABLE 7

Factor contribution to wage inequality and to change in inequality: 1981-1999

	Full sample			Registered			Non-registered		
	Level		Changes	Level		Changes	Level		Changes
	1999	1981	1999-1981	1999	1981	1999-1981	1999	1981	1999-1981
log variance	0,84	0,97	-0,13	0,78	0,84	-0,06	0,77	0,87	-0,09
Education	0,32	0,36	0,61	0,38	0,44	1,13	0,20	0,19	0,12
Experience	0,04	0,04	0,03	0,03	0,02	-0,17	0,06	0,08	0,27
Region	0,06	0,02	-0,20	0,04	0,01	-0,27	0,08	0,04	-0,30
Metropolitan	0,02	0,02	0,02	0,01	0,01	0,03	0,03	0,02	-0,02
Gender	0,05	0,08	0,28	0,04	0,05	0,19	0,06	0,16	0,99
Registered	**0,07**	**0,11**	**0,38**						
Residual	0,45	0,38	-0,13	0,51	0,48	0,09	0,58	0,51	-0,05
Total	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00

However, the estimates above offer only a partial view of what happened with the inequality during the sample period. In order to have a better understanding of what happened to inequality at different parts of the wage distribution and to assess the role of observable and unobservable components in shaping the evolution of wage inequality between 1981 and 1999, we will apply Juhn, Murphy and Pierce's (1993) decomposition (full-sample distribution accounting scheme). This decomposition allows one to distinguish which changes in inequality were due to changes in observed quantities (of skills), observed (skill) returns and changes in unobserved returns and quantities (of unobserved skills). The starting point is the estimation of standard earning equations:

$$w_{it} = X_{it}\beta_t + u_{it} \tag{8}$$

where w_{it} is the log hourly-wage of individual i in year t, X_{it} is a vector of observed individual characteristics in t, and u_{it} is the log wage residual, which is assumed to be an unknown function of prices and quantities of unobserved skills, measurement error and estimation error. Juhn *et al.* (1993) assume that the wage equation residual has two components: an individual's percentile in the wage distribution θ_{it} and the distribution function of the residuals $F_t()$, which implies, by the definition of the cumulative distribution function, that one can write the residual as:

$$u_{it} = F_t^{-1}(\theta_{it} \mid X_{it}) \tag{9}$$

where $F_t^{-1}(\theta_{it} \mid X_{it})$ is the inverse cumulative residual distribution for workers with characteristics X_{it} in year t.

The decomposition is illustrated by the formula:

$$w_{it} = X_{it}\beta + X_{it}(\beta_t - \beta) + G^{-1}(\theta_{it} \mid X_{it}) + [F_t^{-1} - G^{-1}(\theta_{it} \mid X_{it})] \tag{10}$$

where β and G^{-1} are the returns to observable skills and the cumulative residual distribution for the base period, respectively. This formula allows one to recover the counterfactual wage distribution implied by holding fixed any subset of the components described above.

In practice, the procedure consists of running wage equations separately for two periods, one of which is the base period, and comparing what would the wage inequality have been if 1) the distribution of individual characteristics ($X's$) in period 2 had remained the same as the distribution in period 1 (base period), holding returns and residuals as in period 2, counterfactual w_{it}^{1}; 2) both the distribution of individual characteristics and the returns have remained the same as in period 1 and the residuals as in period 2, counterfactual w_{it}^{2}. Thus, differences in wage inequality between period 1 and 2 can be decomposed in differences due to changes in the observables (changes in w_{it}^{1}), due to changes in returns (additional changes caused by w_{it}^{2}), and due to changes in unobservables (changes in w_{it} beyond those found w_{it}^{2}).

Taking 1981 as the base period we applied the Juhn *et al.* decomposition to the full sample of employees and separately for registered and non-registered worker samples. As shown in table 8 (panel A), the $90-10$ log hourly-wage differential fell for the full sample and both registered and non-registered workers. For the full sample and for registered workers the major contribution for this decrease in inequality came from changes in the returns, whereas for the non-registered workers it came from changes in observables. The residuals also had a positive, but less important contribution. For the full sample and for registered workers, changes in the observable characteristics, unlike the other components, would have contributed to an increase in inequality.

The inequality in the upper part of the wage distribution had different patterns for the different samples. The $90-50$ log wage differential has decreased for the full sample and for registered workers, but has slightly increased for non-registered workers. Again, changes in the observables would have led to a higher wage inequality for the full sample and for registered workers. In the non-registered case, they would have contributed to a fall in inequality, but changes in returns and changes in unobservables were strong enough to compensate its effect and then worsen the wage inequality.

In the lower part of the wage distribution the changes in inequality were different from the ones observed in the upper part. The $50-10$ log wage differential has decreased for the full sample and for non-registered workers and increased for registered workers. For the full sample, all three factors acted to deliver a reduction in inequality, but the main effect came from changes in returns. For the non-registered sample change in returns would have contributed to worsen wage inequality, whereas changes in observables and unobservables contributed to attenuate it. As for the registered sample, the small increase in wage inequality was entirely due to changes in observables.

TABLE 8

Juhn-Murphy-Pierce changes in inequality decomposition

Panel A	w_{it}=1981	w_{it}=1999	w_{it}^1	w_{it}^2	Δ observable	Δ returns	Δ unobservables
90-10							
overall	2,435	2,058	2,483	2,081	-12,7%	106,6%	6,1%
registered	2,071	1,990	2,205	2,032	-165,6%	213,8%	51,8%
non-registered	2,186	1,903	1,816	2,109	130,9%	-103,6%	72,8%
90-50							
overall	1,360	1,195	1,411	1,203	-31,1%	126,1%	4,9%
registered	1,318	1,206	1,342	1,222	-20,6%	106,4%	14,3%
non-registered	1,071	1,088	0,918	1,055	-923,7%	824,5%	199,2%
50-10							
overall	1,075	0,863	1,072	0,877	1,5%	91,5%	7,0%
registered	0,753	0,784	0,864	0,810	350,7%	-168,7%	-81,9%
non-registered	1,115	0,815	0,898	1,054	72,3%	-52,1%	79,8%
Panel B	w_{it}=1981	w_{it}=1986	w_{it}^1	w_{it}^2	Δ observable	Δ returns	Δ unobservables
90-10							
overall	2,435	2,280	2,493	2,251	-37,8%	156,7%	-18,9%
registered	2,071	2,159	2,156	2,119	96,8%	-42,2%	45,4%
non-registered	2,186	2,188	2,167	2,200	-850,0%	1466,6%	-516,6%
90-50							
overall	1,360	1,355	1,406	1,328	-995,2%	1667,9%	-572,8%
registered	1,318	1,303	1,339	1,287	-133,6%	337,7%	-104,1%
non-registered	1,071	1,183	1,068	1,088	-3,2%	18,2%	85,0%
50-10							
overall	1,075	0,925	1,088	0,923	-8,2%	110,0%	-1,8%
registered	0,753	0,856	0,818	0,832	63,2%	13,2%	23,6%
non-registered	1,115	1,006	1,099	1,112	14,4%	-11,8%	97,4%
Panel C	w_{it}=1981	w_{it}=1990	w_{it}^1	w_{it}^2	Δ observable	Δ returns	Δ unobservables
90-10							
overall	2,435	2,430	2,528	2,321	-1909,0%	4234,7%	-2225,7%
registered	2,071	2,363	2,244	2,210	59,2%	-11,4%	52,2%
non-registered	2,186	2,252	2,256	2,132	106,4%	-188,7%	182,3%
90-50		20,000					
overall	1,360	1,417	1,442	1,361	144,1%	-141,8%	97,8%
registered	1,318	1,376	1,351	1,310	57,1%	-72,1%	115,0%
non-registered	1,071	1,279	1,246	1,185	83,9%	-29,1%	45,2%
50-10							
overall	1,075	1,013	1,086	0,960	-17,6%	202,8%	-85,2%
registered	0,753	0,986	0,892	0,901	59,8%	3,7%	36,5%
non-registered	1,115	0,973	1,010	0,947	73,5%	44,9%	-18,4%
Panel D	w_{it}=1981	w_{it}=1995	w_{it}^1	w_{it}^2	Δ observable	Δ returns	Δ unobservables
90-10							
overall	2,435	2,195	2,529	2,198	-39,1%	137,6%	1,4%
registered	2,071	2,163	2,223	2,129	165,7%	-102,8%	37,1%
non-registered	2,186	1,911	2,184	1,950	0,7%	85,0%	14,3%
90-50							
overall	1,360	1,320	1,447	1,302	-222,9%	368,5%	-45,7%
registered	1,318	1,288	1,360	1,261	-134,8%	322,6%	-87,8%
non-registered	1,071	1,128	1,245	1,132	308,4%	-200,6%	-7,8%
50-10							
overall	1,075	0,874	1,081	0,896	-3,1%	92,4%	10,6%
registered	0,753	0,875	0,863	0,868	90,6%	3,6%	5,9%
non-registered	1,115	0,783	0,939	0,818	53,0%	36,5%	10,5%

In order to have a better view of what happened during the period we calculated the same decomposition for years with low wage differential between registered and non-registered workers. As shown above, 1986 (panel B), 1990 (panel C) and 1995 (panel D) were years with particular low wage differential. The decompositions for

these years – keeping 1981 as the base – reveal some similarities, but also some interesting differences. Among the similarities it is worth noting that in all periods, the $90-10$ log wage differential has diminished for the full sample and the main responsible for that was the returns to observable skills. Changes in the observables and in the residual distribution have contributed in the opposite direction, causing more inequality.[46] Another similarity is the fact that inequality has decreased for the upper part of the wage distribution as measured by the $90-50$ log wage differential among the registered workers[47] and increased among the non-registered workers. Differently, the inequality in the lower part of the wage distribution, the 50-10 log wage differential has increased among the registered and decreased among the non-registered in all three periods, when compared to the wage structure of 1981.

The dissimilarities between the decomposition for 1981/1999 and the other three periods refer mainly to the fact that the inequality measured by the $90-10$ log wage differential has increased for both registered and non-registered workers in 1986 and 1990. For non-registered workers it has decreased in 1995, but for the registered it was still in a higher level than in 1981. Thus, the reduction in inequality observed for the $90-10$ log wage differential for the full sample was due to the reduction in the wage differential between the two groups, i.e., to the fact that the non-registered workers have been improving their position within the overall wage distribution. It is worth noticing that the non-registered workers are concentrated in the lower tail of the wage distribution and the inequality as measured by the 50-10 log differential decreased in 1986, 1990, 1995 and 1999. Besides, it was the reduction in lower tail of the wage distribution for the full sample that led to the reduction in the $90-10$ log differential between the four years analysed and 1981, as noticed above.

One possibility that could explain these results, mainly from 1995 onwards is the substantial reduction of non-registered workers earning less than the minimum wage. Besides, the surprising increase in the indexation of non-registered earnings to the minimum wage may have contributed to a decrease in the wage inequality among low wage non-registered workers.[48]

4 CONCLUDING REMARKS

Most of the empirical literature on segmentation between formal and informal sectors in developing countries focuses on the wage differential between these two groups. As shown above, a major problem in comparing these studies is the lack of homogeneity in the way the informal sector is defined. Another characteristic of the empirical literature is the great emphasis on the need to correct for selectivity bias when discussing the hypothesis of segmentation in the lines of formal/informal sector. In a forthcoming discussion paper we will discuss selectivity issues in the context of a job queue for formal jobs. We will assess among other things, the role of

46. The exception being 1995, when even the unobservables contributed to the reduction in inequality.

47. There is an exception for the period 1981-1990. The inequality increased for all measures 90-10, 90-50 and 50-10 log wage differentials for the sample of registered workers.

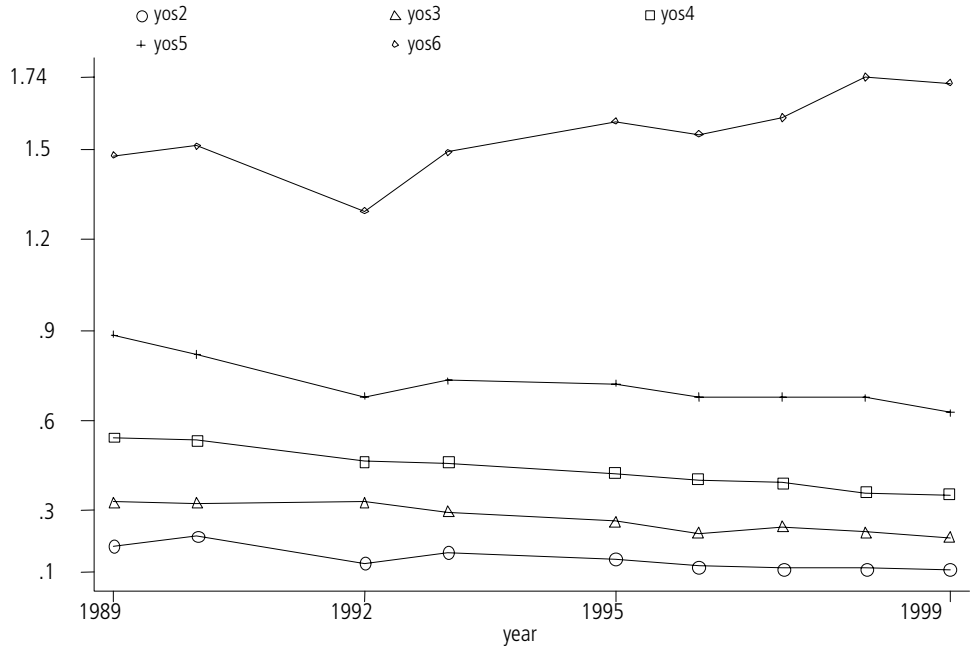
48. In a forthcoming discussion paper we will discuss in depth the indexation of the wage of informal and formal sector to the minimum wage.

the wage differential in determining sector allocation and evaluate how the results change once we take into account the individual "willingness" to switch from a informal to a formal job.

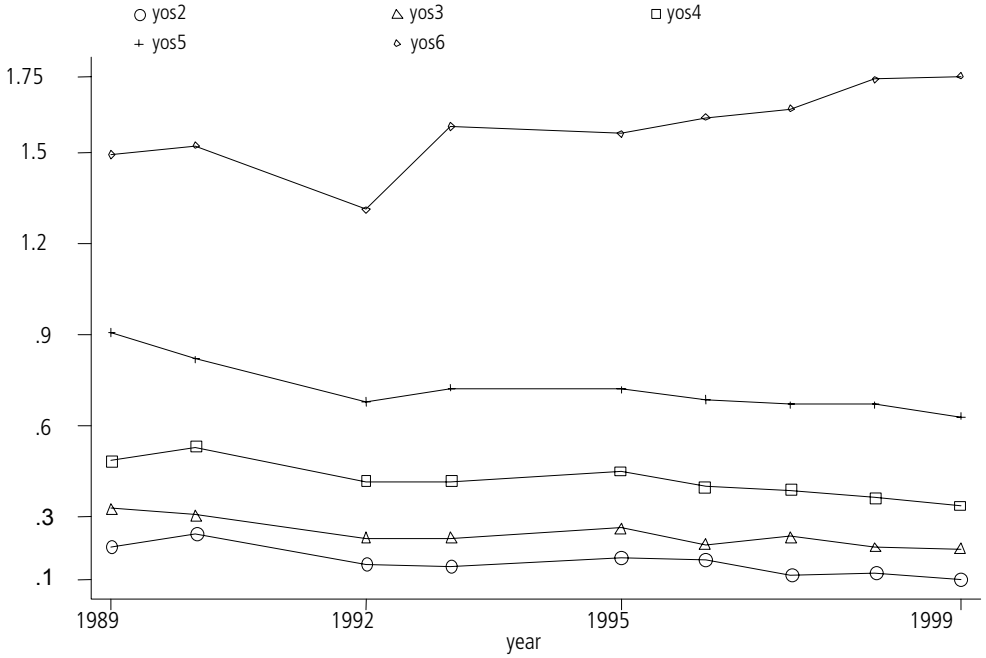
As documented above there were great changes in the proportion of registered/non-registered workers in the economy, in its wage differential and in the inequality within and between the two groups over the 1980's and the 1990's. According to Fields' (2002) decomposition scheme changes in the variable related to the possession of a work-card was the most important force, after education, driving down the variance of the log hourly real wage. The most striking and lasting changes in the wage gap occurred after 1990. Episodical changes such as the increase in the proportion of non-registered workers in 1983 or the sharp reduction in the wage gap in 1986 did not last. In contrast, the increase in the proportion of non-registered workers observed since 1990 and the diminishing wage gap after 1992 seem to be a more stable process triggered by recent moves in the Brazilian economy. In a second forthcoming discussion paper, we will investigate whether the fall in the wage gap between registered and non-registered workers and the increase in the size of the informal sector are correlated with the process of trade liberalisation of the early 1990's. Similarly, in third forthcoming discussion paper we will investigate whether minimum wage hikes had any effect on the employment mobility for workers in the formal and in the informal sectors. Particular attention will be given to the growing indexation of the informal sector wage to the minimum wage after 1990, as documented in this paper.

APPENDIX

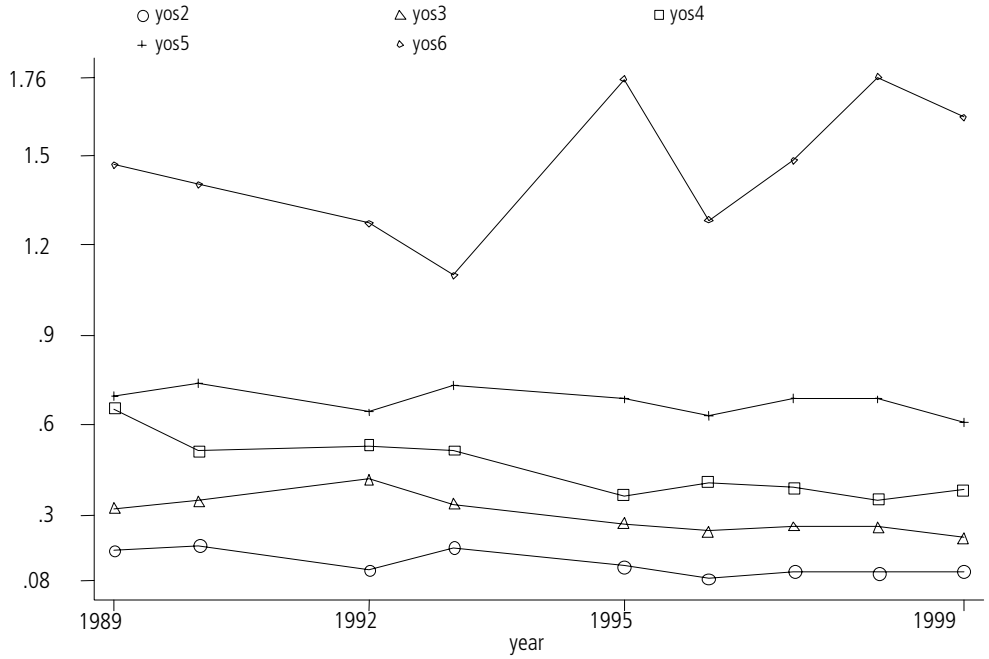
A.1
Relative returns to education (survey based: full sample) – 1989-1999



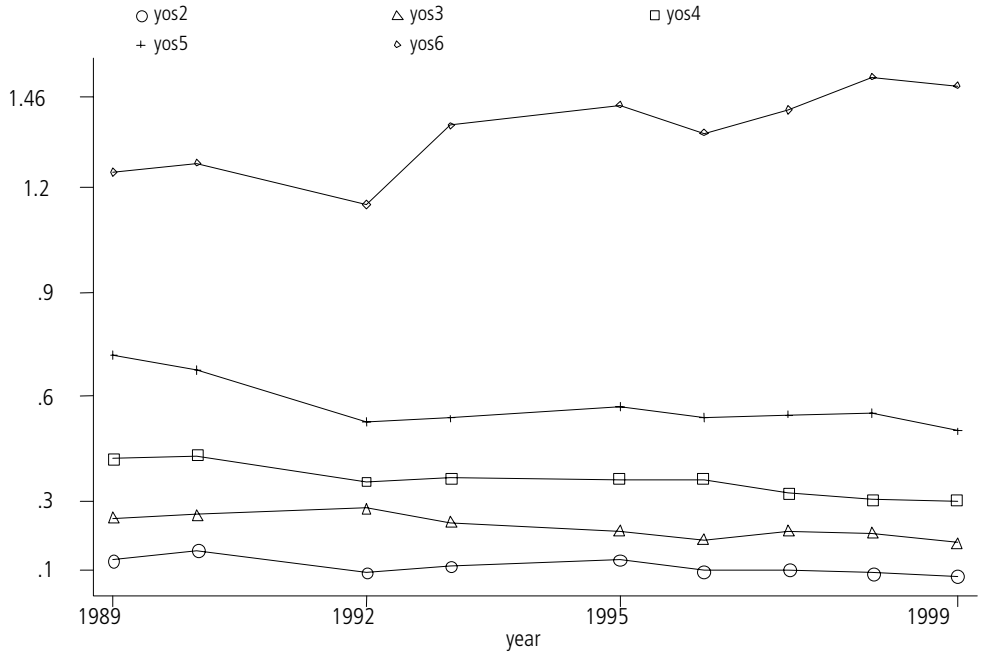
A.2
Relative returns to education (survey based: registered sample) – 1989-1999



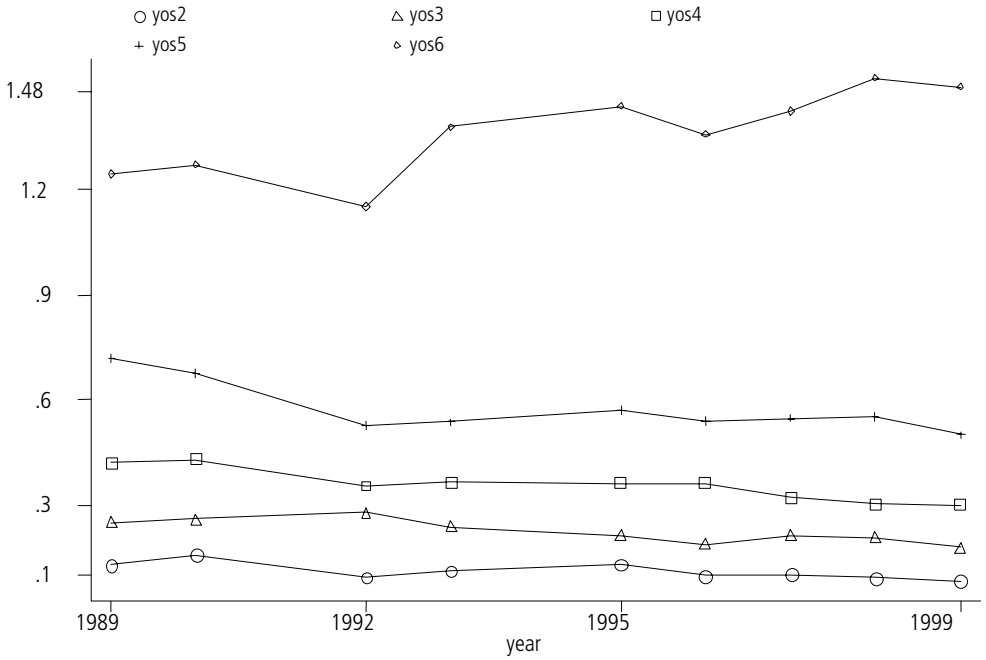
A.3
Relative returns to education (survey based: non-registered sample) – 1989-1999



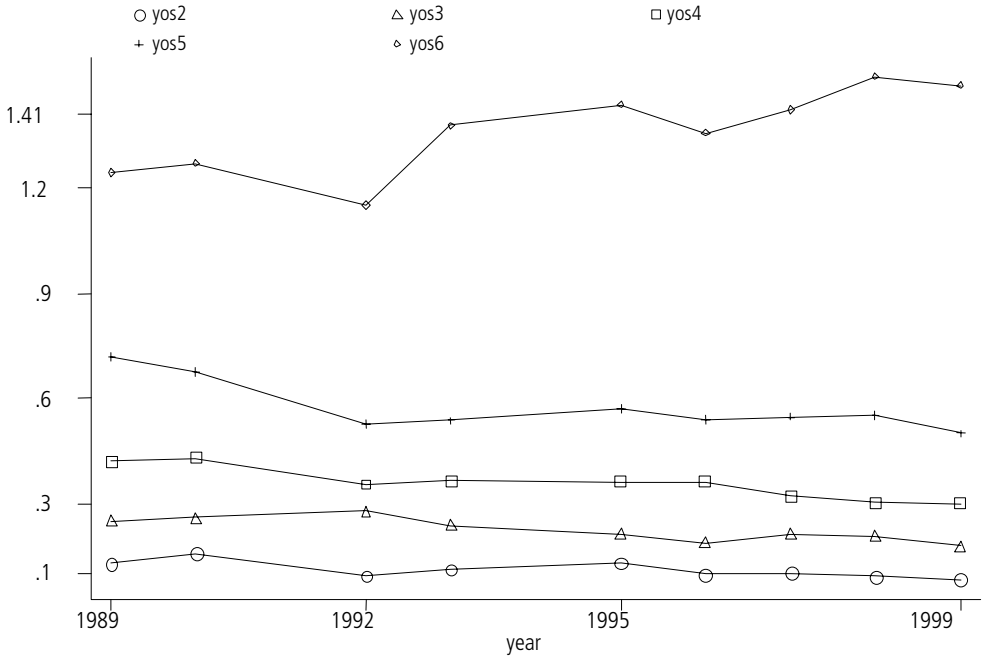
A.4
Relative returns to education (survey based and more controls: full sample) – 1989-1999



A.5
Relative returns to education (survey based and more controls: registered sample) – 1989-1999



A.6
Relative returns to education (survey based and more controls: non-registered sample) – 1989-1999



REFERENCES

Barros, R. P., Camargo, J. M. and Sedlasek, G. (1992) "Os Tres Mercados: Segmentacao, Mobilidade e Desigualdade". Ipea. Mimeo.

Barros, R. P, Mello, R. and Pero, V. (1993) "Informal Labor Contract: A Solution or a Problem?". Texto para Discussão, n. 291. IPEA.

Blau, D. M. (1985) "Self-Employment and Self-Selection in Developing Country Labor Markets." *Southern Economic Journal,* v. 51, n. 2, p. 351-363.

Behrman, Jere. R, (1999) Labor Markets in Developing Countries. In: *Handbook of Labor Economics*, V.3, Ed. O. Ashenfelter and D. Card. Elsevier Science.

Behrman, Jere R., Birdsall, N. and Szekely, M. (2001) "Economic Policy and Wage Differential in Latin America" Penn Institute for Economic Research, Working Paper 01-048.

Camargo, J. M. and Ramos, C. A. (1988). "A Revolução Indesejada". Rio de Janeiro: Campus.

Carneiro, F. G. and Henley, A. (2001) "Modelling Formal vs. Informal employment and earnings: microeconometric evidence for Brazil", *Annals of the XXIX National Meeting of Economics of ANPEC*.

Dickens, William T. and Lang, Kevin (1985) "A Test for Dual Labor Markets". *American Economic Review*, v. 75, n. 4, p. 792-805.

Doeringer and Piore (1971) *Internal Labor Markets and Manpower Analysis*. Ed. Sharpe.

Esfahani, Hadi S. and Salehi-Isfahani, D. (1989) "Effort Observability and Worker Productivity: Towards an Explanation of Economic Dualism", *The Economic Journal,* v. 99, n. 397, p. 818-836.

Fernandes, Reynaldo and Menezes-Filho, Naercio A. (2002) "A Evolucao da Desigualdade no Brasil Metropolitano entre 1983 e 1997", *Estudos Econômicos,* v. 30, n. 4, p. 549-569.

Fields, Gary S. (1975) "Rural/urban Migration, Urban Unemployment and Underemployment, and Job Search Activity in LACS", *Journal of Development Economics,* v. 2, p. 165-187.

Fields, Gary S. (2002) "Accounting for the Income Inequality and its Change: A New Method, with Application to the Distribution of Earnings in the United States." *Research in Labor Economics*. Forthcoming.

Fortin *et al.* (1997) "Taxation, Wage Controls and the Informal Sector", *Journal of Public Economics,* v. 66, p. 293-312.

Funkhouser, E. (1997) "Demand-Side and Supply-Side Explanations for Barriers to Labor Market Mobility in Developing Countries: The Case of Guatemala". *Economic Development and Cultural Change,* v. 45, n. 2, p. 341-366.

Gindling, T. H. (1991) "Labor Market Segmentation and Determination of Wages in the Public, Private-Formal and Informal Sector in San Jose, Costa Rica." *Economic Development and Cultural Change,* v. 39, n. 3, p. 585-605.

Gong, X, Van Soest, A. and Gomez, E. V. (2000) "Mobility in the Urban Labor Market: A Panel Data Analysis for Mexico". *IZA Discussion Paper,* n. 213.

Gong, X. and Van Soest, A. (2002) "Wage Differentials and Mobility in the Labour Market: A Panel Data Analysis for Mexico". *Labour Economics,* v. 9, p. 513-529.

Green, F., Dickerson, A., Arbache, J. S. (2000) "A Picture of Wage Inequality and the Allocation of Labor through a Period of Trade Liberalization: The Case of Brasil". Mimeo.

ILO (International Labour Office)(1972) "Employment, Incomes and Equality: A Strategy for Increasing Productive Employment in Kenya". Geneva: ILO publications.

Juhn, C., Murphy, K.M., and Pierce, B. (1991) "Accounting for the Slowdown in Black-White Wage Convergence". In: *Workers and their Wages.* Editor Marvin H. Kosters. The AEI Press.

Juhn, C., Murphy, K. and Pierce, B. (1993), "Wage inequality and the rise in returns to skill", *Journal of Political Economy,* v. 101, p. 410-442.

Heckman, James J. and Sedlacek, Guilherme, (1985) "Heterogeneity, Aggregation and Market Wage Functions: An Empirical Model of Self Selection in the Labor Market" *Journal of Political Economy*, Dec. 93, p. 1.077-1.125.

Heckman, James J., and Hotz, Joseph v., (1986) "An Investigation of the Labor Market Earnings of Panamanian Males: Evaluating the Sources of Inequality", *Journal of Human Resources*, Fall, n. 21, p. 507-542.

Krueger, Alan and Summers, Lawrence. (1987) "Reflections on the Inter-industry Wage Structure", In: Kevin Lang and Jonathan S. Leonard, eds, *Unemployment and the Structure of Labor Markets*, Oxford: Basil Blackwell.

Magnac, Thierry, (1991) "Segmented or Competitive Labor Market? *Econometrica*, v. 59, n. 1, p. 165-187.

Maloney, W. F. (1997) "The Structure of Labor Market in Developing Countries: Time Series Evidence on Competing Views". Mimeo. World Bank.

Maloney, W. F. (1999) "Does Informality Imply Segmentation in Urban Labor Markets? Evidence from Sectoral Transitions in Mexico". *The World Bank Economic Review,* v. 13, n. 2, p. 275-312.

Marcoullier, D. *et al.* (1997) "Formal Measures of the Informal Sector Wage Gap in Mexico, El Salvador and Peru". *Economic Development and Cultural Change*, v. 45, n. 2, p. 367-392.

Pero, Valeria and Urani, Andre (1994) "Determinantes do Excesso de Mao-de-Obra do Setor Formal do Mercado de Trabalho Metropolitano" In: *Perspectivas da Economia Brasileira*, v. 2, p. 541-559. Ipea.

Pratap, S. and Quintin E, (2001) "Are labor markets segmented in Argentina? A semiparetric approac", Center for Latin America Working Papers 0701, Federal Reserve Bank Dallas.

Ramos, Lauro (2002) "A Evolucao da Informalidade no Brasil Metropolitano: 1991-2001". Texto para Discussão, n. 914, Ipea.

Rauch, J. E. (1991) "Modelling the Informal Sector Formally". *Journal of Development Economics*, v. 35, p. 33-47.

Saavedra, J. and Chong, A. (1999), "Structural reform, institutions and earnings: Evidence from the formal and informal sectors in urban Peru", *Journal of Development Studies*, v. 35, n. 4, p. 95-116.

Saint-Paul, Gilles (1996) “Dual Labor Markets: A Macroeconomic Perspective”. The MIT Press.

Soares, F. V. (2004a) “The Impact of Trade Liberalisation on the Informal Sector in Brazil”. Mimeo. Ipea.

Soares, F. V. (2004b) “Minimum wage hikes and Employment Transitions in Brazil”. Mimeo. Ipea.

Soares, F. V. (2004c) “Do Informal Workers Queue for Formal Jobs in Brazil?”. Ipea. Mimeo.

Tannuri-Pianto, M. and Pianto, D.M. (2002) “Informal Employment in Brazil – a choice at the top and segmentation at the bottom: A Quantile Regression Approach. Mimeo.

Verry, Donald and Araujo, Tarcisio (1996) “Dualism in Brazilian Metropolitan Labour Markets. *UCL Discussion Paper* 96-15.

World Bank (2002) World Development Report.

Yamada, Gustavo (1996) “Urban Informal Employment and Self-Employment in Developing Countries: Theory and Evidence”. *Economic Development and Cultural Change,* v. 44, n. 2, p. 289-314.

Ipea – Institute for Applied Economic Research

PUBLISHING DEPARTMENT

Coordination
Cláudio Passos de Oliveira

Supervision
Everson da Silva Moura
Reginaldo da Silva Domingos

Typesetting
Bernar José Vieira
Cristiano Ferreira de Araújo
Daniella Silva Nogueira
Danilo Leite de Macedo Tavares
Diego André Souza Santos
Jeovah Herculano Szervinsk Junior
Leonardo Hideki Higa

Cover design
Luís Cláudio Cardoso da Silva

Graphic design
Renato Rodrigues Buenos

The manuscripts in languages other than Portuguese published herein have not been proofread.

Ipea Bookstore

SBS – Quadra 1 – Bloco J – Ed. BNDES, Térreo
70076-900 – Brasília – DF
Brazil
Tel.: + 55 (61) 3315 5336
E-mail: livraria@ipea.gov.br

Composed in Adobe Garamond 11/13.2 (text)
Frutiger 47 (headings, graphs and tables)
Brasília – DF – Brazil

Ipea's mission
Enhance public policies that are essential to Brazilian development by producing and disseminating knowledge and by advising the state in its strategic decisions.

ISSN 1415-4765

ipea Institute for Applied Economic Research

Secretariat of Strategic Affairs

BRAZILIAN GOVERNMENT BRASIL